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Abstract

Recent research suggests that flawed status reporting is a serious concern in information systems projects. Several investigations have sought to understand the factors that lead project reporters to engage in misreporting. The main motivation for these studies has been the presumption that inaccurate reporting has a significant, negative impact on project performance. However, the linkage between reporting quality and project performance has not been empirically confirmed. The goal of this effort was to answer the following research question: Is reporting quality associated with project outcomes? Our investigation consisted of two complementary survey studies. The first study considered the perceptions of status report senders; the second study considered the perceptions of status report receivers. Both studies showed that reporting quality is positively associated with task and psychological outcomes. Moreover, the second study's results suggest that reporting quality is also related to organizational outcomes.

Keywords: Information systems development, project management, status reporting, project outcomes, communication quality

Introduction

Recent research suggests that flawed status reporting is a serious concern in information system (IS) projects. Evidence of misreporting has been documented in several case studies (Iacovou 1999; Oz 1994), experiments (Keil et al. 2004; Smith et al. 2001; Tan et al. 2003), surveys (Keil et al. 2000; Keil and Robey 2001), and simulations (Snow and Keil 2002a, 2002b). This stream of research suggests that individuals reporting on the progress of project related activities are prone to providing inaccurate information, especially when bearing bad news (Keil and Robey 2001; Smith and Keil 2003), communicating with overcommitted executives (Iacovou 1999; Keil 1995), or furthering their own interests (Iacovou et al. 2002).

Virtually all of the investigations cited above seek to understand the factors that lead project reporters to engage in misreporting behaviors. The main motivation for these studies is the *presumption* that inaccurate reporting has a significant, negative impact on project performance. Some researchers (Smith and Keil 2003) have provided theoretical arguments supporting such an impact. However, there is only a minor amount of empirical evidence in support of this presumption. Some is largely anecdotal (Keil and Robey 2001), while evidence from one empirical study (Keil et al. 2000) only speaks to a relatively narrow dimension of project quality (propensity to escalate). So, while there is some suggestive evidence, it is also clear that *the full linkage between reporting quality and the broader scope of project performance has not been empirically confirmed* (Tan et al. 2003). To address this gap in the literature, we have conducted an empirical investigation, which was comprised of two survey studies. The goal of the investigation was to address the following research question*: Is reporting quality associated with project outcomes?*

This paper describes the empirical studies and provides suggestions for future research. The remainder of this paper is organized into six sections. First, we provide some background regarding status reporting in IS projects. Then, we discuss and derive

hypotheses about the potential association between reporting and project performance. Following this, we present the methodology that we employed to carry out our investigations. Next, we present the findings of our studies. After that, we outline the limitations of our work and discuss its implications for researchers and managers. We conclude by highlighting our contributions.

Project Status Reporting

IS project reporting refers to the upward communication (either verbal or written) of information about the status of project activities to interested managers. In such communications, the reporters usually compare the state of the activities for which they are responsible (with respect to budgets, schedules, and other dimensions) against a project plan and identify issues that may be causing deviations from the plan.

While project reporting frequently represents a sequential chain of communication (from team members to the project manager to the project executive and so on), our work focuses on the "team member to the project manager" communication link of this chain. We focus on this dyad because of the critical role it plays in monitoring and managing the project: team members are often the original sources of key status information (even for data that is transmitted within other project dyads, such as from a project manager to an auditor), while project managers tend to be the key decision-makers in running the day-to-day project activities.

Gauging and communicating project status in IS development is a complex task for three reasons. First, because IS development is a social endeavor that involves the development of intangible assets (i.e., software) and interactions with specialists (programmers, analysts, etc.), assessing the *true* status of project activities is difficult and frequently involves subjective judgments. Second, inherent cognitive and processing limitations make it virtually impossible for reporters to obtain and transmit a complete, accurate picture of a project (Campbell 1958). Third, human biases and social pressures have been shown to exert an influence on the accuracy of project reports (Keil et al. 2000; Keil et al. 2004; Smith and Keil 2003). Given the complicated nature of IS projects and the reporters' errors and biases, it is no surprise that status reporting is often imperfect (Iacovou 1999; Keil and Robey 2001; Keil et al. 2004; Smith and Keil 2003; Smith et al. 2001; Snow and Keil 2002a; Tan et al. 2003).

Reporting Quality and Project Performance

As IS projects are social undertakings that aim to develop a technological system for an organization, assessing their performance can be a complex task. From a social perspective, one would expect that successful projects would result in satisfied project members; from a technological perspective, they should produce usable systems in an efficient manner; and from an organizational perspective, they should result in a net benefit to the adopting firm (Aladwani 2002). Given the multifaceted nature of projects, a comprehensive evaluation of an IS project should include assessments of three key performance components: task, psychological, and organizational outcomes. These three dimensions were identified in an extensive review of the IS project management literature (Aladwani 2002). Each one and its linkage to reporting quality is discussed next.

Task outcomes refer to the capability of a project to produce high quality deliverables in an efficient manner (Aladwani 2002; Henderson and Lee 1992). Theoretical research suggests that reporting quality should be related positively to both task effectiveness and efficiency in IS projects. According to the information processing perspective (Galbraith 1974), to achieve superior performance in the execution of uncertain tasks, accurate information must be provided to decision makers by the specialists who perform the various subtasks. By acquiring such knowledge, decision makers can better coordinate the specialists' efforts and can make needed adjustments to align resource allocations, schedules, and priorities with the real-time status of the task at hand. This, in turn, should result in enhanced task efficiency and high-quality outputs.

As uncertainty is a prominent trait of most IS projects (Curtis et al. 1988; Kraut and Streeter 1995; Sawyer 2001), the information processing perspective is especially relevant to status reporting. Indeed, researchers of IS project communications have asserted repeatedly that misreporting is likely to have a negative impact on project task outcomes, especially efficiency in terms of budget and schedule overruns (Keil and Robey 2001; Smith et al. 2001). Despite the extensive theoretical arguments, empirical evidence for this linkage remains elusive (Tan et al. 2003). In what is arguably the most compelling evidence, Keil et al. (2000) found that information asymmetry is often observed in projects that experience escalation. Although this was one subordinate finding in their much larger study, it is indeed intriguing since the existence or nonexistence of escalation would likely be correlated with some project outcomes. Of course, it must be noted that escalation is not isomorphic with project failure, since a project might escalate and still ultimately succeed; similarly, a non-escalated project could fail for many other reasons.

