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The Impacts of Goal Structure Design among Projects within an IT Program on the Resources Monitoring

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ABSTRACT

Within an IT program, a key source of conflict has been the competition among project managers over scarce resources necessary for the completion of their own individual projects. To succeed in the overall implementation of their program, however, program managers must consider methods for effectively monitoring resources when designing projects. The shared cognition theory suggests that a shared understanding of tasks among all program members would serve as a solid foundation for the effective monitoring of resources. However, would a shared understanding alone be sufficient to achieve the needed level of resources monitoring among individual teams? Drawing from the social interdependence theory, we propose that goal interdependence is a critical condition for integrating multiple projects into a program. We argue that shared goal understanding leads to heightened levels of resources monitoring which in turn leads to greater efficiency in the implementation of the IT program. However, this relationship may be moderated by the goal interdependence among projects within the program. To empirically test the model, an instrument has been developed while data collection nears completion.

Keywords

Shared goal understanding, goal interdependence, resources monitoring, IT program implementation efficiency.

INTRODUCTION

Winning is about having the whole team on the same page. -- Bill Walton

Many managers regard the newly proposed program-based approach for large information technology (IT) implementations as an effective vehicle to align related projects (Ritson et al., 2012) and achieve business objectives (Turner and Müller, 2003; Hatzakis et al., 2007; Prieto, 2008; Parolia et al., 2011). An essential responsibility of program management is the identification, rationalization, monitoring, and control of interdependencies among projects; and the tracking of the contributions of each project to the consolidated program benefits (Project Management Institute, 2006). In spite of the widespread adoption of IT program management practices, organizations still experience a high failure rate in their implementations (Denyer et al., 2011; Koh et al., 2011). Failures may be due to an inability to deliver on a reasonable schedule, the usage of far more resources than originally anticipated, or a simple inability to deliver product and service functionality that meets business requirements (Milosevic, 2007). Engwall and Jerbrant (2003) argued that resource allocation syndrome is the most challenging issue of multi-project management. They identified syndrome as an effect of failing project scheduling and effect of over commitment. Resource allocation syndrome might be due to the effect of management accounting systems that are ill-suited to multi-project management and/or due to the effect of opportunistic project management behaviors within an organization. Multi-project management has to go beyond resource allocation and address incentive structures, accounting systems, and other deeply embedded organizational features. In fact, a major part of program planning is to consider what resources individual projects will require, and how they will be acquired, used, and shared effectively. However, competition among projects to secure specific resources for individual project goals is a feature of a multi-project environment (Eskerod, 1996). Program and project managers need to assess whether projects are continuing to meet objectives and using resources efficiently (Ferns, 1991). Unfortunately, the issue of how to enhance the effectiveness of resources monitoring among multiple projects within a single program has been overlooked in the literature.

Two major characteristics of programs are interdependence and shared goals (Engwall and Jerbrant, 2003; Lycett et al., 2004; Project Management Institute, 2006; Prieto, 2008). Interdependence is defined as the extent to which stakeholders and team members of each project believe that individual project goals can be achieved only when the goals of other projects are met, and resources are appropriately allocated across projects (Weldon and Weingart, 1993). Furthermore, related projects must align their own goals with the overall program goals (Ribbers and Schoo, 2002). The specific goals of a program and the specific objectives of each project should be clearly established and shared among all key program members to provide a direction and common cognitive foundation (Parolia et al., 2011). Shared goal understanding suggests that team members with a shared mental model will be able to anticipate goal-specific actions and the efforts needed from other team members better. Such a common understanding enables individual projects to coordinate and control independent work efforts effectively while minimizing the need for more costly monitoring mechanisms. However, will understanding of a shared goal alone be sufficient to achieve effective resources monitoring during an IT program implementation?

Social interdependence exists when outcomes of individuals are affected by the actions of themselves and others (Johnson & Johnson, 1989). The concept postulates that the structure of interdependence will influence how individuals interact with each other and that this pattern of interaction will determine collective outcomes (Deutsch 1949; Johnson et al. 1989). In this study, we argue that project goal interdependence among individual projects is a facilitator of promotive interaction. This refers to team members encouraging and facilitating each other's efforts in task completion in order to reach the goals of the group as well as the goal of each individual (Johnson & Johnson, 1989; Johnson & Johnson, 2005). In other words, we argue that in addition to shared goal understanding among project teams, goal interdependence will motivate project managers to effectively monitor scarce resources to ensure that they are allocated for maximum benefit to the program and to completion of each project. Unfortunately, existing single project studies fail to address issues that arise when multiple, related projects are undertaken as part of a program (Lycett et al., 2004; Reiss et al., 2006).

