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Post-Project Reviews: An Examination of Determinants

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Abstract

Post-project reviews constitute a valuable learning device for IT organizations to help later project teams avoid making the same mistakes and improve systems development practices. Despite its importance, empirical research on post-project review practices is sparse. Based on a nationwide questionnaire survey of lessons learned from Y2K projects, this study investigates the prevalence of post-project reviews and compares two models that explain their use. Findings from this study suggest that organizational culture, particularly an organization's learning orientation, represents a significant predictor of the use of post-project reviews. The size of the IT organization in terms of IT personnel represents another significant predictor.

Keywords: IT project management, post-project review, organizational learning, learning orientation

Introduction

Statistics on IT project successes are dismal: over 70% of all IT projects are challenged, 33% fail to deliver the expected value to stakeholders, and only 16% of projects are delivered on time and on budget (Christian 2002). Poor IT project performance is often attributed to organizations' failure to learn from their own experiences (Nash 2000; Lyytinen and Robey 1999). An important phase of the IT project life cycle and "arguably the single most cost effective tool available for improving a software organization" (Woodings and Everett 1999) is the post-completion project review (also referred to as post-project review, postmortem, post-implementation review/audit). Defined as "the final formal review in the course of a project that examines any lessons that may be learned and used to the benefit of future projects" (von Zedtwitz 2002, p. 256), a post-project review should be conducted by representatives from all functional organizations that contributed to the project (Nicholas 2001). Such reviews are viewed as an excellent method for knowledge management (Birk et al. 2002). Often documented in the form of a project summary report, reviews can help later project teams avoid making the same mistakes and improve systems development practices in the areas of estimating projects, requirements analysis, design, coding, and project management (Hamilton 1982; Pitman 1991). While post-project reviews should be conducted to learn from mistakes, they should also be performed for successful projects to transfer best practices to future projects, a method called learning from success (Nolan 1999). Post-implementation reviews can also provide useful feedback on the value achieved by an IT project (Norris 1996).

Several authors developed formal guidelines and methodologies for conducting post-project reviews (e.g., Pitman 1991; Anderson and Gilmore 1997; Collier et al. 1996; Woodings and Everett 1999). While important, the review stage is often the most neglected part of IS projects (Pitman 1991). Organizations do not carry out such reviews, conduct them for a small percentage of projects, or fail to properly transfer lessons learned to the next and future projects (Anderson and Gilmore 1997).

Empirical research regarding post-project reviews is sparse. In a field study of 33 new information systems in 22 organizations, Hamilton (1982) examines decision-making criteria involved in selecting applications for such reviews as well as organizational and system factors influencing the review decision. A questionnaire survey study of practices in post-implementation evaluation of computer-based information systems which examined prevalence, stakeholders involved, criteria, benefits, and barriers to post-implementation evaluation found that the primary reason for use of evaluations was project closure and not project improvement (Kumar, 1990). In a study of post-implementation reviews (PIRs) in Australian organizations, 85.5% of respondents claimed to be using such reviews (Kilambi et al. 1998). However, the study also suggested that many organizations did not make effective use of the reviews which appeared "to be more of a 'rubber stamping' process than a detailed review activity" (Kilambi et al. 1998).

The purpose of this study is to add to the sparse body of post-project review research and extend our knowledge of this important phase of IT project management. Specifically, the goals are (1) to examine the prevalence of post-project reviews, and (2) to determine if the conduct of a post-project review can be correctly predicted from characteristics of the project, the IS organization, and the organizational environment contexts.

Factors Explaining the Use of Post-Project Reviews

Based on a review of the literature and depicted in Figure 1, this study has identified characteristics of three contexts discussed below that can be used to distinguish between organizations that conduct post-project reviews and those that do not.