In spite of the elusiveness of empirical support, we anticipate that accurate, timely reporting is likely to enhance the task outcomes of projects. This positive effect should be self-reinforcing; projects that enjoy high quality communications will tend to be well-organized and thus will be less conducive to distortion. Troubled reporting, on the other hand, is likely to lead to misunderstandings, mismanagement, overruns, and delays. Such a troubled task environment is ripe for misreporting since the communication of bad news is frequently problematic (Pfeffer 2004). Given the bidirectional impact between reporting quality and project efficiency and effectiveness, we propose that

H1: Reporting quality will be positively related to project task outcomes.

Psychological outcomes refer to the level of team members' satisfaction with the project work (Aladwani 2002). To the best of our knowledge, no prior study has examined the linkage between IS reporting quality and the team members' contentment with the IS development process. In our view, when decision makers receive more complete and accurate information about the status of project activities, they are more likely to manage the project team effectively by allocating resources to project members who need them the most. Moreover, better informed managers are more likely to engage in evenhanded decisions that provide rewards to contributing members while disciplining less productive ones. Without accurate information reflecting the true status of the project and the level of accountability of each member, the behavior of project managers (and distorting reporters) is likely to affect the morale of the project team negatively. Similar to the task impact, the linkage between reporting quality and psychological outcomes should be bidirectional. Good, open communication will lead to equitable resource allocations, improved interactions, and higher team performance. This, in turn, will create better relationships and a more comfortable team environment (Emmers-Sommer 2004) that is less conducive to intentional misreporting (Doolen et al. 2003). Inaccurate reporting, on the other hand, can lead to misjudgments, misallocations and the development of an instrumental team culture in which each member looks after his/her own interests (Victor and Cullen 1988). Such environments of mistrust and reduced morale are prone to distortion (Iacovou et al. 2002). Thus, we expect that

H2: Reporting quality will be positively related to project psychological outcomes.

Organizational outcomes refer to the business value that the produced system adds to the adopting organization (Aladwani 2002). With respect to such outcomes, we propose that more precise status reporting is likely to lead to the development of systems that are suited better for the adopting organization. Clear signals about project work as it is relates to users (e.g., their level of involvement, their reaction to the quality of intermediate deliverables such as analysis documents, and their early feedback to the system's features during testing) can provide vital cues to project managers, who can use this information to guide the team and to make any needed changes so that a usable system with strong user acceptance will be produced. Lacking such important information about relevant user activities, managers may not become aware of key issues, and the eventual acceptance and use of the system may be jeopardized. Given that the impact of a system is determined largely by its use, we assert that clear communications during the project will lead to more usable systems with more positive organizational impacts (Russell and Chatterjee 2003). Given this, we anticipate that

H3: Reporting quality will be positively related to project organizational outcomes.

Research Methods

To assess the above propositions within the context of the "team member–project manager" dyad, we conducted two survey studies. In Study 1, project team members were asked to provide information about their reporting to their project manager. In other words, the Study 1 respondents offered their perceptions in their role as report *senders*. In Study 2, which was designed to provide a complementary perspective to Study 1, project managers were asked to provide an assessment of the reporting that they received from their teams. Thus, the Study 2 respondents were offering their perceptions as report *receivers*. In both studies, the reporting quality measures were correlated with assessments of project outcomes to test the hypotheses.

Measures

We utilized previously developed and validated measures to assess the constructs of interest. The same measures were used in both studies: to assess the quality of reporting, we utilized Mohr and Spekman's (1994) communication quality scale, which taps into communication timeliness, accuracy, adequacy, completeness, and credibility; to evaluate project performance, we used an 11-item, multidimensional scale (Law et al. 1998) that was developed by Aladwani (2002) based on an extensive theoretical

review and empirical validation. The questions from Study 2 (along with descriptive statistics from both studies) are shown in Appendix A.

The survey instrument was pilot tested by 10 individuals from the Study 1 population and by 7 individuals from the Study 2 population. Based on their feedback, the wording of some of the questions was modified to reflect their professional environment.[1]

Samples

Study 1: The sample for Study 1 consisted of individuals who were team members in state governmental projects in an Eastern U.S. state. These individuals included users, IS professionals, and vendor representatives. We used stratified sampling to select a diverse subset of projects (based on several dimensions, including project duration, budget, and vendor involvement) from a listing of on-going state projects. Surveys were sent to all nonexecutive participants in each selected project. The cover letter that accompanied the survey was signed by the researchers, the state auditor, and an executive from the respondent's organization. A total of 500 surveys were mailed, and 21 were returned as undeliverable. Two reminders were e-mailed to each subject. In all, 264 participants responded, yielding a gross response rate of 55.1 percent. Of these, 54 cases were removed from the sample because of missing data.[2] This left 210 usable responses, for a net response rate of 43.8 percent. We believe that the endorsement of the survey by state government executives contributed positively to the response rate. The profile of the Study 1 respondents is shown in Table 1.

The respondents were instructed to answer the questions in the questionnaire within the context of a specific IS project (the project on which the participant was spending most of his/her time). In all, 144 respondents (68.5 percent) indicated the project they were thinking of was either in the implementation phase or had been just completed; 45 respondents (21 percent) indicated that the project was in the design phase, and the remainder either specified the analysis phase or did not respond.

Study 2; The sample for the second survey consisted of project managers who were members of the Project Management Institute (PMI). A total of 3,000 surveys were mailed to randomly selected PMI IS project managers in the Eastern United States, and 52 were returned as undeliverable.[3] The cover letter was signed by the researchers and the PMI Research Director. One reminder was mailed to each subject. In all, 599 responses were received (representing a response rate of 20.3 percent). Of these, 114 were removed because of missing data,[4] leaving a usable sample of 485. The response rate for the second study is comparable to that of prior studies focusing on sensitive IS issues; for example, a survey on computer abuse (Straub and Nance 1990) yielded a 19 percent response rate. It is also consistent with the typical response rate (10 to 20 percent) for surveys of PMI members (Stefanou 2003).