The objective of this study is, therefore, to address this gap by examining the impact of shared goal understanding on effective resources monitoring among multiple projects within a program. More specifically, we argue that a shared understanding of program goals leads to effective resources monitoring, which, in turn, leads to overall IT program implementation efficiency. Furthermore, this relationship is moderated by goal interdependence among projects within the program: a higher level of goal interdependence among projects will strengthen the positive effect of shared goal understanding on effective resources monitoring.

THEORETICAL BACKGROUND

IT Programs

A program is an interdependent collection of projects to achieve organizational objectives in a fluid environment with a focus on longer-term outcomes (Denyer et al., 2011). The aim of IT program management is to deliver higher order strategic goals undeliverable by individual IT projects on their own (Turner and Müller, 2003; Lycett et al., 2004; Prieto, 2008). The issue of how to effectively monitor resources among projects within a program has become a critical management challenge in the achievement of program objectives. Resource monitoring is defined as the extent to which projects keep track of other projects' resource utilization as they relate to overall enterprise system (ES) program accomplishment. IT programs have a high degree of complexity and interdependency, more so than at the project level (Parolia et al., 2011). In contrast to a project, a program involves the management of multiple deliverables rather than a single deliverable (Pellegrinelli, 1997). The advantage of a program is that resources can be better reallocated to critical projects even after funds have been assigned to individual projects (Pellegrinelli, 1997). However, Combe (1999) stated that traditional bottom-up identification of projects is often inadequate to ensure selection of the most important tasks on which to expend resources. In terms of resource management within a program, current issues include (a) infrequent use of monitoring methods on resource use and cost tracking, (b) insufficient methodologies used in project planning and estimation of resource requirements and (c) resource use within a program is not optimized (Elonen and Arto, 2003). Since sharing expertise, equipment and funds from a common resource pool is necessary for program execution, the establishment of resource monitoring is likewise essential to accurately identify resources and costs of each individual project.

Shared Cognition

Shared cognition refers to the mental models collectively held by a group of individuals that enable them to accomplish tasks by acting as a coordinated unit. Team cognition facilitates members to formulate accurate teamwork and taskwork predictions (He et al., 2007; Cannon-Bowers, 1993; Katz and Tushman, 1979), adapt activities and behaviors in a coordinated way, and thereby increase overall team effectiveness (Cannon-Bowers and Salas, 2001; Lewis, 2004, Salas and Cannon-Bowers, 2001). Shared goal understanding is derived from the theory of shared mental models (Cannon-Bowers and Salas, 2001). When program team members share common goals, they are better able to anticipate goal-specific actions of other team members. Such a common understanding enables individual projects to coordinate independently performed work efforts while minimizing the need for more costly coordinative mechanisms. Without a shared mental model, team members will not be able to efficiently coordinate each other's activities or resolve conflicts (Cannon-Bowers, 1993; Hollingshead, 2001; Walsh, 1995). A shared mental model helps program team members effectively coordinate their actions, monitor resources, and adapt behaviors to the demands of projects and the expectations of other members (Cannon-Bowers and Salas, 2001; Levesque et al., 2001). A shared understanding of the project goals within a program will provide a foundation for resolution of conflicts arising between project managers over resource coordination, and avoid situations where project managers compete with each other without understanding the goals of other projects, only focusing on their individual interests. Although the shared mental model argues the positive effect of shared goal understanding on team coordination activities, including resources monitoring and control, we doubt whether this shared cognition will be sufficient to motivate project managers within a program to effectively monitor the resources of other projects during the program implementation process.

