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Promoting the integration of users and developers to achieve a collective mind through the screening of information system projects

Jack S. Hsu [a,*], T.P. Liang [a,1], Shelly P.J. Wu [a,2], Gary Klein [b,3], James J. Jiang [c,4]

[a] Department of Information Management, College of Management, National Sun Yat-sen University, Taiwan
[b] College of Business Administration, 1420 Austin Bluffs Parkway, University of Colorado, Colorado Springs 80918, CO, United States
[c] Research School of Business, The Australian National University, Canberra ACT 0200, Australia

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Abstract

The active and fruitful participation of users in the development projects of information systems (IS) is a crucial factor in achieving success. However, difficulties such as conflict and apathy often plague IS development projects that do not rely on building effective partnerships between users and those responsible for the development. Partnering ideas have been proposed that consider the building of relationships earlier in the life cycle of the development project. With this in mind, we propose going back further to the screening process and build a model that establishes how directed screening of projects to consider user-related criteria can improve the active participation of users by fostering trust, knowledge exchange, and a collective mind in the project team among users and developers. The model is tested with a sample of IS project managers and finds that project performance can be enhanced by attending to screening criteria that consider the user perspective when selecting projects to add to the organizational portfolio.

Keywords: Information systems; Project screening; User participation; Collective mind; Knowledge externalization; Trust; Project portfolio

1. Introduction

Organizational information capabilities are built with a number of interrelated projects that must be successful to achieve overall goals (Kumar et al., 2008). A number of criteria and methods are proposed in the information systems and project management literature to select the best projects to be included in an organization's portfolio of projects (Archer and Ghasemzadeh, 2004; Badri and Davis, 2001; Cheng and Li, 2005; Jiang and Klein, 1999; Wang et al., 2009). The criteria for selection in these approaches are typically aimed at organizational goals, which might ignore the considerations of achieving individual project success (Martinsuo and Lehtonen, 2007). This happens in spite of reports in the project management literature that identify the inability to successfully complete individual projects as one of the most frequent barriers to the success of a project portfolio (Elonen and Artto, 2003). Project choices must be made and managed in a way that strives to achieve the objectives of the organization by considering both the single projects and the multiple project environments (Dietrich and Lehtonen, 2005). One commonly cited framework for selecting projects to be in an organization's portfolio considers screening and selection as two separate stages (Archer and Ghasemzadeh, 1999; Kumar et al., 2008). In the screening stage, submitted projects are compared with a set of criteria to determine whether each individual project meets minimal requirements. This step aims to prevent projects that do not fit the culture, resources, or available talent from being considered in the selection stage.

* Corresponding author. Tel.: +886 7 5252000x4732.
E-mail addresses: jackshsu@mis.nsysu.edu.tw (J.S. Hsu), tpliang@faculty.nsysu.edu.tw (T.P. Liang), d964020006@student.nsysu.edu.tw (S.P.J. Wu), gklein@uccs.edu (G. Klein), james.jiang@anu.edu.au (J.J. Jiang).
[1] Tel.: +886 7 5252000x4711.
[2] Tel.: +886 7 5252000xt4760.
[3] Tel.: +1 719 255 3157; fax: +1 719 255 3494.
[4] Fax: +61 2 6125 5005.

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Information system (IS) projects are uniquely complex, dynamic, and unstructured requiring communication and coordination of expertise from across multiple domains in order to effectively diagnose problems and design solutions (Schwalbe, 2007; Tesch et al., 2009). In the development or deployment of information technology, the talent and culture at the project and implementation level lie primarily within the users and developers that comprise the project development team (He and King, 2008). For this reason, IS projects are often organized to effectively integrate users and developers to successfully complete the IS development projects, as are many projects in a knowledge intensive discipline (Bettencourt et al., 2002). The question not answered is whether screening projects in accordance with the importance of users in this type of environment can be effective in achieving the success of individual projects crucial to the composition of a successful portfolio.

The purpose of this exploratory study is, therefore, to examine the impact of considering whether collaborative integration essential to IS project success can be promoted with project screening and, in turn, whether the resulting user-developer integration may improve IS project performance. More specifically, we hypothesize that users and developers can establish a common perspective and coordinate their knowledge and actions when projects are screened to standards of cooperation established in the management literature (Bettencourt et al., 2002). This integration of users and developers results in a collective mind when the level of exchanging information or knowledge with each other is high in an environment of trust. Additionally, we verify that project success, as a measure considering cost, schedule, output quality and scope, is more effectively reached as user and developer integration improves in the appearance of trust, knowledge exchange, and common perspective. The results have implications at the portfolio level in terms of screening projects that fit the development environment, resulting in more successful individual projects important to the overall success of the project portfolio.

