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Information systems project management: an agency theory interpretation

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Abstract

The failure rate of information systems development projects is high. Agency theory offers a potential explanation for it. Structured interviews with 12 IS project managers about their experiences managing IS development projects show how it can be used to understand IS development project outcomes. Managers can use the results of the interviews to improve their own IS project management. Researchers can use them to examine agency theory with a larger number of project managers.

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1. Introduction

Despite recent improvements, the failure rate of information systems development projects seems high (BusinessWeek, 1998; Controllers Update, 1996). One study found that 50% of finished projects exceeded budget by 60–190% while only 25% were completed on time, within budget, and to the client's satisfaction (LaPlante, 1995). According to another study, only 16% were completed on time and within budget (Cafasso, 1994). A more recent study found some improvement (Johnson, 1999), but room for more exists (Deutsch, 1991; Jiang et al., 2000; Shenhar, 1998).

Agency theory has been used to understand failures in projects other than IS development and to suggest improvements to practices in those areas. It explains problems that occur when one party (a principal) hires another party (an agent) to perform work on the principal's behalf (Baiman, 1982; Baiman, 1990; Eisenhardt,

1989a). A model based on agency theory has been proposed to explain the effects of deadlines on quality decisions (Austin, 2001). However, a complete agency theory model has not yet been applied to the study of IS development projects.

This paper has three main purposes. First, it elucidates agency theory. Second, it shows how the theory can be applied to understand the outcome of IS projects. Third, it demonstrates how agency theory might be used to suggest improvements to IS project management.

2. Overview of agency theory

An agency relationship governs all employment settings. A manager is a principal and an employee is an agent (Bergen et al., 1992). A problem—referred to as the agency problem—arises when the agent does not work entirely on the principal's behalf. As a result, the work of the agent may conclude less successfully than it otherwise would. In functional organizations, the principal is a traditional manager. In matrix organizations, the principal is represented by two people, the functional manager and the project manager. Several recent articles discuss the impact of a matrix organization structure on

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projects (Dunn, 2001; Laslo and Goldberg, 2001; Little and Little, 1999). In both situations, an agency problem exists when an agent works in his or her own self-interests instead of the best interests of the principal or the firm.

IS development projects are considered to have concluded successfully when they are completed on time, within budget, with the desired functionality, and are high in quality (DeLone and McLean, 1992; Pinto and Slevin, 1988). Projects that do not meet one or more of these criteria are, of course, thought of as less successful (Ford and McLaughlin, 1992). Moreover, the more a project fails to meet an individual criterion, the less successful it is (Pinto and Mantel, 1990). (From the perspective of the project team members, a project may be successful if the developers were able to overcome some technical limitation or if they learned from the experience, regardless of the schedule, budget, or level of system quality (Linberg, 1999); however, that view was not incorporated in the current research because, although it may be common, it focuses more on the narrow interests of the developers rather than the broader ones of the organization.)

Fig. 1 summarizes agency theory. Project success is the desired outcome. Contract type influences project success and the monitoring of project progress. That is, according to the theory, the more that a principal rewards the agent for the results of his or her work, the more successful the project. Likewise, the more the principal rewards the agent for a successful project, the more the principal monitors the status of the project. Greater monitoring is further presumed to produce greater project success (Might and Fischer, 1985).

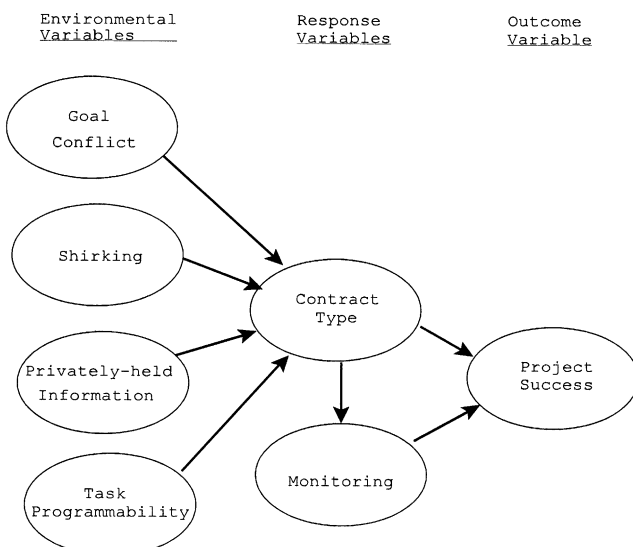


Fig. 1. Agency theory model.