Social Interdependence

Social interdependence refers to the outcomes of individuals are affected by their own and others' actions (Johnson et al., 1989). The assumption of social interdependence theory is that members of the same team are made interdependent through common goals. Social interdependence theory postulates that the structure of interdependence will influence how individuals interact with each other and that this interaction pattern will determine the collective outcome (Deutsch 1949; Johnson et al. 1989). The theory defines situations of promotive interaction, oppositional interaction, and no interaction. In promotive interaction (i.e., positive goal interdependence), team members encourage and facilitate each other's efforts to complete tasks in order to reach group and individual goals (Johnson et al. 1989; Johnson et al. 2005). These interactions may involve mutual assistance, communication, information and resource monitoring and sharing. In oppositional interaction, team members discourage and obstruct each other's efforts to complete tasks in order to reach their own goals (Johnson et al. 1989; Johnson et al. 2005). These interactions may involve misleading communication, inadequate information and resource sharing. In a no interaction pattern, team members act separately without any direct interaction with each other. Team members only focus on how to increase personal productivity and achievement and ignore relationships with others. In general, SIT suggests that interaction processes among team members such as decision making, information sharing, and mutual monitoring (Guzzo et al. 1992; Mathieu et al. 2008) are affected by perceptions of either positive or negative goal interdependence. Based upon the shared mental model, SIT, and the above discussion, we, therefore, propose the following research model for this study (see Figure 1). Detailed hypotheses are developed in the following sections.

RESEARCH MODEL AND HYPOTHESES

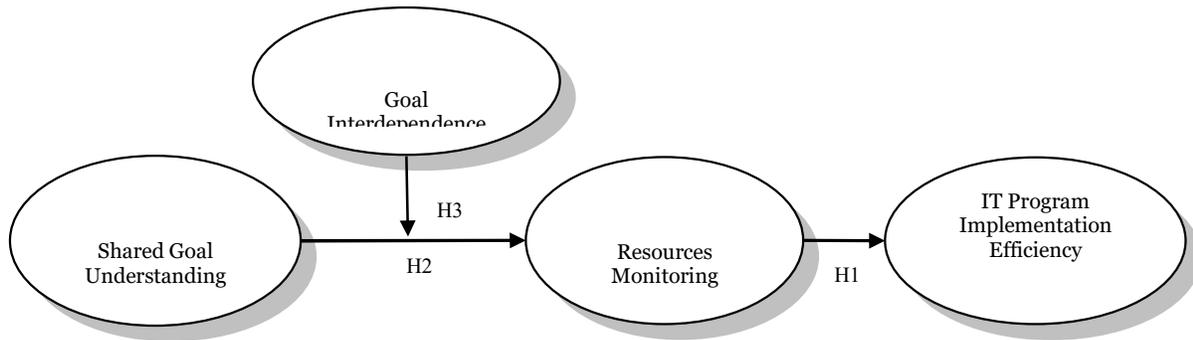


Figure 1. Proposed Research model

The Impact of Resources Monitoring

Resources monitoring is defined as tracking team resources and environmental conditions as they relate to task accomplishment (Marks et al., 2001). It includes monitoring levels and performance of team resources such as personnel, equipment, information, environmental conditions, and organizational changes. When team members monitor their environment, both internal and external to the team itself, they are better able to apply appropriate task strategies and respond in timely fashion to ongoing changes (Cannon-Bowers et al., 1995). The monitoring of environmental conditions enables team members to detect any changes and respond appropriately to a dynamic environment. Salas et al. (2005) argue that as team members progress towards task completion, the monitoring of their environment enables them to make sure that they are doing the right things. A team cannot adjust behaviors unless they recognize changes in conditions. In order to achieve the common objectives of the program within the given resource, individual project teams need to keep track of resources consumed by other project teams, and program managers should ensure that projects all have sufficient resources. Therefore, the ability of the program manager to effectively identify program resources and costs, and to successfully resolve resource conflict of competing projects, is critical to meeting established schedule deadlines. More specifically, resource monitoring affects program efficiency by tracking resource status constantly. Most past studies show that monitoring is widely recognized as an important task in construction project contexts (Al-Jibouri, 2003; Aliverdi et al., 2013; Wong and Wong, 2014, Wong et al., 2010). Based on the above discussion and empirical evidence in the literature in a single project implementation context, we propose the following hypothesis:

H1: The level of resources monitoring among projects within an IT program is positively associated with IT program implementation efficiency.