2. Background

The management of an information system project portfolio is a continuous process to maximize portfolio benefits, minimize risks, and ensure the alignment with the strategic intentions of the organization (Kumar et al., 2008). New projects are expected to fit into the overall organizational technology infrastructure to achieve maximum benefits (Weill and Aral, 2006). Project opportunities might come from any aspect of information technology, including technology asset development, establishment of information processes, and the development and deployment of application systems—the latter being the focus of this exploratory study. In an ideal setting, potential projects are evaluated to consider the long run benefits to the organization as well as the costs and interdependencies of all projects in the development and applied portfolios. What may be missing from the selection process, however, is the consideration of the talents and knowledge needed to successfully complete each project to meet the common success criteria—typically meeting required scope, being on time, and staying within budget (Tesch et al., 2009). Since research indicates that individual project success is essential to the success of a project portfolio, this oversight may be very problematic for an organization that relies on projects for strategic advancement (Elonen and Artto, 2003).

Frameworks proposed to choose projects to be included in a portfolio are generally flexible enough to allow initial screening on a number of criteria (Archer and Ghasemzadeh, 1999). So the criteria to initially screen individual projects can include more critical issues to achieve success. In the case of information systems development, integrating users into the development process as one class of stakeholders is essential to the successful development and deployment (Markus and Mao, 2004). Studies have concluded that users contributing their domain knowledge to an IS project is a key activity since the sharing or exchange of knowledge between users and developers is necessary for final project performance (Tesch et al., 2009). However, simply including users in the development process does not guarantee such knowledge transfer and sharing will occur. True integration of users into the development project is an emergent process, and as such will more likely occur under the proper conditions (Markus and Mao, 2004). Logically, screening potential projects along criteria to foster user integration should yield better individual project results and contribute more to the organization's portfolio.

First, we identify the traits of an environment that fosters desired user integration, and then we will turn attention to potential screening considerations based on the management literatures. Simply putting users into a position to contribute to the development of a new system by placing them on the development project team is not sufficient, there must be active engagement to contribute business knowledge, provide requirements information, and exercise control (He and King, 2008). Further, in addition to such behavioral engagement, a certain level of integration between users and developers is needed for them to unify efforts from both parties to maximize the performance; that is, users and developers should be cooperatively involved to the extent that the activities of each facilitate the attainment of the ends of the others (Tesch et al., 2009). Previous studies indicate that team performance is determined by how well team members can integrate their cognition, emotions, and behavior (Barrick et al., 2007). In the IS context, we establish cognitive integration to be when users and developers are able to understand, anticipate, and integrate each other's perspective; affective integration is the presence of sufficient trust to accomplish tasks; and behavioral integration refers to the degree to which project members exchange information with each other. In this exploratory study, we adopt these concepts as the relationship between IS users and IS developers persisting across time and tasks.

2.1. Cognitive integration: collective mind

Collective mind is defined as "a pattern of heedful interrelations of actions in a social system" (Weick and Roberts, 1993). It

contains three components: contribution, representation, and subordination. Contribution means that actions are constructed and taken by actors within the system; representation indicates the actor understands that the system consists of connected actions by themselves and others; and subordination reflects the interrelation of actions taken by actors within the system. With a collective mind, people pay attention to contributing, representing, and subordinating behaviors which generate consequences at the system level. In an IS development context, each of these three components can be said to occur when both users and developers contribute to the project outcome, build an internal model of the group, and put team goals ahead of individual goals.

A collective mind among users and developers is critical for the success of project performance. With a collective mind, project members make contributions to the outcome with attention and care, users and IS developers have a global perspective of each other's tasks and responsibilities, and they carefully interrelate actions to each other to maximize the project performance. A collective mind helps teams to resolve conflicting requirements, negotiate solutions, ensure that the development staff shares a consistent understanding of the design, and provide communication between contending groups crucial to project performance (Faraj and Sproull, 2000). Evidence shows that insufficient spread of application knowledge among project members is a significant problem and the consequence is a substantial design effort to be spent fostering a common understanding (Curtis et al., 1988). A collective mind between users and developers does not emerge automatically when including users in the IS development team. It emerges over time through repeated interactions and communications among individuals (Faraj and Sproull, 2000).

2.2. Behavioral integration: knowledge externalization with users

The quantity and quality of information and knowledge exchanged between parties is a critical component of behavioral integration (Hambrick, 1994). By studying the behavioral processes of an IS development project, system developers have to integrate knowledge from several domains–technical knowledge, methodological knowledge, and business domain knowledge–so that they can perform their job successfully (Curtis et al., 1988). In most situations, developers possess the technical and methodological knowledge but not the business domain knowledge. Knowledge acquisition, sharing, and integration are all activities that enable the IS development team to learn what it needs for producing an appropriate design. The amount of application domain knowledge across the entire software development staff is positively associated with software productivity and quality (Curtis et al., 1988). Therefore, knowledge sharing between the developer and the user is crucial when the project faces tough decisions.

In the knowledge management literature, knowledge is classified as explicit and tacit and the dynamic interaction between these two is vital for the creation of new knowledge (Nonaka, 2005). Tacit knowledge is the knowledge internalized by an individual from previous experience, so it is personal and hard to formalize or communicate. It is rooted in action, commitment, and involvement within a specific context. Explicit knowledge is documented knowledge that is externally visible, can be stored on various media and is transmittable in a formal, systematic language. The term "externalize" represents actions to make tacit knowledge explicit, and "externalization" is the conversion of tacit knowledge into explicit knowledge (Nonaka, 2005).