In all, 311 of the Study 2 participants (64.1 percent) indicated they were an employee of the organization that completed the project. Another 133 (27.4 percent) indicated they were an employee of a third party (e.g., a vendor or consulting firm), and the remainder indicated they were an independent consultant. The majority (308, or 63.5 percent) reported having over 10 years of project management experience. Seventy percent of the respondents were male.

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[1]For example, the term *company* was replaced with *organization* to account for the fact that the Study 1 population included many employees of governmental agencies.

[2]We embraced an intentionally conservative algorithm in deciding which cases should be removed. A case was removed if the respondent did not complete two or more of the items for any construct. In addition, a case was removed if the respondent had not answered the single item for "organizational outcome."

[3]The sample targeted PMI members in the Eastern United States because PMI and the researchers felt that such individuals would be more likely to be familiar with the researchers' institution and that this would result in a higher response rate.

[4]Respondents were given the option of online or paper surveys; we received 502 hardcopy responses, and 97 online ones. As with Study 1, we embraced an intentionally conservative algorithm in deciding which cases should be removed. A case was removed if the respondent did not complete two or more of the items for any construct. In addition, a case was removed if the respondent had not answered the single item for "organizational outcome." Seventeen hardcopy cases were removed for one of these reasons. In addition, it was discovered that the 97 responses that had been submitted on-line were missing values for the "organizational outcome" question. It was later determined that there had been an error in coding the online survey, and the responses were not captured in the database. We decided to disqualify the 97 cases that had been completed online, leaving a usable sample of 485, and a net response rate of 17.3 percent. A test of means for differences between the online and paper-based respondent groups showed no differences in responses. Of the 19 measurement items, only one showed a difference in mean responses that was statistically significant at $p < .05$, which is roughly what would be expected from chance alone.

Table 1. Study 1 Sample Profile	
Respondent Type	**N**
Business users	63
IS professionals	91
Vendor representatives/Consultants	51
Not specified	5
Total	210

Table 2. Project Profiles				
	Study 1		**Study 2**	
	N	**%**	**N**	**%**
Project Cost ($)				
Less than 500K	45	21.4	167	34.4
500K -3M	53	25.2	182	37.5
3M - 8M	22	10.5	56	11.5
More than 8M	20	9.5	58	12.0
Not specified	65	31.0	22	4.5
Maximum Project Team Size (Members)				
Less than 10	69	32.9	149	30.7
10 – 50	111	52.9	237	48.9
More than 50	11	5.2	74	15.3
Not specified	19	9.0	25	5.2

As mentioned above, the team members in Study 1 were asked to focus on an ongoing project; the project managers in Study 2 were asked to focus on their most recently completed one. A classification of the projects that were the focus of the participants is shown in Table 2.

To assess the presence of nonresponse bias, we compared late responses (last 20 percent received) to the rest of the sample (first 80 percent received) in each study. In both studies, only one item (out of the 16 that were included in our analysis) was found to be different across the sample segments (at the .05 level of significance), which is what one would expect from chance alone. Thus, we concluded that the threat of nonresponse bias was not high.

Results

To analyze the data, we utilized the partial least squares (PLS) technique (Chin and Frye 2001).[5] Compared to traditional statistical methods, PLS is advantageous because it enables the simultaneous assessment of the measurement and the structural models (Fornell 1982). PLS is considered especially useful in the early stages of theory testing (Fornell and Bookstein 1982), and emphasizes model prediction rather than model fit (Chin and Newsted 1999). In addition, PLS is less restrictive than covariance-based structural equation modeling (CB-SEM) techniques such as LISREL, AMOS, or EQS in terms of sample size and distributional requirements (Chin and Newsted 1999). For example, CB-SEM techniques generally require large sample sizes; fit indices from CB-SEM techniques tend to over-reject models at sample sizes of 250 or less (Hu and Bentler 1995, p. 95). Given that (1) our study represents an initial attempt to explore the linkage between reporting quality and project performance, (2) the sample size for one of our studies was below 250, and (3) our primary emphasis was on model prediction rather than model fit, the use of PLS was deemed appropriate.

[5] PLS-Graph version 3.0 software was used to carry out the analysis.

Measurement Model Assessment

To assess the quality of the measurement model, we conducted several tests of convergent and discriminant validity, as prescribed by Chin (1998) and Fornell and Larcker (1981). To assess convergent validity, we assessed (1) individual item reliability and (2) construct reliability.[6] With respect to item reliability, we examined the item-to-construct loadings for all multi-item variables (i.e., all variables, except organizational outcomes which utilized a single-item scale).[7] Although standardized loadings of 0.707 or greater are needed for the shared variance between each item and its construct to exceed the error variance, loadings of 0.6 to 0.7 are considered acceptable, especially if the loadings of other items within the same construct are high (Chin 1998). All items in Study 1 exhibited loadings over .7; in Study 2, two task outcomes items (T3 and T6) and one psychological outcomes item (P3) had loadings below .7 (see Table 3). Given that the two task outcomes items had loadings over .60 and the remaining items for this construct had strong loadings (over .74), this did not raise too much of a concern. Thus, we concluded that all items except P3 in Study 2 exhibited adequate reliability.

Construct reliability was assessed utilizing two internal consistency indicators: composite reliability and average variance extracted (AVE) scores. All composite reliability indicators for the multi-item measures in our surveys are higher than .8 (see Table 4). According to Bearden et al. (1993), internal consistency scores of .8 or higher provide exemplary evidence of reliability. With respect to the AVE scores, Fornell and Larcker (1981) suggest that a value of 0.5 is required to provide evidence of satisfactory construct reliability. All of our scores meet this standard. Given this, we find that the reliability of our construct measures appears to be adequate.

To assess the discriminant validity of the measures, we conducted two tests. In the first test, we calculated each item's loading on its own construct and its cross-loadings on all other constructs. As Table 3 shows, each item has a higher loading with its intended construct than its cross-loadings with other constructs.

In the second test of discriminant validity, we examined whether the square root of the AVE score of each construct was greater that its correlations with the other latent constructs (Chin 1998). As Table 5 indicates (the square root of the AVEs are shaded), all measures passed this test.