Goal conflict between a principal and agent, shirking of responsibility by an agent, and the presence of information privately held by an agent all motivate the principal to employ more outcome-oriented contracts. On the other hand, greater task programmability inspires a principal to employ less outcome-oriented contracts. Thus, goal conflict, shirking, privately held information, and task programmability all affect project success.

3. Interviews with project managers

To understand the application of agency theory to IS development projects, the authors conducted structured interviews of IS project managers. We discuss the interview methodology now, before further elucidation of agency theory research. The explanation of the methodology now will facilitate the discussion of that research and the interview findings together for each construct in the next section of the paper.

We selected the managers from firms in a regional directory of businesses in a large mid-western US city. Fifteen firms were initially chosen to represent a cross-section of industries and firm sizes, and thus ensure a broad view of IS project management. Twelve of the firms agreed to participate.

The structured interviews consisted of a series of well-defined, open-ended questions (Eisenhardt, 1989b). The subjects were asked to discuss how developers were compensated and how incentives were used to motivate. They were also asked how they monitored IS projects. They were asked for their impressions of the goals of developers and for their own goals for the project. They were asked to describe the activities of developers when shirking. They were asked how developers were able to withhold project status information. They were also asked how their organizations made the tasks of developers more routine. Ten of the subjects managed in-house development projects; the others were in charge of out-sourced projects.

Each of these questions was followed by extemporaneous, probing ones. The interviews lasted about an hour.

The project managers averaged 21 years of experience in IS, 13 years in project management, and 11 years with their current employers. The employers ranged in size from 120 to 18,000 employees, with an average of 7300. The managers currently were responsible for projects from \$50,000 to \$12 million in cost, with an average of \$2.3 million. The durations of these projects was from six months to four years, with an average of one and a half years. Except for one manager who was responsible for several hundred developers, about 16 team members reported directly or indirectly to the managers. The managers' job titles and industries appear in Table 1.

Table 1
Subjects

Title	Industry	Years in IS	Years in project management	Developers managed	Projects managed	Education level
Systems Development Manager	Health Insurance	20	15	80	9	Some college
Senior Project Manager	Financial Services	17	15	0	0	BS
Director of Technical Services	Education	26	10	24	25	Ph.D.
Manager of Information Security and Administration	Utilities	25	10	6	3	MBA
Director of Computer Services	Government	27	23	3	4	BS
Manager of World Wide IT Business Controls	Manufacturing	17	10	12	15	BS
Executive Project Manager	Consulting	17	15	420	1	MBA
Systems Manager	Health Care and Medical Research	21	12	6	8	MA
Group Project Manager	Consumer Products	19	11	12	12	BS
Manager of Manufacturing Division	Manufacturing	13	9	27	35	AS
Information Systems Manager	Manufacturing	25	12	1	6	AS
Director of Information Systems	Health Care	28	20	3	50	BS

4. Agency theory in information systems projects

The purpose of the interviews was not to test the validity of agency theory. Agency theory has been validated in many other contexts. The purpose of the questions was to understand better the agency theory constructs (i.e., the ovals in Fig. 1) and in particular how they relate to one another in the specific context of IS development projects.

Each construct is now elucidated in two subsections. The first explains the construct in terms of the general theory. The second explains it in terms of IS development projects from the interviews.

4.1. Contract type in agency theory

The contract is the core idea in agency theory. It may be an explicit signed contract with an outside consultant or contract programmer, or it may be implicit, as with in-house employees. In either case, it can compensate based on behaviors or on outcomes. A behavior-based contract compensates agents for performing certain tasks or behaving in a certain way. The agent is paid a salary or hourly rate for performing the tasks, regardless of the outcome. This type of contract is more common with in-house employees than it is with outside contractors.

An outcome-based contract compensates agents for achieving certain goals or outcomes. Compensation with this type of contract typically takes the form of a commission (i.e., stock options, bonuses, etc.). Thus, the tying of performance evaluations and merit bonus payments to meeting project deadlines and staying within budget illustrates an outcome-based contract (Lederer and Prasad, 2000). Such a contracts are commonly used with both in-house employees and with outside contractors.

Agency theory predicts that the more outcome-based (and thus less behavior-based) the contract, the greater the project success (Balkin et al., 2000). This is because outcome-based contracts ensure the agent works in the best interest of the principal. Lab experiments with students as subjects have confirmed this relationship. (The contract type to project success arrow in Fig. 1 illustrates the relationship.)