We view the externalization process, a transfer of knowledge through dialogue or other dealings, as a behavioral interaction between users and developers. In the context of the current study, the IS developers and users work together as a team to externalize the IS developers' knowledge with users in order to acquire feedback, including shared experiences and needs. Knowledge exchange between developers and users, and the learning during the exchange process, are critical for successful information system development (Tesch et al., 2009). Users generate an understanding of the system requirements, the usage of the system, and its impact on the business operation. On the other hand, users transfer knowledge about business operation to developers. As they work together, they often generate links between individuals who can provide each other with useful information (Seely-Brown and Duguid, 1991).

2.3. Affective integration: trust between users and developers

Affective integration between users and developers can be represented by the level of mutual trust between two parties (Barrick et al., 2007). Mayer et al. (1995) defined trust as "the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor" (p712). According to the definition, trust between users and developers is an expectation shared by the IS staff and functional groups that they will meet reciprocal commitments (Dasgupta, 1988). Since IS development is a cooperative process between users and developers and trust serves as one important factor of successful partnering (Wong and Cheung, 2004), understanding the development of trust between these two parties is then critical.

Lewicki et al. (2006) summarized three perspectives in studying trust. First, the uni-dimensional approach views trust as a single dimension with distrust on the opposite side. This perspective suggests that numerous psychological, behavioral, and contextual factors may cause the level of trust to vary across the spectrum. The second perspective is two-dimensional, viewing trust and distrust as two distinct components instead of two sides of single measurement. Trust or distrust is viewed as a function of the frequency, duration, and diversity of experienced interactions. Trust increases after positive interactions and distrust increases after negative experiences accumulate. Users will increasingly trust IS developers with positive interactions during the development.

The third perspective, transformational, suggests that there is more than one type of trust and the nature of trust itself transforms over time. Knowledge-based trust is built on knowledge about the other party, allowing a prediction of behavior. Calculus-based trust is a rational choice made about

short-term outcomes of acting in a distrustful way or long term gains from acting in a trustful way. Identification-based trust is built upon identifying with the desires of the other party, resulting in mutual understanding and decisions that incorporate the interests of the other party. With these in mind, IS developers should consider the desires of the user in all activities, allow users to accumulate knowledge about the development process, and make certain that the long term gains due to a trusting relationship is evident, The importance of trust has been examined in IS development settings. Project success and satisfaction with working relationships increased as the level of trust with each other increased (Pinto et al., 2009). Sabherwal (1999) revealed that distrust hurts performance as participants from each side focus on their own interests and seek to blame others for failure.

2.4. Project screening

Project screening and selection is a two stage process to choose the most suitable projects from available options to yield the highest returns (Melone and Wharton, 1984). This two-stage framework is expanded on by Archer and Ghasemzadeh (1999, 2004). In the first stage, each project is evaluated individually and those that do not meet pre-defined criteria are excluded. In the second stage, formal methodologies are then applied to select which projects are to be included in the portfolio. The purpose of this screening process is to exclude those projects that are not urgent or necessary and to reduce the number of projects to be simultaneously considered in the second stage. Screening is critical and wanting of more attention because most companies suffer from adopting too many projects competing for limited available resources with resulting poor performance (Badri and Davis, 2001). An effective screening process should be able to filter out those projects that have low probability in completion, are not urgent or important, or may generate a negative impact on the overall project portfolio. When screening includes consideration of the multiple perspectives on a project team, screening effectiveness should be increased. Thus, consideration of the requirements to achieve a user perspective during screening should improve the results of the screening process.

However, most project selection research focuses on examining the antecedents of project selection or developing project selection methods (Badri and Davis, 2001; Cheng and Li 2005; Wang et al., 2009). It is noticeable that those methodologies are proposed solely to focus on the second stage, that is, how to determine which project to be added to the portfolio. We argue that, determining the candidate pool is as critical as the selection process since some projects, such as those not important to users, may show preferred characteristics in the selection process. The output generated from the selection process is polluted if the input is in low quality. To avoid such problems, it is necessary to engage users and consider their needs in the IS project screening stage, as collaborative behaviors may contribute to better knowledge-based project solutions (Bettencourt et al., 2002). Specifically, Bettencourt et al. (2002) proposed several user-related criteria for project choice: (1) the urgency and priority of the project within the client departments, (2) the budget and client resources to be devoted to the project, (3) the client department's operating philosophy and culture, (4) the client's goals and project objectives, and (5) the complexity and level of customization of the desired solution. Importantly, when the goal is vital to users, behaviors aimed at reducing the discrepancy between the goal and performance will be induced even when a minor deviation is found. Therefore, users are more likely to be integrated with developers behaviorally, affectively, and cognitively when the selected projects meet the users' needs and interests.