Based on the above evidence, it appears that the measures exhibited appropriate reliability and discriminant validity in both studies, with the exception of one measure of psychological outcomes (P3) in the Study 2 data set. This item refers to whether team members thought about quitting the project. We suspect that the reason for this item's low loading is the inability of the respondents (project managers) to know whether or not any of their team members were intending to quit the project. After careful consideration, we decided to retain the measure for our subsequent analysis for two reasons. First, we wanted to be able to compare the results between the two studies, and we have more confidence in doing so when the same measures are used in both. Second, the item in question belongs to a validated instrument that underwent a rigorous evaluation with robust results (Aladwani 2002). To ensure that the inclusion of this item did not affect the structural model results, we ran a second PLS analysis (for the Study 2 data set) after removing P3 from the model. An examination of the revised model showed that it satisfied all of the above validity requirements (suggesting that there are no other validity concerns). Moreover, the results of this revised model at the structural level were virtually identical to the ones from the original model (that included P3), providing us with more confidence in our decision to retain item P3.

Structural Model

Study 1: Figure 1 shows the effects for each hypothesized path, as well as the amount of variance explained (R^2) for all endogenous factors.[8] In terms of explanatory power, our model indicates that 8 percent of the variance of task outcomes, 6 percent

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[6]All multi-item constructs were modeled as reflective, rather than formative, since the measurement items were viewed as being influenced by (or caused by) the underlying latent variable (Chin and Newsted 1999).

[7]As project outcomes is a multidimensional construct (Law et al. 1998), each of its dimensions was assessed separately.

[8] Note that some authors have argued that an alternative measure of predictive relevance of a model, Q^2, is also relevant for endogenous latent constructs involving multiple reflective indicators (Sirohi et al. 1998). For completeness, the Q^2 values were .07 for task and .14 for psychological outcomes for Study 1.

Table 3. Loadings and Cross-Loadings

Construct	Item	Study 1				Study 2			
		T	P	O	Q	T	P	O	Q
T	**T1**	.87	.60	.33	.21	.77	.52	.44	.39
	T2	.83	.53	.30	.14	.77	.46	.33	.35
	T3	.83	.55	.30	.22	.66	.37	.30	.27
	T4	.82	.56	.38	.27	.74	.43	.38	.33
	T5	.86	.61	.44	.26	.78	.56	.39	.47
	T6	.80	.48	.39	.24	.62	.39	.22	.35
	T7	.87	.63	.43	.29	.84	.57	.48	.41
P	**P1**	.64	.89	.41	.23	.65	.89	.40	.51
	P2	.56	.89	.43	.22	.57	.90	.36	.50
	P3	.47	.70	.25	.18	.16	.43	.13	.24
O	**E1**	.45	.44	1.00	.12	.50	.41	1.00	.35
Q	**Q1**	.28	.28	.12	.82	.42	.51	.26	.78
	Q2	.25	.25	.10	.90	.46	.49	.28	.86
	Q3	.23	.18	.11	.90	.43	.46	.29	.87
	Q4	.24	.19	.08	.92	.43	.47	.31	.89
	Q5	.25	.19	.09	.86	.39	.45	.35	.82

Note: T = Task outcomes; P = Psychological outcomes; O = Organizational outcomes; Q = Quality of reporting.

Table 4. Construct Reliability Indicators

Construct	Study 1		Study 2	
	Composite Reliability	Average Variance Extracted (AVE)	Composite Reliability	Average Variance Extracted (AVE)
Task outcomes	.94	.71	.89	.55
Psychological outcomes	.87	.69	.80	.60
Quality of reporting	.94	.77	.93	.71

Table 5. Square Root of AVE Versus Correlations Among Latent Constructs

Construct	Study 1				Study 2			
	T	P	O	Q	T	P	O	Q
T	.84				.74			
P	.68	.83			.65	.77		
O	.45	.44	1.00		.50	.41	1.00	
Q	.28	.25	.12	.88	.51	.57	.35	.84

Note: T = Task outcomes; P = Psychological outcomes; O = Organizational outcomes; Q = Quality of reporting.