In addition to influencing project success, contract type affects monitoring. That is, the principal may create a feedback system to provide information about the actions of the agent to allow observation of them.

The monitoring of agents is theoretically unnecessary with an outcome-based contract because agents are paid only when they achieve the desired outcome. Thus, agency theory predicts the more outcome-based the contract, the less monitoring of agents' work. Research has examined a link between monitoring and contract type and suggested that more monitoring is related to outcome-based contracts under certain conditions. (Parks and Conlon, 1995; The contract type to monitoring arrow in Fig. 1 illustrates this relationship.)

4.2. Contract type in IS development projects

All twelve interviewees viewed straight exempt salaries as the primary means of rewarding developers. However, according to agency theory such salaries are entitlements, more behavior than outcome-based.

When probed, the interviewees then identified several specific incentives by which they motivate their developers for successful project completion. Table 2 summarizes them and shows the number of subjects who mentioned each.

The subjects discussed these incentives at length. For example, one described organizational bonus plans for

Table 2
Rewards for outcomes

Description	Number of subjects
Technical training	7
Flexible work schedule	6
Sense of contribution to organization	6
Public praise	5
Favorable annual performance appraisals	4
Private office space	3
Time off	3
Pride	3
Financial bonus	2
Newer technology (i.e., PC or laptop)	2
Opportunity to work at home	2
Project completion celebration	2
Choice of future assignments	1
Job promotion	1
Job security	1

division and company-wide performance. He said “The entire organization has an incentive plan. If the company meets its goals, then everyone gets extra pay. Also, if the team meets its goals, there is extra pay for the team members. Typically, the team is a division or a department. We are moving toward having individual projects defined as a team.”

In effect, according to agency theory such outcome-based incentives motivate more successful project outcomes. They also motivate more project monitoring.

4.3. Monitoring in agency theory

Agency theory suggests that monitoring increases project success because problems are identified more quickly and corrective action can be taken. Research has shown that increased monitoring deters agents from pursuing risky investment strategies (Kirby and Davis, 1998). It has also indicated that more monitoring encourages agents to act in the interests of the principal (Tosi et al., 1997) and that monitoring in the presence of an outcome-based contract is particularly effective (Tosi et al., 1997). (The monitoring to project success arrow in Fig. 1 illustrates this relationship.)

4.4. Monitoring in IS development

The project managers revealed that monitoring was performed to track project progress as well as to observe the work of the developers. They named many tools and techniques for doing so. They mentioned project management software as the most commonly used tool, and Microsoft Project as the most popular software. They most often named two techniques, namely periodic progress reports and periodic team meetings. Table 3 summarizes the monitoring tools and techniques. The project managers illustrated their use of these tools and techniques with many anecdotes. However, because

Table 3
Monitoring

Description	Number of subjects
Project management software	8
Project progress reports periodically produced by project team	8
Periodic project team meetings	7
Periodic comparison of actual results to planned results	6
Periodic comparison of project progress to schedule	4
A project plan	3
Gantt charts	3
Periodic comparison of actual costs to estimated costs	3
Critical path analysis	2
Internal posting of project progress for all developers' review	2
Periodic audit by external auditors	2
Periodic project review sessions	2
Project status reports periodically produced by developers	2
Testing of modules by project manager for completeness	2
Time reports periodically produced by developers	2
Periodic computation of the percentage completed	1
Post-completion audit of the project	1
Software change management	1
User sign-off on deliverables as completed	1
Project manager sign-off on deliverables as completed	1

these tools and techniques are so widely known, elucidation is omitted.

4.5. Goal conflict in agency theory

According to agency theory, in situations where the goals of the principal differ from those of the agents, the agents will engage in self-promoting actions (Eisenhardt, 1989a). Agents may have private goals that conflict with the overall objectives of the firm (Baugh and Roberts, 1994). That is, agents may seek to achieve their own goals instead of working in the best interests of the principal.

This conflict can be minimized by adopting an outcome-based contract, where the agent is compensated for successfully achieving the goals of the firm. In the presence of goal conflict, a behavior-based contract does not provide motivation for the agent to act in the best interest of the principal. In such situations, an outcome-based contract would provide the desired motivation. Agency theory thus suggests that greater goal conflict predicts the use of more outcome-based contracts. (The goal conflict to contract type arrow in Fig. 1 illustrates this relationship.)