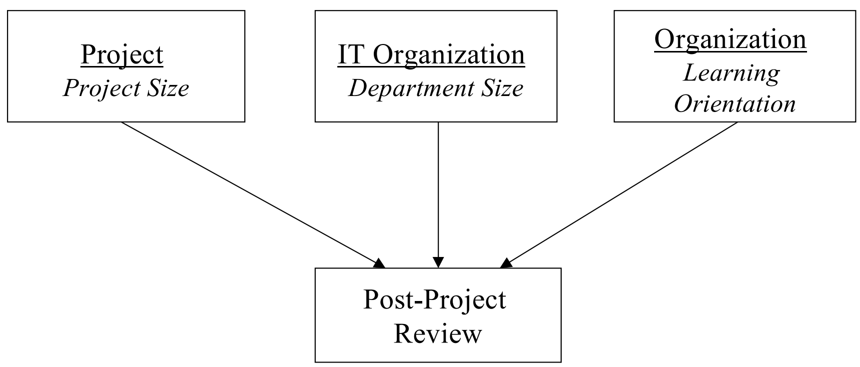

Figure 1. Research Model

Project Context: Project Size

Post project reviews have been mainly advocated for completion of large projects (Birk et al. 2000). Results from an exploratory survey on R&D post-project reviews indicated that post-project reviews were mostly conducted on an ad-hoc basis or after particularly large projects (von Zedtwitz 2002). Hamilton (1982) found that system size in terms of development cost was not significantly correlated with the performance of a post implementation review. On the other hand, the number of personnel on the development team was significantly correlated with post-implementation reviews, suggesting that the pressures to perform a post implementation review were greater for larger systems. The above discussion leads to the first hypothesis:

H1: Project size is positively related to the conduct of post-project reviews.

IT Organization Context: IT Department Size

A resource theory view would suggest that larger IS units may have greater resources to implement post-project review practices and foster a quality culture that values lessons learned. Following Ravichandran (2000), one can reason that organizations may have to commit resources to train employees in post-project review methodologies, and implement and maintain lessons learned practices and structures such as knowledge repositories. While the adoption of IS innovations is generally related to IS department size (Ravichandran 2000), research results regarding the importance of IS department size are mixed. A study regarding the adoption of TQM practices found no significant relationship between the size of the IS unit and the adoption of TQM in systems development (Ravichandran 2000). Likewise, neither the number of MIS personnel nor the equipment budgets were significant determinants of post-project reviews in Hamilton's (1982) study. However, Kilambi et al. (1998) found that larger organizations were more likely to conduct post-implementation reviews than smaller organizations, and shortage of qualified staff was a major reason for not conducting them. Hence, H2: IT department size is positively related to the conduct of post-project reviews.

Organizational Environment Context: Learning Orientation

Previous research has shown that the use of post-project reviews is dependent on the organizational environment. Organizations appear not to perform post-implementation reviews if they run counter to the culture and philosophy of the organization (Remenyi et al. 1999; Kilambi et al. 1998). Hamilton (1982) found that the organizational norm for performing post-implementation reviews was significantly correlated with the actual performance of a post-project review. One of the benefits of post-project reviews is organizational learning (Kilambi et al. 1998). Only well-managed organizations with vigorous commitment to continuous improvement and organizational learning appear to use project audits and reports to identify changes to improve the delivery of future projects and affect such learning (Gray and Larson 2000). A recent study of the adoption of TQM in information systems found a strong positive effect of the host organization's quality orientation on adoption behavior (Ravichandran 2000), which was explained from an organizational learning perspective. A survey of NASA's lessons learned process (GAO-01-1015R 2001) highlights the need for an organizational culture that fosters the value of sharing knowledge based on others' experiences if the use of lessons learned was to succeed. It thus follows that the firm's propensity to create and use knowledge – its learning orientation (Sinkula et al. 1997) – impacts the IT department's predisposition to learn from its project experiences. The learning orientation has been conceptualized as giving rise to a set of organizational values that are fundamental to learning: *commitment to learning*, *open-mindedness*, and *shared vision* (Sinkula et al. 1997). This discussion leads to the following hypotheses:

H3: The overall learning orientation is positively related to the conduct of post-project reviews.
- H3a: Commitment to learning is positively related to the conduct of post-project reviews.
- H3b: Shared vision is positively related to the conduct of post-project reviews.
- H3c: Open-mindedness is positively related to the conduct of post-project reviews.

Research Method

Sample

As part of a study to assess lessons learned from the Y2K experience, a large-scale nation-wide mail survey was conducted to collect data for the study. A questionnaire was mailed to a random sample of 1446 top IS executives obtained from the Spring 2000 edition of the *Directory of Top Computer Executives* who were assumed to be in the best position to answer questions related to their Year 2000 project efforts. Many CIOs in the United States considered the Y2K problem as a significant IT function (Korn/Ferry International 1998), were in charge of or provided oversight for the coordination of their company's Y2K project, and were on-site on New Year's Eve 1999 to play a role in monitoring systems on Y2K weekend (Greenemeier 1999). 84 questionnaires were returned because they were not deliverable, the person no longer worked for the organization, or the organization had a policy of not participating in research studies. 105 questionnaires were received within a month after the questionnaires were sent, yielding a response rate of 7.71%, which is similar to Moore (2000). Of those, 59 (56.2%) had conducted a post-project review, 46 (43.8%) had not.