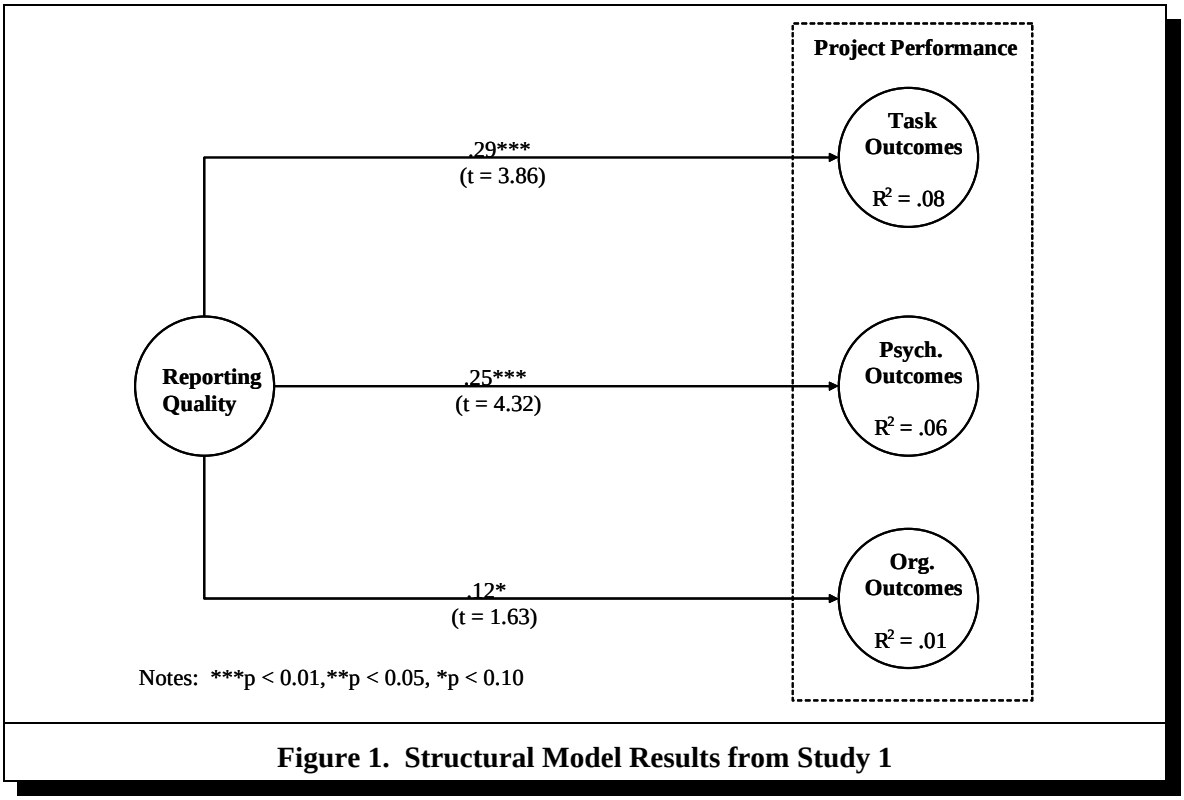

Figure 1. Structural Model Results from Study 1

of the variance of psychological outcomes, and 1 percent of the organizational outcomes was explained by reporting quality. The small variance values suggest, not surprisingly, that other factors besides reporting quality influence project performance.

The path coefficients were .29 for task outcomes, .25 for psychological outcomes, and .12 for organizational outcomes. In terms of practical significance, the effect of reporting quality on task and psychological outcomes appears to be moderate, while the effect on organizational outcomes seems to be weak (Cohen 1988). To assess statistical significance, the bootstrapping method (using 500 resamples) was used (Chin 1998). The first two paths (to task and psychological outcomes) were significant at the .01 level; the third one (to organizational outcomes) was significant at $p < .10$.[9]

In sum, the results suggest that task and psychological dimensions of project performance have a significant association with reporting quality, providing strong support for hypotheses H1 and H2. Given that the evidence for H3 was marginal in terms of statistical significance (at $p < .10$) and its practical importance was very low ($R^2 = .01$), we concluded that the results did not provide adequate support for the hypothesis.

While the findings from Study 1 are enlightening, it should be noted that there are two limitations associated with Study 1's design—both of which were addressed by a slightly different design in Study 2. These limitations relate to the measurement of (1) organizational outcomes and (2) reporting accuracy. With respect to the organizational outcome measurement, in Study 1, we asked respondents to estimate the likely organizational impact of the system before the completion of their project, which may have been problematic. In Study 2, we were able to ask respondents to assess organizational outcomes based on the actual usage of the system (following the completion of the project). With respect to the measurement of reporting quality, in Study 1, we had to use each respondent's assessment of his/her own project status communications as a proxy for the overall project reporting that was being received by his/her project manager (from all team members). While we believe that this proxy is an adequate measure due to its stochastic nature (in representing the average reporting quality received by project managers, factored across all the respondents within the sample), the respondents in Study 2 were able to provide a direct assessment of their teams' reporting quality.

[9]Acceptable t-test values were 2.326 (for p = 0.01), 1.645 (for p = 0.05) and 1.282 (for p = 0.10); one-tailed tests were used because of the directional nature of our propositions.

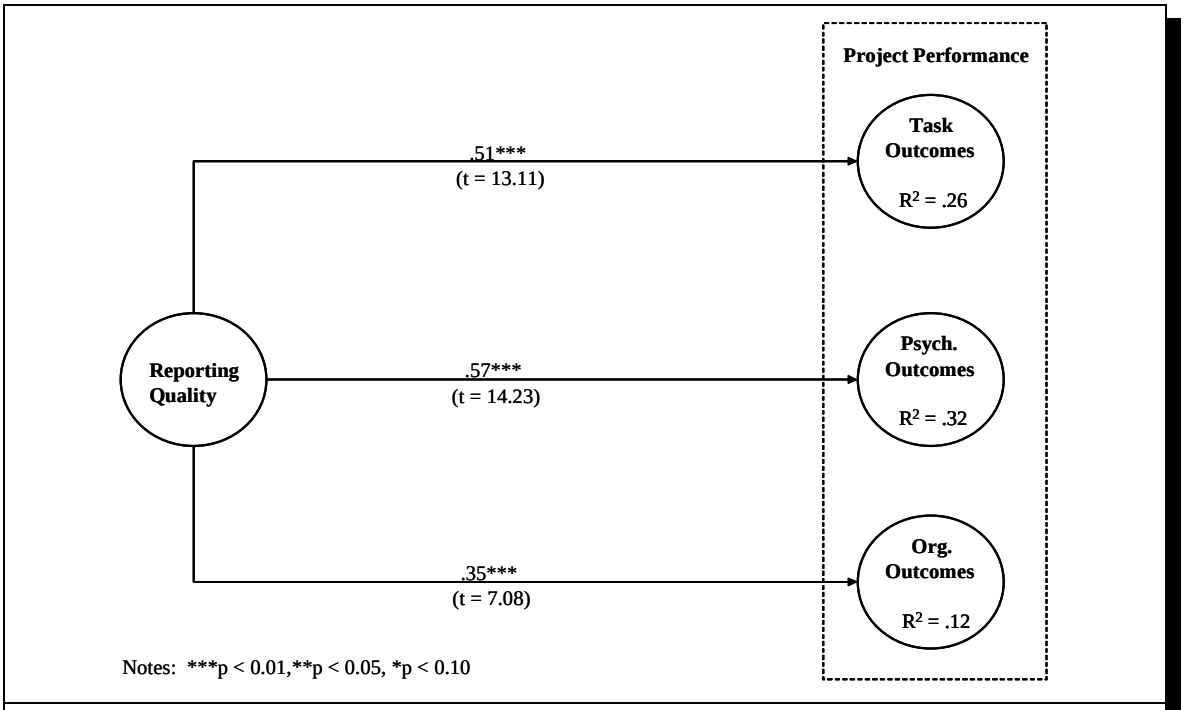

Figure 2. Structural Model Results from Study 2

Study 2: In addition to addressing some of the limitations inherent in Study 1's design, Study 2 enabled us to examine the linkage between reporting accuracy and project outcomes from another perspective. In Study 1, the respondents were team members and were asked to offer their perceptions as they relate to their role as report senders; in Study 2, the respondents were project managers and were asked to offer their view as report receivers.