The Impact of Shared Goal Understanding

Shared goal understanding among team members will establish a common set of expectations for an entire program. With everything else being equal, people tend to work harder when they understand expectations based on directives (Locke & Latham, 2002). Without a shared understanding of goals, project teams are likely to disagree on what tasks they should perform and how. The specific goals of IT multi-projects must be clearly established to expect the necessary efforts to be made to complete multi-projects successfully (Parolia et al., 2011). Prior IT project management studies have observed that the specific goals of a program must be clearly established and shared among all key program stakeholders to provide expectations for a project (Prieto, 2008; Shao and Müller, 2011, 2012). A shared understanding of common goals is the foundation for planning and communicating related actions, knowledge and objectives of interdependent members, and monitoring project resources. Prior studies indicate that shared goals encourage team members to support joint actions and actively participate in coordinated teamwork (Johnson and Johnson, 1999). DeShon et al. (2004) argued that when team members work as a team, individuals will

make decisions concerning the allocation of resources that assist in the achievement of individual as well as team goals. Therefore, a shared understanding of goals will direct team members to work with each other toward an overall goal. Based on the above discussions and empirical evidence, this study proposes:

H2: The level of shared goal understanding among projects within an IT program is positively associated with resources monitoring.

The Impact of Goal Interdependence

Interdependence is a defining characteristic of teams, referring to the “extent to which teams cooperate and work interactively to complete the objectives” (Stewart and Barrick, 2000, p.137). Team interdependency increases as individual teams become mutually reliant on one another for resources (e.g., equipment, information required for collective goal accomplishment) (Wageman, 1995), interaction during the accomplishment of collective work (Van de Ven & Ferry, 1980), and desired outcomes (Alper et al., 1998; Guzzo and Shea, 1992). Interdependence has been found to strengthen relationships between team cognition and collective efficacy (Gully, et al., 2002) and team behavioral process (LePine, et al., 2008). Synergistic emergent states and processes become more pivotal to team functioning when team members are mutually reliant upon one another (Kozlowski and Ilgen, 2006). For example, Johnson et al. (1989) suggested that positive interdependence promoted higher individual achievement and group productivity than did a mere common goal of members alone. When positive goal interdependence is structured with a high level of shared common goals among team members, team members will be more motivated and equipped to engage in information exchanges that facilitate effective coordination/cooperation than any other combined conditions. High interdependence ought to necessitate more distributed and compilation cognition (He et al., 2007). Thus, the relationship between the shared goal understanding of individual projects’ goals and resources monitoring is strengthened when goal interdependence is high. Based upon the above discussion, we propose the following hypothesis:

H3: The relationship between shared goal understanding and resources monitoring is positively moderated by the level of goal interdependence.

METHODOLOGY

Sampling

A mail survey will be conducted of a sample of the top 1000 performing firms as announced by the China Credit Information Service, Ltd, a leading business database in Taiwan. The target sample is programs that implemented enterprise systems. We chose to limit the sample to enterprise systems due to the frequent instances of resource overutilization and frequent lack of implemented functionality of these systems, as well as their widespread use (Koh et al., 2011). Furthermore, the common traits of IT programs considered in the model (interdependent projects having unique functional level goals) are commonly exhibited in enterprise system implementations. Two informants within an enterprise system program implementation will be asked to assess items of different constructs. The informants include IT managers and functional managers involved with the enterprise system implementation. IT managers will assess the goal interdependence, system monitoring, and IT program implementation efficiency. Functional managers supervise individual projects and thus have the opportunity to observe shared goal understanding. The use of match-paired questionnaires for the two key informants prevents single respondents and common method bias (Podsakoff et al., 2012).

Constructs

All measures used in the two questionnaires come from prior studies and are adjusted to fit our context. Table 1 shows the measurement items. Shared goal understanding refers the extent to which the program goals are specifically stated and fully understood by key program members within the Enterprise systems at the initial stage, assessed by four items adapted from Fang et al. (2004). Goal interdependence refers to the interconnections among projects implied by the type of goal that guides their performance and efforts toward the program, assessed by three items adapted from Chen et al. (2005). Resources monitoring refers to the extent to which project teams keep track of other project teams’ resources and environmental conditions as they related to the enterprise system program accomplishment, assessed by three items adapted from Marks et al., (2001). IT program implementation efficiency refers to the extent to which the program team accomplished the IT program implementation according to resource

usage, schedule, and scope, assessed by four items adapted from Hoegl and Gemuenden (2001). An English version of a questionnaire was compiled and modified to fit the context of program implementation and then translated into Chinese. The Chinese version of the questionnaire was verified and refined for translation accuracy by two MIS professors and one senior doctoral student who familiar with extensive research on project management. In addition, the Chinese versions were validated by a couple of senior project managers with industrial experience. Research constructs were operationalized on the basis of their original studies and pilot test. First, we invited two experts to diagnose the measurement items and response formats for content validity. Based on their feedbacks, we modified problematic items as necessary. Second, six IT managers who had IT project/program management experience participated in the pilot test. This procedure resulted in some modifications, and/or deletions to the questionnaires and to the clarity of each item. Each construct will be measured using seven-point Likert scales anchored with “strongly disagree” and “strongly agree”.