Measures

The dependent variable used in this study is dichotomous. Specifically, respondents were asked to respond "yes" or "no" to the question: *Did your company conduct a post-Y2K project review?* The size of the IS unit was measured in terms of *number of IS employees* and *annual IS budget* following previous research. Project size was measured in terms of the *total cost to make the organization's information systems Y2K compliant*. The learning orientation of the organization was operationalized in terms of an 18-item 5-point Likert scale adapted from Baker and Sinkula (1999). The scale with all 18 items was used to test the effect of overall learning orientation (H3) in regression model 1 described below. The learning orientation subscales labeled commitment to learning, open-mindedness, and shared vision were used in regression model 2 to test individual learning orientation components (H3a, H3b, and H3c).

Statistical Analyses

Construct reliability for the 18-item learning orientation scale was assessed by computing Cronbach's alpha. The reliability estimate (á =.9205) indicates a high level of internal consistency and is consistent with Baker and Sinkula's (1999) estimate (á

=.94). Convergent and discriminant validity were assessed by performing a factor analysis using principal components analysis and Varimax rotation with SPSS Base 11.0. Sampling adequacy was assessed by two measures: the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, which can range between 0 and 1, and Bartlett's test of sphericity. The KMO measure of .884 and a highly significant Bartlett's test (approx. Chi-Square = 1059.996, Sig. = .000) indicate that factor analysis is appropriate for these data. As shown in Table 1, three factors which account for 63.61% of the variance emerged consistent with Baker and Sinkula (1999) who labeled them 1. Commitment to learning, 2. Shared vision, and 3. Open-mindedness. Table 1 also shows the construct reliability for the three sub-scales using Cronbach's alpha.

Convergent validity is demonstrated if the items load strongly (>.50) on their associated factors. Only one item related to factor 3 (Item 17) had a loading slightly lower than .50. Discriminant validity is achieved if each item loads stronger on its associated factor than on any other factor. While this holds true for factor 1 and factor 2, several items related to factor 3 (*Open-Mindedness*) cross-loaded to a different scale. Particularly, Item 13 ("We are not afraid to reflect critically shared assumptions we have about the way we do business") does appear to overlap the domain of the *shared vision* construct (Factor 2). Similarly, Item 16 ("Managers encourage employees to "think outside of the box") does overlap with the *commitment to learning* and *shared vision* scales. Finally, Item 17 ("An emphasis on constant innovation is not a part of our corporate culture") overlaps with the *commitment to learning* scale (Factor 1). Because the domain and validity of the Open-Mindedness scale has been established in the marketing literature, and the loadings were greater than .5 for two of the items that cross-loaded, the items were retained as part of factor 3 in subsequent analyses.

Table 1. Factor Analysis Results of the Learning Orientation Scale

Item	Factor 1: Commitment to Learning	Factor 2: Shared Vision	Factor 3: Open-Mindedness	Cronbach's Alpha
1	**0.716**	0.245	0.190	.9196
2	**0.862**	0.185	0.074	
3	**0.855**	0.209	0.175	
4	**0.880**	0.215	0.137	
5*	**0.752**	0.011	0.237	
6	**0.778**	0.081	0.363	
7	0.241	**0.804**	-0.018	.8531
8	0.088	**0.808**	0.148	
9	0.166	**0.684**	0.183	
10	0.268	**0.664**	0.239	
11	0.191	**0.661**	0.294	
12*	0.001	**0.666**	0.253	
13	0.029	0.448	**0.533**	.8289
14*	0.167	0.037	**0.786**	
15	0.360	0.303	**0.700**	
16	0.354	0.404	**0.589**	
17*	0.349	0.135	**0.442**	
18	0.191	0.351	**0.722**	

Note: Items with an asterisk (*) were reverse coded.