In terms of explanatory power, our model indicates that 26 percent, 32 percent, and 12 percent of the variance (R^2) of the three project performance dimensions was explained by reporting quality in Study 2 (see Figure 2).[10] All relationships between reporting quality and outcomes (path coefficients) were strong in terms of magnitude (Cohen 1988). All three paths were statistically significant ($p < .01$), providing strong support for all hypotheses.

Discussion

As the empirical results suggest, our first two propositions received considerable support in both studies. The third conjecture was supported in Study 2, but not in Study 1. Overall, these results indicate that the quality of status reporting in IS projects is significantly associated with performance, especially as it relates to task and psychological outcomes. This link is confirmed by the perceptions of both report senders and receivers.

The findings suggest that the linkage between reporting quality and organizational impact is the weakest one among the three. This is not surprising as the business impact of a system is affected by many usage-related factors that are outside the scope of our model and may not become clear to participants until long after a system's introduction.

A comparison of the results across the two studies shows that the variance explained in Study 1 (across all three performance dimensions) is considerably lower than that of Study 2. Given that the context of Study 2 (completed projects) seems to be more

[10] The corresponding Q^2 values for task outcomes and psychological outcomes were .05 and .17, respectively. Note that the smaller Q^2 values (relative to the R^2 values) could indicate the presence of outliers in the data (Quan 1988).

conducive to accurate, comprehensive project outcome assessment, we believe that the variance explained in Study 2 is likely to be more accurate than that in Study 1.

While the contexts of the studies differ, their results are similar in terms of hypotheses H1 and H2, providing support to their external validity. With respect to H3, we believe that the nonsignificant finding in Study 1 is primarily due to the limitations of our sampling methodology (which focused on ongoing projects) and not the validity of the hypothesis.

Limitations

While we were able to address two limitations from Study 1 in the design of Study 2, we do wish to note a few limitations that carry across both studies and may impact the quality of our results. First, with respect to measurement, our instruments gauged self-reported perceptions. While such perceptual self-reports tend to be subjective, we believe that they shed significant light on the phenomenon under investigation. Indeed, evidence suggests that insiders' evaluations of projects are consistent with assessments by outsiders (Hoegl and Gemuenden 2001; Sicotte et al. 2004). Also associated with measurement, the use of a single-item to measure organizational outcomes may be of concern (and, in fact, may account partly for the low variance explained for the factor in both studies). Although this item was part of a previously validated instrument (Aladwani 2002), future work in this area could likely benefit from the development of a multi-item measurement scale for this dimension of project performance.

Second, with respect to the sampling, our work is cross-sectional in nature. While each of our studies focused on different project lifecycle stages (Study 1 focused mostly on ongoing projects, while Study 2 focused on completed ones), the lack of longitudinal data did not allow us to assess the dynamic nature of the bidirectional influence between reporting and project performance as outlined in our conceptual discussion. In addition, while the sample for the second study was drawn from a cross-section of diverse organizations and industries, the sample for the first study was selected from state governmental projects. This could limit the generalizability of the Study 1 findings; for example, it is possible that the impact of reporting quality on organizational outcomes would be stronger in a for-profit environment. This is consistent with the findings of Study 2, which enjoys higher external validity due to the diverse nature of its sample.

Third, the amount of variance explained in the dimensions of performance were somewhat modest. Although the magnitude and statistical significance of the path coefficients indicate an influence of reporting quality, it is obvious that other factors also play an important role. As suggested earlier, future work could incorporate reporting quality with other factors previously shown (or hypothesized) to impact project performance, such as the experience level of the project manager and the use of formal project management tools and techniques.

Finally, the applicability of our findings may be limited because of the use of a single source to derive our measures. We embraced this approach in order to protect the anonymity of the respondents and to minimize their personal risk in participating in the study. As the admission of inaccurate reporting (by report senders in Study 1) and poor performance on project outcomes (by project managers in Study 2) are rather controversial and sensitive issues, we wanted to eliminate any concern that potential respondents might have about protecting their identities (Renzetti and Lee 1993). Thus, we decided to allow a single respondent for each project, without requiring the input of additional informants. To assess the magnitude of the common method bias risk in our studies, we used Harman's one-factor statistical test (Podsakoff and Organ 1986). For each study, we performed an exploratory factor analysis using all items in the instrument. The factor analysis did not generate a single or a general factor for either study. This suggests that this threat was not serious in our data sets (Podsakoff and Organ 1986).

Implications for Research

Our work demonstrated empirically that inaccurate reporting does occur in IS projects and, more importantly, is associated with degraded performance, as previously posited by IS researchers (Snow and Keil 2002a). Consequently, it is important to conduct additional research to more fully understand the dynamics of the reporting process and the forces that contribute to distortion within that process.

To examine the influence of potential distortion-inducing factors, experimental studies could be pursued. This would allow interested researchers to assess their influence carefully. Furthermore, case studies could be executed to understand how managers detect, contain, and respond to distortion behaviors. Such assessments would enable researchers to take the first step toward providing prescriptive advice in dealing with biased reporting.

Our findings have important implications for researchers who study project risks. Until now, reporting quality has been omitted from studies that attempt to assess the risk profile of a project (Ropponen 1999) or predict its eventual outcomes (Nidumolu 1996; Saarinen 1996). Given our results, future studies on project performance predictors should consider it. This will enable us to determine its relative impact vis-à-vis other project factors and risks.

While our study has empirically established a direct association between reporting quality and project performance, more work is needed to tease out the exact nature of this linkage. To more fully develop our understanding of this linkage, investigations of additional mediating constructs should be pursued. Project factors, such as team coordination, control, and integration (Henderson and Lee 1992; Nidumolu 1995) are likely to influence both reporting quality and outcomes. Thus, more comprehensive models depicting the relationship between reporting, project performance, and related project factors should be developed and tested.

Implications for Practice

Our results support the notion that good project reporting is a critical success factor that is associated with process efficiency, team satisfaction, and—to a lesser degree—system success. Given this, project executives will be well advised to establish communication environments that are likely to nurture open, complete reporting lines. To achieve this, managers should take steps to identify and minimize situations that are likely to lead to distortion. Previous research has identified several factors that can lead to such situations, such as troubled or escalated development initiatives, distrust toward report recipients, and others (Iacovou et al. 2002). A periodic audit of a project's communication environment can assist such managers in identifying potential reporting problems. Moreover, project executives who establish and maintain unguarded, trust-based communication channels with multiple sources within a project team are more likely to detect inaccurate reports and can improve the likelihood of project success (Jablin and Sussman 1983).