3. Proposed research model and hypotheses

Based on the above discussion, we argue that an effective IS project screening process can lead to better collaboration between the developers and the users, which in turn leads to the success of a project. As shown in Fig. 1, three dimensions of user-IS integration, including affective, cognitive, and behavioral, are proposed to be affected by IS project screening and have a direct impact on final project performance.

3.1. IS project screening to user-IS integration

Motivation is the basis for cooperative behaviors such as sharing, communicating, and coordinating members' knowledge and expertise (Kanter, 1994). In general, motivation to contribute resources and efforts in accomplishing a selected project is higher when the project is urgent to the user. Additionally, the development of a cooperative relationship between developers and users is easier when two parties have compatible operating philosophies. Social capital theory indicates that sharing narratives and vision is the basis for exchange, integration, and creation of intellectual capital; such as knowledge and expertise (Nahapiet and Ghoshal, 1998). Moreover, communication and coordination is easier when both parties have a common understanding of task content, process, and even terminologies. Dialogue should be easier and the use of metaphor is possible when two parties possess common understanding or knowledge (Klimoski and Mohammed, 1994). Therefore, we put forward the following hypothesis:

H1a. *IS project screening is positively associated with knowledge externalization.*

Among the proposed IS project screening criteria are the compatibility of the operating philosophy and culture of the user units with the IS structure. The knowledge management and shared mental model literature indicated that a certain level of overlap is required for people with diversified backgrounds to work together (Nonaka, 2005). A compatible working culture facilitates communication and coordination between users and developers to find a shared understanding of how to work together. Another selection criterion is the client's understanding of the level and types of involvement expected. In many cases, users believe that their duties are over after informing developers what system to develop. User participation was

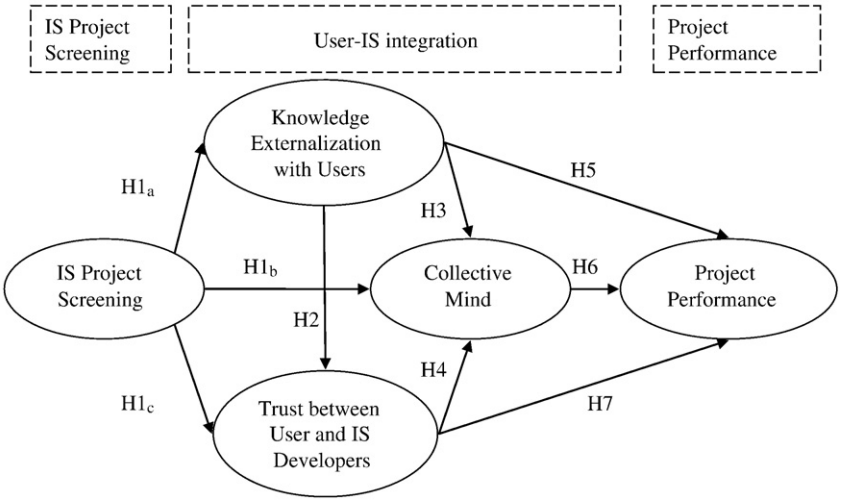

Fig. 1. Proposed research model.

proposed to counter the above limitation. However, user participation does not generate expected benefits. Symbolic participation without active contribution is not rare (Markus and Mao, 2004). For users to really engage in the development process and contribute their domain knowledge to the system development, a certain level of understanding about their role and level of involvement is required. With those understandings, both users and developers can develop a pattern of heedful interrelation of actions in the development work—a collective mind. Formally:

H1b. *IS project screening is positively associated with a collective mind.*

When a high priority or urgent project is selected, developers can expect that the users are more willing to commit to the execution of the project tasks due to longer-term gains when trusting the actions of the developers. Commitment plays the central role of relationship exchange and is the basis of trust between parties that can grow as knowledge is gained from experience (Lewicki et al., 2006). In addition, trust emerges when two parties have the same goals, objectives, or values because common values and beliefs provide the harmony of interests that reduce the possibility of opportunistic behavior and serve to help identify with the desires of the other party (Lewicki et al., 2006). The social capital gained during an exchange fosters trust among the participants in the process (Nahapiet and Ghoshal, 1998; Smart, 1993). Users feel less uncertainty and tend to trust IS developers more when they possess more knowledge about system development and the developers. Therefore, we hypothesize the following:

H1c. *IS project screening is positively associated with trust between users and IS developers.*

3.2. Relationships among the three dimensions of user-IS integration

The development of knowledge-based trust relies on high quality and frequent interaction (Lewicki et al., 2006). Mistrust occurs due to the fear of the unknown (McCole and Palmer, 2002). Uncertainty is reduced once a trustor has more understanding of what is likely to happen and, hence, trust is increased (Lewicki and Bunker, 1996). Understanding of each other is developed through working together repeatedly on a mutual goal. Knowledge externalization can make key knowledge known by users and IS developers. Higher knowledge sharing provides more clues to predict what is going to happen and hence the uncertainty level can be lowered and trust can be increased. Based on the above discussion, we posit the following hypothesis:

H2. *Knowledge externalization with users is positively associated with trust between users and IS developers.*

A collective mind emerges through alertness, attentiveness and connection between users and developers. Socialization and conversation are recommended by Weick and Roberts (1993) to build collective mind. Socialization refers to the process where a newcomer becomes familiar with the environment. The purpose of social interaction is to exchange information and the exchange of information serves as the basis for forming a shared vision. A socialization process is required for users to understand how developers work and communicate. It is the basis for one to learn a common language, symbols, and an understanding of other members (Jones et al., 1997). A dialogue for users and developers to communicate bilaterally is the basis for knowledge to flow from one side to another side. A reciprocated interaction allows users and developers to exchange individual goals, opinions toward issues, and perceptions in the IS development team (Pastor et al., 2002). Reducing the communication between two parties leads to a lacking shared mental model (Levesque and Wilson, 2001). Therefore, we propose:

H3. *Knowledge externalization with users is positively associated with the collective mind.*

Partnership is critical in a cooperative working context. Building and sustaining working partnerships is a necessary antecedent of trust. Mutual trust then leads to better

communication. Finally both parties form a shared understanding of the desired outcome, generate a global perspective toward tasks, and sense that joint efforts lead to successful outcomes (Anderson and Narus, 1990). Studies also showed that a shared understanding between IS developers and clients can be strengthened with mutual trust (Nelson and Cooprider, 1996). Social network research has shown that the affective integration is the antecedent of similar attitude. For example, networks built through partnering activity before the start of a project increase one's perception toward working relationships during the course of a project (Jiang, et al., 2002). Team studies also concluded that a cohesive group generates similar attitudes (Burkhardt, 1994). Therefore, we hypothesize:

H4. *Trust between users and IS developers is positively associated with collective mind.*

3.3. User-IS integration to project performance

Externalization requires the expression of tacit knowledge and its translation into comprehensible forms that can be understood by others (Nonaka, 2005). Thus, the externalization process should involve interaction among individuals who are able to express the tacit knowledge and share it with others. This cooperative interaction among individuals for the purpose of knowledge creation and sharing can lead to cooperative learning, since the learning is activated through direct collaborative interaction with experts and peers in groups to make knowledge transferable (Janz and Prasarnphanich, 2003).

Empirical studies have confirmed the importance of such learning during the IS development project (Tesch et al., 2009). Exchange behaviors of seeking and providing knowledge can lead to superior work performance (Guzzo and Dickson, 1996). When users and IS developers work together as a team, they create new ideas through dialogue and discussion to integrate knowledge from different domains to maximize their performance (Curtis et al., 1988). Hence, we can view project performance as the outcome of knowledge sharing via the externalization process where cooperative learning exists, and when more knowledge is shared via the knowledge externalization with users, a better project performance can be expected. Therefore, we hypothesize:

H5. *Knowledge externalization with users is positively associated with project performance.*

The collective mind refers to the pattern of an interrelation of actions in a social system. With a collective mind, users or developers can better anticipate what others are likely to do and unnecessary checking can be avoided. Therefore, coordination between users and developers is easier and more efficient. The consequence is that less attention to coordination is needed and team members can shift their attention to tasks which lead to higher productivity. This is not limited to routine work; a well-developed collective mind also allows users and IS staff to anticipate how to react in novel situations (Crowston and Kammerer, 1998). During the development process, users contribute business domain knowledge and functional requirements and developers produce the system accordingly. Users and developers build an understanding toward the final product and visualize how they each fit in, how others will act, and how their actions will affect others (Faraj and Sproull, 2000). That is, users and developers can act as one unit. Therefore, we hypothesize that

H6. *A collective mind is positively associated with project performance.*

Mayer et al. (1995) provided a model to state that one's belief about another's ability, benevolence, and integrity lead to a willingness to accept risk, which in turn leads to risk taking in a relationship, as manifested in a variety of behaviors. Risk-taking behaviors in social units, such as work groups, include cooperation and information sharing. These behaviors are expected to lead to higher performance (Lin and Huang, 2010). Trust has been assumed to be one critical factor for a team to be successful and has positive effects on team performance in both efficiency and effectiveness (Pinto et al., 2009). With trust, it is easier for team members to unify their efforts and, in turn, improve the execution of team tasks. On the other hand, trust is

Table 1
Demographic analysis.