Research has shown that firms experiencing goal conflict respond by implementing outcome-based con-

Table 4
Goal conflict

Description	Number of subjects
<i>Goals of developers</i>	
Production of a high quality system	7
Professional advancement	7
Satisfaction of clients' needs	3
Favorable impact of the project on profits	2
Production of an error-free system	2
Support overall corporate goals	2
Project completion on time	1
Programs that meet performance targets	1
<i>Goals of Project Managers</i>	
Project completion on time	6
Project completion within budget	5
Satisfaction of clients' needs	4
Favorable impact of the project on profits	3
Production of an error-free system	1

tract types. Also, a direct link between goal conflict and failure has been found (Harrell and Harrison, 1994).

4.6. Goal conflict in IS development

Project managers first described their understanding of developers' goals, and then their own. Goal conflict exists when the two sets of responses disagree. Table 4 summarizes the project managers' responses. Interpreting these responses is somewhat complex and thus requires greater explanation.

Seven project managers said that developers want technical training. One stated, "Training is usually important to developers. They want to develop their skills. They are not typically concerned with timely delivery of the project." Another said, "They want to keep their skills current." Thus, professional advancement was a goal of developers. As one subject expressed, "Of course, developers are interested in personal development and career advancement." Personal development enhances the developers' marketability.

Seven also stated that performing good work and creating a useful product were goals of developers. As one put it, "Developers have a craftsman pride in their work. They know that their job is to use technology to solve business problems. Their foremost goal is to see their hard work put to good use. They feel pride in their work and they want to see it used." Another explained, "The better developers have a lot of pride in their work. They want to do a good job for themselves."

Still another project manager stated, "Not only do they want to write quality code, they want to get in into production. No developer wants to write code for the sake of writing it. They want to see the programs go into production and be used by the company."

The subjects were then asked about their own project goals. Six responded that one of their goals is project completion on time. Five of them stated that

another goal is project completion within budget. As one project manager stated, "I only have two goals as a project manager. One is to deliver the project on time. The other is to deliver the project within budget. This is the only purpose of the project manager." (Note: This comment was not representative of the group.)

The managers' comments illustrate sources of goal conflict. According to them, developers appear to have two predominant goals: to remain marketable and to create a high quality system. Project managers have two predominant goals: to deliver a project on time and within budget. The different goals can produce the scenario where developers spend too much time making themselves marketable and crafting a high quality product, thus resulting in a time and budget overrun. According to agency theory, such conflict warrants an outcome-based contract.

4.7. Shirking in agency theory

Primarily because of agents' self-interests, they may not spend effort working toward the goals of the principal (Baiman, 1982). They may shirk their responsibilities. Research has shown that firms negatively impacted by shirking respond by implementing outcome-based contracts. Thus, agency theory suggests shirking will increase the use of outcome-based contracts. (The shirking to contract type arrow in Fig. 1 illustrates this relationship.)

4.8. Shirking in IS development

The project managers described shirking activities, i.e., developers' activities when not working on their assigned tasks. Table 5 summarizes these activities. They merit some commentary.

Table 5
Shirking

Description	Number of subjects
Socializing	8
Surfing the Internet	7
Working on the wrong tasks	6
Playing computer games	4
Spending time on tasks other than their assigned duties	4
Taking excessive breaks	4
Working on enjoyable, less important tasks	4
Talking on the phone	3
Being poorly organized	2
Calling in sick when healthy	1
Claiming not to understand the requirements	1
Sending e-mail jokes	1
Taking long lunches	1

Eight identified socializing as a common problem with developers on their projects. According to one, “A work related question could easily lead to a 20 min discussion of college basketball.” Similarly, four discussed excessive breaks as a common problem.

Seven reported that developers spend too much time surfing the Internet and/or playing computer games. According to one, “Many developers spend a lot of time on the Internet, in the name of keeping up with the industry. They send e-mail jokes to one another and to their friends outside of the company.”

Half of the 12 project managers said developers waste time by working on the wrong tasks. Often, they self-prioritize their assignments so they can work on enjoyable or challenging ones instead of those the project manager wants them to complete. According to one project manager, “He may have spent time helping others instead of working on the items that I had put on his plate. He thought he was doing good work for the company but he was not doing what needed to be done. Keeping developers focused on the business priorities instead of their own priorities is the job of a project manager.” Four project managers said that developers spending time on tasks other than their assigned duties was a form of shirking.

According to one of them, “Instead of working on the Visual Basic application they are suppose to be building, they spend time learning JavaScript. They want to remain current in the field and they want to remain marketable. They want to know JavaScript to keep up with the industry.”