Conclusion

Our work offers evidence to support the linkage between reporting quality and three dimensions of project outcomes. The existence of this association was confirmed by the perceptions of both report senders and receivers. It is our hope that our investigation has shed additional light on our understanding regarding the role of reporting in IS project management. Given the damaging effects of misreporting, we contend that there is a need to more fully understand both the factors and the management practices that impact reporting quality. We hope that our research will provide a starting point for both researchers and managers who wish to consider this phenomenon further.

References

Aladwani, A. M. "An Integrated Performance Model of Information Systems Projects," *Journal of Management Information Systems* (19:1), 2002, pp. 185-210.

Bearden, W. O., Netemeyer, R. G., and Mobley, M. F. *Handbook of Marketing Scales*, Sage Publications, Newbury Park, CA, 1993.

Campbell, D. T. "Systematic Error on the Part of Human Links in Communication Systems," *Information and Control* (1), 1958, pp. 334-369.

Chin, W. W. "The Partial Least Squares Approach to Structural Equation Modeling," in *Modern Methods for Business Research*, G. A. Marcoulides (Ed.) Lawrence Erlbaum Associates, Nahwah, NJ, 1998, pp. 295-336.

Chin, W. W., and Frye, T. *PLS-Graph User's Guide Version 3.0*, Soft Modeling, Inc., Houston, TX, 2001.

Chin, W. W., and Newsted, P. R. "Structural Equation Modeling analysis with Small Samples Using Partial Least Squares," in *Statistical Strategies for Small Sample Research*, R. Hoyle (Ed.) Sage Publications, Thousand Oaks, CA, 1999, pp. 307-341.

Cohen, J. *Statistical Power Analysis for the Behavioral Sciences*, Lawrence Erlbaum Associates, Hillside, NJ, 1988.

Curtis, B., Krasner, H., and Iscoe, N. "A Field Study of the Software Design Process for Large Systems," *Communications of the ACM* (31), 1988, pp. 1268-1287.

Doolen, T. L., Hacker, M. E., and Van Aken, E. M. "The Impact of Organizational Context on Work Team Effectiveness: A Study of Production Team," *IEEE Transactions on Engineering Management* (50:3), 2003, pp. 285-296.

Emmers-Sommer, T. M. "The Effect of Communication Quality and Quantity Indicators on Intimacy and Relational Satisfaction," *Journal of Social and Personal Relationships* (21:3), 2004, pp. 399-411.

Hu, L. T., and Bentler, P. M. "Evaluating Model Fit," in *Structural Equation Modeling: Concepts, Issues and Applications*, R. H. Hoyle (Ed.), Sage Publications, Newbury Park, CA, 1995, pp. 76-99.

Fornell, C. *A Second Generation of Multivariate Analysis Methods*, Praeger, New York, 1982.

Fornell, C., and Bookstein, F. L. "Two Structural Equation Models: LISREL and PLS Applied to Consumer Exit-Voice Theory," *Journal of Marketing Research* (19:4), 1982, pp. 440-452.

Fornell, C., and Larcker, D. F. "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error: Algebra and Statistics," *Journal of Marketing Research* (18:3), 1981, pp. 382-388.

Galbraith, J. R. "Organizational Design: An Information Processing View," *Interfaces* (4:3), 1974, pp. 28-36.

Henderson, J. C., and Lee, S. "Managing I/S Design Teams: A Control Theories Perspective," *Management Science* (38:6), 1992, pp. 757-777.

Hoegl, M., and Gemuenden, H. G. "Teamwork Quality and the Success of Innovative Projects: A Theoretical Concept and Empirical Evidence," *Organization Science* (12:4), 2001, pp. 435-449.

Iacovou, C. L. *Managing IS Project Failures: A Project Management Perspective*, unpublished doctoral dissertation, University of British Columbia, 1999.

Iacovou, C. L., Smith, H. J., and Thompson, R. L. "Communication Distortion in Information Systems Projects: A Message Exchange Perspective," paper presented at the First JAIS Theory Workshop, Barcelona, Spain, 2002.

Jablin, F. M., and Sussman, L. "Organizational Group Communication: A Review of Literature and Model of the Process," in *Organizational Communication: Abstracts, Analysis, and Overview*, H. H. Greenbaum, R. L. Falcione and S. A. Hellweg (Eds.), Sage, Newbury Park, CA, 1983, pp. 11-50.

Keil, M. "Pulling the Plug: Software Project Management and the Problem of Project Escalation," *MIS Quarterly* (19:4), 1995, pp. 421-447.

Keil, M., Mann, J., and Rai, A. "Why Software Projects Escalate: An Empirical Analysis and Test of Four Theoretical Models," *MIS Quarterly* (24:4), 2000, pp. 631-647.

Keil, M., and Robey, D. "Blowing the Whistle on Troubled Software Projects," *Communications of the ACM* (44:4), 2001, pp. 87-93.

Keil, M., Smith, H. J., Pawlowski, S., and Jin, L. "Why Didn't Somebody Tell Me? Climate, Information Asymmetry, and Bad News About Troubled Projects," *DATA BASE* (35:2), 2004, pp. 65-84.

Kraut, R. E., and Streeter, L. A. "Coordination in Software Development," *Communications of the ACM* (38:3), 1995, pp. 69-81.

Law, K. S., Wong, C.-S., and Mobley, W. H. "Toward a Taxonomy of Multidimensional Constructs," *The Academy of Management Review* (23:4), 1998, pp. 741-755.

Mohr, J., and Spekman, R. "Characteristics of Partnership Success: Partnership Attributes, Communication Behavior, and Conflict Resolution Techniques," *Strategic Management Journal* (15:2), 1994, pp. 135-152.

Nidumolu, S. "The Effect of Coordination and Uncertainty on Software Project Performance: Residual Performance Risk as an Intervening Variable," *Information Systems Research* (6:3), 1995, pp. 191-219.

Nidumolu, S. "Standardization, Requirements Uncertainty and Software Project Performance," *Information & Management* (31), 1996, pp. 135-150.