Variables	Value	#	%	Variables	Value	#	%
Gender	Male	65	50.80%	Number of persons dedicated to project	<=3	16	12.50%
	Female	63	49.20%		4~7	41	32.00%
Project completed	No	58	45.30%		8~15	29	22.70%
	Yes	70	54.70%		16~25	10	7.80%
Average project duration	<1 year	47	36.7		26~50	8	6.30%
	1~2 years	51	39.8		51~100	8	6.30%
	2 ~3 years	16	12.5		>100	15	11.70%
	3~5 years	5	3.9	Number of years work experience	<1 years	11	8.60%
	<5 years	9	7		1~5 yeas	37	28.90%
Industry type	Service	32	25.00%		6~10 years	28	21.90%
	Manufacturing	25	35.20%		11~15 years	15	11.70%
	Others	34	26.30%		16~20 years	10	7.80%
					>21 years	27	21.10%

also expected to increase the efficiency since it reduces the need and cost for controls and inhibits behaviors which inhibit information circulation (Lin and Huang, 2010). Empirical studies in IS confirmed the importance of trust in achieving high performance (Mao et al., 2008). Therefore, we propose:

H7. *Trust between users and IS developers is positively associated with project performance.*

4. Research methods

4.1. Sample

In order to test the research model, a survey was conducted to collect essential data. Target respondents of this study included the project managers of information system development projects. Project managers are responsible for achieving user involvement and should be aware of how intricately users are involved. This approach is adopted by researchers focusing on understanding user roles in the system development process (Jiang et al., 2002; Petter, 2008; Tesch et al., 2009). A target list was generated from development contacts at foremost companies for a major Asian university. Calls were made to development contacts to identify project managers within the organizations. The project managers were in turn contacted to determine if they would be willing to complete a survey instrument regarding a recently completed or almost completed IS development project. Survey packages, including a questionnaire and return envelope, were sent to those willing to participate. A total of 194 managers from the sampling pool showed their willingness and a total of 134 returned the survey. Out of the received responses, questionnaires from six were incomplete and thus were discarded. Table 1 shows the demographics of the remaining sample.

Table 2
Factor loadings and item-total correlation.

Constructs	Loadings	ITC
IS project screening (Source: Bettencourt et al., 2002)		
CR = 0.87		
(1) IS developers screen potential projects based upon user urgency and priority.	0.70*	0.50
(2) IS developers screen potential projects based upon budget and user resources.	0.67*	0.53
(3) IS developers screen potential projects based upon compatibility of both operating philosophy and culture of users and developers.	0.79*	0.64
(4) IS developers screen potential projects based upon the user's understanding of expected involvement required for a successful project.	0.79*	0.65
(5) IS developers screen potential projects based upon the level of complexity and customization.	0.81*	0.67
Knowledge externalization with users (Source: Lee and Choi, 2003)		
CR = 0.91		
(1) IS developers and users often have creative and essential dialogues.	0.87*	0.77
(2) Users and IS developers often adopt deductive and inductive thinking for problem solving.	0.76*	0.65
(3) IS developers and users often use metaphors in dialogue for concept creation.	0.76*	0.70
(4) IS developers and users often exchange various ideas and dialogues.	0.85*	0.78
(5) Subjective opinions from IS developers and users are encouraged.	0.80*	0.66
Collective mind (Source: Weick and Roberts, 1993)		
CR = 0.91		
(1) IS developers make their contributions to the joint outcome with attention and care.	0.81*	0.71
(2) Users and IS developers have a global perspective of each other's tasks and responsibilities.	0.92*	0.79
(3) Users and IS developers carefully interrelate actions to each other to maximize joint performance.	0.94*	0.80
Trust between users and IS developers (Source: Simons and Peterson, 2000)		
CR = 0.95		
(1) Users and IS developers respect each other's competence.	0.85*	0.77
(2) Users and IS developers on the project show integrity.	0.91*	0.86
(3) Users and IS developers expect the truth from each other.	0.85*	0.77
(4) Users and IS developers can trust each other.	0.89*	0.83
(5) Users and IS developers count on each other to live up to their word.	0.93*	0.89
Project performance (Source: Tesch et al., 2009)		
CR = 0.92		
(1) Projected goals were met.	0.85*	0.73
(2) The expected amount (scope) of work was completed.	0.88*	0.78
(3) Completed work was of a high quality.	0.72*	0.57
(4) The schedule was adhered to.	0.82*	0.71
(5) The budget was adhered to.	0.76*	0.62
(6) Task operations were carried out efficiently.	0.92*	0.86
(7) High work morale was maintained.	0.83*	0.69

*$p < 0.05$.

4.2. Constructs

All research variables were measured using multi-item scales from prior research. All scales were translated to Chinese by one researcher and validated by a second. The survey was reviewed by three project managers for clarity, resulting in minor corrections to the instrument. All items were measured on a 5-point Likert scale, with anchors ranging from 1 (strongly disagree) to 5 (strongly agree).

Project performance refers to the extent to which project team accomplishes system development tasks efficiently and effectively. It deals with team members' qualifications such as ability, efficiency and outcome quality. It was measured using seven items adopted from existing scales (Tesch et al., 2009) that tap into perceptions of project performance in terms of schedule, budget, and work quality. *IS project screening* refers to selecting the optimal projects from competing alternatives to meet predefined objectives. It was measured using 5 items adapted from Bettencourt et al. (2002), which focused on the urgency, resource, fit with the users, the level of expected involvement from the user, and the level of customization required.