Two cited being personally disorganized as a cause of wasted time. According to one, “Developers do have a problem managing their unstructured time. As long as they have meaningful, well defined deliverables and realistic due dates, there is no shirking.” According to another, “They do have a problem of being bad time managers. They over commit themselves and project managers exploit this aspect of developers. Project managers allow it because they need the extra hours from them.”

Finally, one project manager described the following behavior as shirking. According to him, “Another technique I call the ‘filibuster routine.’ In this, the developer claims that he or she does not understand the requirements and is not able to begin coding. The developer must schedule a time to go back to the user and ask for clarification. This can go on for several rounds as a way of goofing off. The developer just doesn’t want to get started so he or she stalls by asking more and more questions.”

4.9. *Privately-held information in agency theory*

The agency problem is magnified when the agent has information that the principal lacks. This is because the

agent can and may misrepresent this privately-held information (Eisenhardt, 1989a). Self-interested agents may be compelled to withhold information from the principal. In response, agency theory predicts that organizations will increase the use of outcome-based contracts. (The privately-held information to contract type arrow in Fig. 1 illustrates this relationship.)

Research has shown that privately-held information may increase the agency problem. Privately-held information was negatively related to stakeholder-rated IS development success. Outcome-based contracts have been used as a way to reduce the impact of privately-held information.

4.10. *Privately-held information in IS development*

Half of the project managers said that developers rely on privately-held information to exaggerate the percent-completed on tasks. One attributed such over-reporting to optimism by saying, “In the event that a programmer over-reports his or her status, I believe it is unintentional. They may say they are 90% completed, but in fact there is much more work that must be done. They just don’t realize it.”

However, some misleading status information is intentional. Some developers exaggerate their progress to appease a project manager. Then, they secretly work evenings and weekends to catch-up. According to one project manager, “Developers can use this technique to buy time during the development process. They may believe that they will catch up by working late or during the weekend.” As one project manager summed it up, “Developers are procrastinators. They always believe that no matter what, they can end up getting it done. They don’t have realistic understandings of their abilities. They underestimate the amount of work required to get the job done.”

According to another account, “I recall one situation where the developer over-stated his progress. This kept the project manager off his back temporarily. In the mean time, he was interviewing for another job with a different company. He was able to stonewall the manager until he found a different job.”

Developers may also understate the actual time they spend on tasks. According to one project manager, “Developers may spend 12–15 h each day working on the project but they only report 8 h per day. If the project estimate was that an activity would take 20 h, then the developer will report just 20 h for it, even if more hours were necessary.” This hides the fact that the developer exceeded the estimate and it thus distorts actual costs.

According to one project manager, “This under-reporting skews the numbers and makes them appear lower than they actually were. This makes the numbers look good for the current project. However, we run into

Table 6
Privately held information

Description	Number of subjects
Over-report percent completed	6
Careful wording in reports	2
Truth buried in status reports	2
Hide problems	2
Skip doing weekly status reports	1
Under-report actual hours worked	1
Reluctant to report percent completed	1
Under-report percent completed (to allow buffer)	1
Withhold knowledge for power	1
Pad estimates	1
“Take the easy way out” but not report it	1
Skipping tasks but not reporting it	1

a problem when we use the history information of previous projects to create estimates for future projects.”

Table 6 summarizes the activities of developers when concealing project information.

4.11. Task programmability in agency theory

Programmability is defined as the degree to which appropriate behavior by the agent can be specified in advance (Eisenhardt, 1989a). A programmable task is one whose requisite behaviors can be precisely defined (Stroh et al., 1996). For example, the activities of a retail cashier would be highly programmable, whereas the activities of a research scientist would be less programmable.

Low task programmability can increase the agency problem (Eisenhardt, 1988; Guinan et al., 1998). Agency theory suggests that outcome-based contracts are an effective way to address situations characterized by low task programmability. (The task programmability to contract type arrow in Fig. 1 illustrates this relationship.)

Researchers found a significant correlation between task programmability and the use of outcome-based contracts. In one study, as programmability decreased, the use of outcome-based contracts increased.

4.12. Task programmability in IS development

The project managers described how the tasks of the developers are made more routine in their organizations.

Table 7
Task programmability

Description	Number of subjects
A systems development life cycle methodology	4
Standardized coding style	2
CASE tools	2
Less customization of packages	2
Standardized tools	2
Reusable code	2
Structured programming techniques	2

The project managers’ responses are summarized in Table 7. Because so much has been written about such task programmability practices in IS development, little elucidation is necessary here.