Constructs	Items	Respondent
Shared Goal Understanding	<ol style="list-style-type: none"> 1. Specific goals for each project were explained to the key program members in the organization 2. A set of specifically assigned goals for each project was fully understood by key program members in the organization 3. Key program members understand the exact level of the assigned performance goals for each project 4. Each project's assigned goals are clear to the key program members 	Functional Manager
Goal Interdependence	<ol style="list-style-type: none"> 1. How much were your goals and the other project teams' goals structured so that they were win-win? 2. How much would your team accomplishing your project goal affect whether the other project teams achieved or did not achieve their goals? 3. All the teams within the Enterprise program are collectively held accountable for our program performance/success 	IT manager
Resources Monitoring	<ol style="list-style-type: none"> 1. Each project team successfully tracked other projects' resources (such as personnel, equipment, and others) that are allocated to the Enterprise program 2. Each project team successfully tracked the project completing status relevant to the Enterprise program 3. Each project team successfully tracked the resources had consumed for the tasks taken by other project teams 	IT manager
IT Program Implementation Efficiency	<ol style="list-style-type: none"> 1. The program effectively utilized available resources to deliver the specified program scope 2. The specified scope of the program were delivered with time and budget 3. It is easy to say that this program was efficiently implemented 4. General speaking, we are satisfied the operation efficiency of this Enterprise program implementation 	IT manager

Table 1. Constructs and Questionnaire Items

EXPTCED DATA ANALAYIS

This study will conduct structural equation modeling (SEM) to access collected data for measurement model and structural model (Anderson and Gerbing, 1988). The study will conduct confirmatory factor analysis (CFA) using SmartPLS to test convergent validity and discriminant validity. SEM analysis will utilize SmartPLS to test hypothesized paths.

EXPECTED OUTCOME AND CONTRIBUTION

A program is a structure for grouping multiple projects to achieve a set of common objectives (Turner and Müller, 2003; Prieto, 2008). Competition among projects results in negative program consequences as individual projects

only focus on self-interest and fail to effectively coordinate scarce resources (Lycett et al., 2004). Management of resources conflict is the critical issue facing the program manager. The process of resources monitoring largely focuses on monitoring and tracking of shared resource usage, which is analogous to the constant assessment of the available resource. Resources monitoring discloses resource status among competing projects in more detail, which in turn alleviates the resource conflicts of multi-project programs. Prior theories have suggested that either shared goal understanding or goal interdependence enhance effective monitoring behaviors. When team members of individual projects fully understand goals, they will track resources to achieve individual project goals. However, when they perceive the goals to be highly interdependent, perceived overall benefits will motivate them to cooperate on overall program goals.

The results of this study will provide new insights to researchers and in practical applications. For researchers, first, we argue that the level of shared cognition of goals among projects within an IT program is positively associated with effective resources monitoring. This shared cognition provides a foundation for conflicting project managers to be more effective in resources monitoring. A positive result will confirm this theoretical proposition under the context of multi-project execution. Second, although the theory argues the positive effect of shared goal understanding on resources monitoring, we suspect that shared cognition may not be sufficient for effective resources monitoring. Social interdependence theory addressed that the structure of interdependence will motivate how individuals interact with each other. When positive goal interdependence is structured, individual project managers will be motivated to engage in resources monitoring. A positive result will suggest that researchers should consider both cognition foundation and motivational factors when examining monitoring behaviors in future studies.

For practical application, shared goal understanding in IT program implementation may be the most critical component to enhancing resources monitoring among multi-projects within a program. It is advisable to ensure there is a shared understanding of program goals among interdependent projects at the early stage of program set-up. Further, resources monitoring is expected to enhance program success. IT program management must ensure effective resources monitoring is conducted among projects for optimal utilization of scarce resources to accomplish both individual project tasks and overall program objectives. These implications must be tempered by limitations of this study - the sample consists only of "ES implementation" programs in Taiwan.

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