Externalization refers to the nature of the process for eliciting tacit knowledge between users and developers, by measuring different approaches used in the process, such as dialogue, metaphor, and inductive or deductive thinking. It was adapted from Lee and Choi (2003). *Collective mind* refers to the pattern of heedful interrelations of actions in an IS development team. A total of three items adopted from Weick and Roberts (1993) were used to measure the level of the collective mind. Finally, *trust between users and IS developers* was measured using 5 items developed and validated by Simons and Peterson (2000). All items are shown in Table 2.

PLS Graph 3.0 was used to evaluate the measurement and structural models. Using ordinary least squares as its estimation technique PLS performs an iterative set of factor analyses and applies a bootstrap approach to estimate the significance (*t*-values) of the paths. A two-step procedure including measurement validation and path analysis was used for data analysis. The validation of measurement includes item reliability, convergent validity, and discriminant validity tests. Factor loadings higher than 0.7 have high reliability and items with loadings lower than 0.5 should be dropped. Convergent validity should be assured when multiple indicators measure a single construct. Convergent validity can be examined by item-total correlation (ITC), composite reliability, and variance extracted by constructs (AVE) (Fornell and Larcker, 1981; Kerlinger and Lee, 1999). To have required convergent validity, ITC should not be lower than 0.3 and composite reliability (CR) should be higher than 0.7. Moreover, if the square root of the AVE is less than 0.707, it means that the variance captured by the construct is less than the measurement error and the validity of both the single indicator and construct is questionable (Fornell and Larcker, 1981).

To have required discriminant validity, the correlation between pairs of construct should be lower than 0.80 and the square root of AVE should be higher than inter-construct correlation coefficients (Chin, 1998). As shown in Table 2 all indicators, except for one, have loadings higher than 0.7, the minimum composite reliability is 0.87 for instrumentality, and the item-total correlation are all higher than 0.5. The correlation matrix in Table 3 shows moderate (0.29 to 0.66) correlations among variables. The square root of the AVE shown in the diagonal of the Correlation Matrix in Table 3, ranged from 0.76 to 0.89, exceeding the threshold of 0.707. The AVEs are greater than the inter-construct correlations. The results exhibit strong construct reliability and validity. Table 3 also shows the descriptive statistics and correlation matrix of aggregated data. For each variable, the mean, standard deviation, skewness (M3), and kurtosis (M4) are provided.

5. Data analysis and results

Fig. 2 shows the analysis results of the structural model. As hypothesized, IS project screening is found to have positive impact on all three dimensions of user-IS integration and, therefore, all H1 hypotheses are supported. These results are consistent with past studies and concepts related earlier indicating that (a) cooperative behaviors can be observed when consideration of users by developers is more pronounced in order to share knowledge; (b) users and developers can develop a pattern of heedful interrelation when users know their role in the project and when developers and users have a shared understanding of the project; and (c) trust is enhanced when users are considered during the screening process.

For the relationships within user-IS integration, first, the relationship between externalization and trust is positively significant which indicates behavioral integration between users and developers leads to high affective integration—a high level of trust between users and developers. The support of H2 indicates that, as we argued, knowledge sharing increases the understanding of each other and trust emerged from this process. Second, the links from both externalization and trust to collective mind are positively significant which represents that

Table 3
Descriptive statistics.

Variables	Mean	SD	M3	M4	Correlation matrix				
					PS	UE	UT	CM	PP
IS project screening (PS)	3.87	0.70	−1.02	2.02	**0.76**				
User Externalization (UE)	3.68	0.74	−0.35	0.32	0.31	**0.89**			
User-IS Trust (UT)	4.00	0.73	−0.49	1.01	0.42	0.60	**0.82**		
Collective Mind (CM)	3.83	0.80	−0.71	0.88	0.62	0.66	0.61	**0.88**	
Project Performance (PP)	3.85	0.72	−0.38	−0.27	0.29	0.60	0.60	0.54	**0.79**

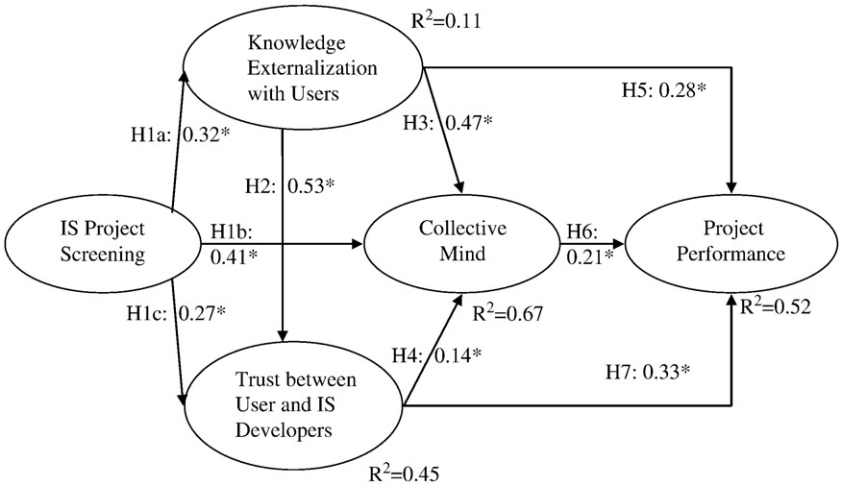

Fig. 2. Results of hypotheses testing.

the cognitive dimensions of user-IS integration is impacted by both behavioral and affective dimensions, as shown by the support of H3 and H4. The collective mind emerged after users and developers developed an understanding of each other through knowledge externalization processes. With strong mutual trust between users and developers, both parties will consider the other party when making a decision.