5. Why information systems development projects fail

According to agency theory, IS development projects fail for four major reasons. First, contracts are not sufficiently outcome-based. In other words, organizations do not adequately provide the incentives in Table 2, or IS developers do not anticipate and work for them to achieve the desired outcomes.

Second, monitoring is ineffective. That is, organizations do not sufficiently employ the tools and techniques in Table 3, or the tools and techniques in the table do not facilitate the identification of project problems early enough to solve them.

Third, organizations fail to manage goal conflict, shirking, and privately-held information well enough. Incentives systems do not ameliorate these problems, and the problems produce delays and overruns.

Fourth, organizations do not effectively employ task programmability techniques. Perhaps contemporary techniques are ineffective, or perhaps organizations simply do not use them well enough.

6. Improving information systems development project management

Agency theory provides a framework for project managers to help them improve IS development projects in their own organization. IS project managers should ask the questions below about the constructs and relationships between them in their organization, and take constructive actions. Tables 2–7 can serve as checklists.

6.1. Contract type

Is the organization using the rewards in Table 2 to motivate IS developers to produce the desired outcome? Do IS developers actually anticipate and work for the rewards? Or is the organization simply rewarding them for hours worked? Could the organization improve its reward systems to motivate them better? What rewards not in the table are possible?

Do project managers offer sufficient technical training, new technology, flex-time, and time off as rewards for their high-achievers? Offering them not only motivates recipients but also may inspire others to become high-achievers so they too can receive these benefits. This study suggests that project managers perhaps should consider offering them even more extensively than they currently do.

Project managers presumably already understand the benefits of praising developers in public. This study confirms the expectation that such praise would motivate developers. Would even more public praise increase their sense of contribution to the organization, and instill greater pride in their work? Should project managers increase such praise to good workers?

6.2. *Monitoring*

Is the organization using the monitoring tools and techniques in Table 3 to identify and correct impediments to project success? Is it doing so early enough? Are there additional potentially effective tools and techniques to employ for that purpose?

6.3. *Goal conflict*

To what extent is goal conflict a problem in the organization? Are the goals in Table 4 the source of any conflict? What are other sources of any goal conflict? How can goal conflict be reduced?

6.4. *Shirking*

To what extent are the shirking activities of Table 5 present and problematic? Are other shirking activities present and problematic? Should attempts be made to reduce shirking, and if so, how can it be reduced?

6.5. *Privately-held information*

To what extent are the privately-held information activities of Table 6 present and problematic in the organization? Should efforts be undertaken to reduce privately-held information, and if so, how can it be reduced?

6.6. *Task programmability*

To what extent is lack of task programmability a problem in the organization? To what extent are the task programmability activities of Table 7 employed successfully in the organization? Should efforts be made to increase task programmability, and if so, how can it be increased? What activities might the organization employ that do not appear in the table?

7. Implications for research

The validity of agency theory and its applicability to IS development projects were predicated on research from various other disciplines. Researchers should still test agency theory in the context of IS projects. In fact,

researchers can use the items in Tables 2–7 to operationalize the agency theory constructs.

Once the constructs are measured with a large number of IS projects, the relationships can be statistically tested. This can allow a better assessment of the theory's applicability to IS development projects.

Most importantly, it can show the predictive strength of both the constructs and the individual items in the tables. It can thus provide more specific suggestions for improving the management of such projects.

Moreover, although agency theory helps explain some possible causes of IT project failure, other possible causes exist. These are often identified as risk factors. Many articles have suggested that a lack of user involvement is one such factor for development projects. When users are not involved from the very beginning, such projects have a higher likelihood of failing. Future researchers should attempt to ascertain the optimal level of user involvement.

Additional risk factors include turnover of key personnel, changing technology, change in the business environment, poorly defined or misunderstood requirements, and a lack of a champion or project sponsor. Research has shown that all of these risk factors may impact the level of success. The current study focuses on agency theory and does not attempt to provide an exhaustive coverage of IS project risk factors. Researchers should investigate these risk factors and their impact on project success.

8. Conclusion

This paper elucidated agency theory. It showed how it can be applied to understand the failure of IS projects. By doing so, it does not contradict other IS project management research, but instead provides a framework for understanding it.

The paper also suggested improvements to IS project management. Perhaps through increased awareness of the role of incentives, monitoring, goal conflict, shirking, privately-held information, and task programmability, project managers can reduce the failure rate of IS development projects.

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