Binary logistic regression using SPSS 11.0 Regression Models was performed to test the research model because the dependent variable was dichotomous, i.e., whether a post-project review was performed (1) or not (2). An advantage of logistic regression over discriminant analysis is that it requires no assumptions about the distributions of the predictor or independent variables (Mertler and Vannatta 2002). Two forward logistic regression analyses were conducted to determine which independent variables were predictors of the use of post-project reviews. Following Mertler and Vannatta (2002), this method of logistic regression was chosen over the Enter method (i.e., entering all the independent variables at once into the model) because learning orientation had not been previously tested as an independent variable in the context of post-project reviews. Consistent with Baker and Sinkula (1999), the first regression (Model 1 shown in Figure 2) with four predictors (cost of compliance, overall learning orientation, # of employees, IT budget) operationalized learning orientation as a summate scale using all 18 items.

Because it was a significant predictor of the performance of post-project reviews, the second regression (Model 2 shown in Figure 3) with six predictors included three learning orientation components (1.Commitment to learning, 2. Shared vision, and 3. Open-mindedness) using the factor scores for the learning orientation scale obtained from the factor analysis shown in Table 1 plus # of employees, IT budget, and Project Size to determine which constructs were significant.

Preliminary multiple regressions were conducted to examine multicollinearity among the predictors. Tolerance for all variables was greater than 0.1, indicating that multicollinearity was not a problem in either model (Mertler and Vannatta 2002). Data screening led to the elimination of two outliers. Means and standard deviations for the study variables by group are shown in Table 2.

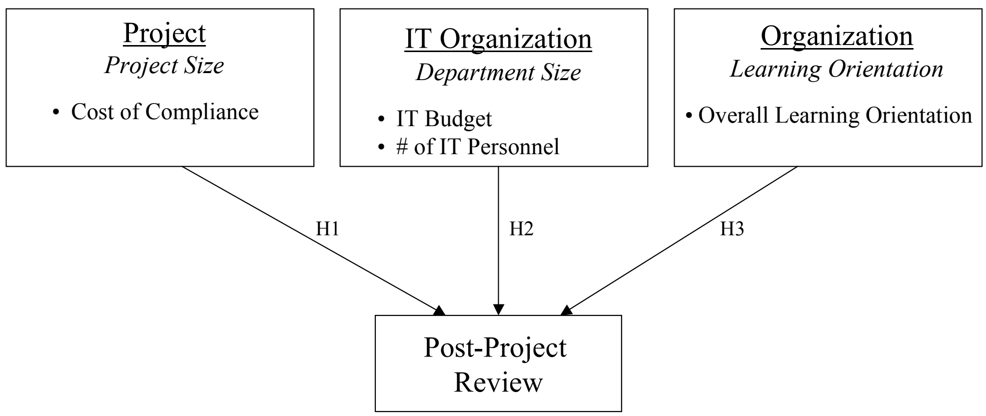

Figure 2. Regression Model 1

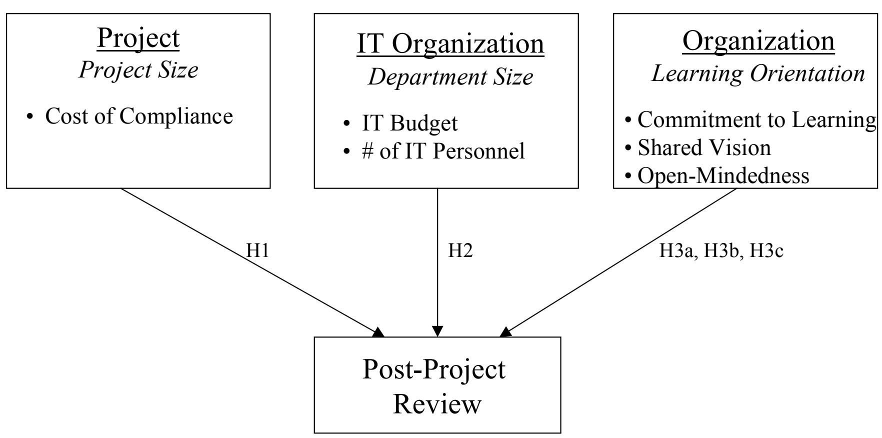

Figure 3. Regression Model 2

Table 2. Descriptive Statistics for Study Variables

Variable	Post-Project Review	N	Mean	Std. Deviation
# of employees	Yes	38	52.72	59.21
	No	33	28.03	24.47
Annual IS Budget	Yes	38	$6,142,947.37	$7,288,550.69
	No	33	$6,899,352.06	$11,680,144.95
Cost of Compliance	Yes	38	$1,844,762.24	$2,191,618.76
	No	33	$1,414,545.45	$2,662,946.96
Overall Learning Orientation (18 items)	Yes	38	3.52	0.59
	No	33	3.04	0.70
Commitment to Learning (Factor 1)	Yes	38	3.76	0.88
	No	33	3.16	0.88
Shared Vision (Factor 2)	Yes	38	3.32	0.69
	No	33	2.97	0.83
Open-Mindedness (Factor 3)	Yes	38	3.47	0.62
	No	33	3.00	0.73

Note: Learning orientation items were measured on a five-point Likert scale with 5 = strongly agree to 1 = strongly disagree.