Finally, consistent with the literature, our results confirmed that knowledge externalization with users, trust between users and developers, and collective mind between users and developers have a positive effect on performance (Guzzo and Dickson, 1996; Crowston and Kammerer, 1998). These three factors of user integration explain more than 50 percent of the variance of project performance. This implies that project performance can be significantly improved when users and developers are able to be integrated cognitively, affectively, and behaviorally.

6. Conclusions and implications

Most previous studies on IS project screening emphasize economic and technical factors such as financial returns and risks, technical requirements and organizational needs. As users are customers, they should not be excluded from consideration. During the development, users are encouraged to take an active role, such as lead the development or take controls during IS development processes. However, it is not rare that users play a passive role during IS development because they are not willing to participate or merely symbolically participate in the system development project. In this study, we examine a model of integration that is impacted by the criteria employed in project screening. Empirical data supported all proposed hypotheses in the research model. First, project performance is highly associated with user-IS integration. Behavioral, affective, and cognitive dimensions of integration were found to have positive effects which help the project meet expected goals of schedule, scope, and cost. Second, the hypothesized relationships among the three dimensions of integration were supported. Lastly, projects screened based on factors that consider user needs and commitment promoted integration between users and developers.

Several of the links confirmed by this study have implications for researchers and practitioners. The study contributes to user engagement research by highlighting the importance of integration between users and IS developers. Prior studies have found that although user participation can help improve system quality, user satisfaction, and system acceptance, superficiality and conflict is unavoidable and can serve to negate any benefits (Barki and Hartwick, 1994). More recent work focused on the user-IS interaction quality and explored the importance of pre-project partnerships (Jiang et al., 2006). These later studies pointed to the potential importance of firming up the relationship among users and developers. We advanced these ideas by modeling the relationship more fully than on strict participation and involvement. Users and IS developers must work closely, share knowledge with each other, build trust, and form shared understanding and perspective. That is, a certain level of integration is required. IS project managers should pay attention to screening as well as activities that can serve to cement team behaviors such as pre-project partnering.

Further, user-IS integration includes three interrelated dimensions: behavioral, affective, and cognitive. By separating integration into three dimensions and studying their interactions, a deeper understanding is obtained. The lessons indicate that insufficient externalization of domain knowledge within IS development teams is harmful to project performance and mutual trust within the team. In addition, a shared cognition, including shared task understanding and awareness of expertise location between users and developers is essential. In this study we showed that both behavioral and affective integration lead to this greater collective mind. The resulting cognitive integration is key to high performance and approaches to improve it are important.

After understanding the importance of user-IS integration, we proposed one possible approach which induces integration between two parties. That is, we demonstrated the importance of user oriented criteria for filtering projects during an initial

screening. We suggest that program or portfolio managers should select a project based on criteria proposed in this study: (1) the priority and available resources of target project to the user unit; (2) how well the user unit understands the nature that target project and amount of efforts they have to enter; and (3) compatibility of the operating philosophy and culture between user unit and IS department. Overall, five indicators were used in our study to assess the role users played in IS project screening. Among them, user priority and urgency may be the most important screening criteria. From an organizational perspective, high priority or urgent projects are also more likely to obtain top management support, which is one critical success factor of project success. From the unit level where users reside, more resources, higher commitment, and, in turn, more cooperative behaviors from the user can be indicators for determining which projects are more urgent.

This study is not without limitations. First, both independent and dependent variables are obtained from the same respondents. Common method bias might inflate or deflate causal relationships proposed in our model. Although we developed and implemented the survey carefully and the Harman's single factor test indicates no problems, data collected from different respondents or different time periods are still recommended (Podsakoff et al., 2003). Secondly, this is a cross-sectional study based on convenience sampling. The causal relationships should be examined with a longitudinal study including more than two-waves of data collection. For example, mutual trust and knowledge exchange or sharing can be easier when users and developers share some common understandings, reversing the direction of causality in the model. Third, the empirical data were collected from IS development project members located in Taiwan, an Asian-based culture, and this generates noticeable concerns: Asian-based cultures take collectivism and conflict avoidance as a virtue. Therefore, the projection of our research to Western business culture should be taken with care. Lastly, although IS project managers should have a certain level of understanding of project priority and user participation, future studies are encouraged to generalize the findings of this study to the user and organizational perspective.

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