Quan, N. T. "The Prediction Sum of Squares as a General Measure for Regression Diagnostics," *Journal of Business & Economic Statistics* (6:4), 1988, pp. 501-504.

Oz, E. "When Professional Standards are Lax: The CONFIRM Failure and Its Lessons," *Communications of the ACM* (37:10), 1994, pp. 29-36.

Pfeffer, J. "The Whole Truth and Nothing But," *Business 2.0* (5:9), October 2004, p. 78.

Podsakoff, P. M., and Organ, D. W. "Self-Reports in Organizational Research: Problems and Prospects," *Journal of Management* (12:4), 1986, pp. 531-544.

Renzetti, C. M., and Lee, R. M. *Researching Sensitive Topics*, Sage Publications, Newbury Park, CA, 1993.

Ropponen, J. *Software Risk Management: Foundation, Principles, and Empirical Findings*, Jyväskylä University Printing House, Jyväskylä, Finland, 1999.

Russell, B., and Chatterjee, S. "Relationship Quality: The Undervalue Dimension of Software Quality," *Communications of the ACM* (46:8), 2003, pp. 85-89.

Saarinen, T. "An Expanded Instrument for Evaluating Information System Success," *Information & Management* (31:2), 1996, pp. 103-118.

Sawyer, S. "Effect of Intra-Group Conflict on Packaged Software Development Team Performance," *Information Systems Journal* (11), 2001, pp. 155-178.

Sicotte, H., Prefontaine, L., Ricard, L., and Bourgault, M. "New Product Development: Customers' and Suppliers' Assessment of the Same Project," *International Journal of Technology Management* (27:2/3), 2004, pp. 176-192.

Sirohi, N., McLaughlin, E. and Wittink, D. "A Model of Consumer Perceptions and Store Loyalty Intentions for a Supermarket Retailer," *Journal of Retailing* (74:2), 1998, pp. 223-245.

Smith, H. J., and Keil, M. "The Reluctance to Report Bad News on Troubled Software Projects: A Theoretical Model," *Information Systems Journal* (13:1), 2003, pp. 69-95.

Smith, H. J., Keil, M., and Depledge, G. "Keeping Mum as the Project Goes Under: Towards an Explanatory Model," *Journal of Management Information Systems* (18:2), 2001, pp. 189-227.

Snow, A. P., and Keil, M. "The Challenge of Accurate Software Project Status Reporting: A Two-Stage Model Incorporating Status Errors and Reporting Bias," *IEEE Transactions on Engineering Management* (49:4), 2002a, pp. 491-504.

Snow, A. P., and Keil, M. "A Framework for Assessing the Reliability of Software Project Status Reports," *Engineering Management Journal* (14:2), 2002b, pp. 20-26.

Stefanou, H. Personal communication with authors, 2003.

Straub, D. W., and Nance, W. D. "Discovering and Disciplining Computer Abuse in Organizations: A Field Study," *MIS Quarterly* (14:1), 1990, pp. 44-60.

Tan, B., Smith, H. J., Keil, M., and Montealegre, R. "Reporting Bad News About Software Projects: Impact of Organizational Climate and Information Asymmetry in an Individualistic and a Collectivist Culture," *IEEE Transactions on Engineering Management* (50:1), 2003, pp. 64-77.

Victor, B., and Cullen, J. B. "The Organizational Bases Of Ethical Work Climates," *Administrative Science Quarterly* (33:1), 1988, pp. 101-125.

Appendix A. Constructs and Measures

Item	Study 1		Study 2		Item Wording*
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**	
Task Outcomes (T) (1 = extremely low; 7 = extremely high)					
T1	4.84	1.60	4.82	1.28	Relative to other comparable IS projects, how did your most recently completed project rate on efficiency of operations?
T2	4.70	1.70	4.81	1.62	Relative to other comparable IS projects, how did your most recently completed project rate on adherence to schedules?
T3	5.02	1.49	4.99	1.59	Relative to other comparable IS projects, how did your most recently completed project rate on adherence to budgets?
T4	5.30	1.46	5.34	1.20	Relative to other comparable IS projects, how did your most recently completed project rate on amount of produced work?
T5	5.46	1.33	5.49	1.15	Relative to other comparable IS projects, how did your most recently completed project rate on quality of produced work?
T6	5.10	1.51	4.92	1.44	Relative to other comparable IS projects, how did your most recently completed project rate on effectiveness of interactions with consultants?
T7	5.31	1.47	5.57	1.26	Relative to other comparable IS projects, how did your most recently completed project rate on ability to meets its goals?
Psychological outcomes (P) (1 = strongly disagree; 7 = strongly agree)					
P1	5.42	1.30	5.44	1.13	Generally speaking, members of the project team were very satisfied with their work.
P2	5.32	1.31	5.41	1.13	The team members were generally satisfied with the kind of work they did in this project.
P3	5.16	1.76	5.95	1.02	Members frequently thought of quitting the project. [Reversed]
Organizational outcomes (O) (1 = strongly disagree; 7 = strongly agree)					
O1	6.28	1.00	5.68	1.33	The outcome of the project added value to the business operations of the user organization.

Item	Study 1		Study 2		Item Wording*
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**	
Quality of reporting (Q)					
Q1	5.97	1.08	5.36	1.23	To what extent do you feel that the communication you received from the team members (regarding the status of the project) was timely? (1 = untimely; 7 = timely)
Q2	6.12	1.18	5.30	1.20	To what extent do you feel that the communication you received from the team members (regarding the status of the project) was accurate? (1 = inaccurate; 7 = accurate)
Q3	5.91	1.34	5.10	1.26	To what extent do you feel that the communication you received from the team members (regarding the status of the project) was adequate? (1 = inadequate; 7 = adequate)
Q4	5.90	1.35	4.99	1.29	To what extent do you feel that the communication you received from the team members (regarding the status of the project) was complete? (1 = incomplete; 7 = complete)
Q5	6.20	1.30	5.40	1.28	To what extent do you feel that the communication you received from the team members (regarding the status of the project) was credible? (1 = not credible; 7 = credible)

*For Study 1, the wording of all items used the present tense (since the respondents were asked to consider an ongoing project). Also items for Reporting Quality focused on the reporting provided to the project manager by the respondent.