Results

Logistic Regression Results

Regression results for Model 1 indicated the overall model of 4 predictors was statistically reliable in distinguishing between companies that conducted a post-project review and those that did not (χ^2 (2) =14.175, p = .001). The model correctly classified 63.4.8% of the cases. Table 3 shows that both IS department size in terms of # of employees as well as overall learning orientation were statistically significant predictors of post-project reviews. For each variable not in the model, the score statistic (instead of the Wald statistic) and its significance level, if the variable were entered next into the model, is also shown in Table 3. Thus, the results provide support for Hypothesis H3 and partial support for Hypothesis H2.

Table 3. Model 1 Logistic Regression Results

Regression Coefficients for Significant Variables in the Equation						
Variables	**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**
# of Employees	-.531	.253	7.798	1	.036	.588
Overall Learning Orientation	-1.161	.439	6.979	1	.008	.313
Variables not in the Equation						
Variables				**Score**	**df**	**Sig.**
IT Budget				1.709	1	.191
Project Size				.001	1	.972

Regression results for Model 2 indicated that the overall model of 6 predictors was also statistically reliable in distinguishing between the two types of companies (χ^2 (3) = 17.926, p = .000). The model correctly classified 66.2% of the cases. Table 4 shows that three variables (# of employees, commitment to learning, and open-mindedness) are statistically significant predictors of post-project reviews, thus providing support for H3a and H3c and partial support for Hypothesis H2.

Table 4. Model 2 Logistic Regression Results

Regression Coefficients for Significant Variables in the Equation						
Variables	**B**	**S.E**	**Wald**	**df**	**Sig.**	**Exp(B)**
# of Employees	-.661	.271	5.965	1	.015	.516
Commitment to Learning	-.586	.271	4.692	1	.030	.557
Open-Mindedness	-.802	.325	6.071	1	.014	.449
Variables not in the Equation						
Variables				**Score**	**df**	**Sig.**
IT Budget				1.465	1	.226
Project Size				.170	1	.680
Shared Vision				.038	1	.845

The goodness-of-fit measures for each model shown in Table 5 together with the "correctly classified" percentages described earlier suggest that Model 2 that uses learning orientation subscales slightly outperforms Model 1 with respect to predicting the conduct of a post-project review.

Table 5. Goodness-of-Fit Measures for each Regression Model

Logistic Model	**-2 Log Likelihood**	**Cox & Snell R^2**	**Nagelkerke R^2**	**Hosmer-Lemeshow Goodness-of-fit (χ^2, p<)**
1	83.900	.181	.242	(4.925, .766)
2	80.149	.223	.298	(2.179, .975)

Predictive Validity of Each Model

To determine if the regression models performed better than chance in their classification ability and following Keil, Mann, and Rai (2000), Morrison's (1969) proportional chance criterion was computed given by the model:

$$C=\text{alpha}^2 + (1- \text{alpha}^2)$$

Alpha is the proportion of projects in group 1, and (1-alpha) is the proportion of projects in group 2. In this study, group 1 represented use of post-project reviews (approximately 54%); group 2 represented companies that had not conducted a review (46%). For the study sample, Morrison's chance criterion (i.e., the overall percentage correct expected by chance) is .50. Thus, both models performed better than chance in terms of their classification ability.

Discussion

While limited to one IT project, the findings of this study are consistent with previous studies that show limited use of post-project reviews. This study also provides support for the important role of the organizational environment, particularly the organizational culture. Hamilton (1982) found that the primary determinant of a review was the PIR (post implementation review) decision maker's intention to perform a PIR. The primary determinant of intention was the PIR decision maker's attitude, which was a function of the behavioral beliefs about the likely consequences, i.e., useful outcomes, of performing a review. He also suggested that the PIR decision maker incorporated other salient groups into attitude. The present study suggests that organizational values that characterize an organization's learning orientation may play a critical role in the decision to perform a post-project review. While learning orientation as a whole plays an important role (Model 1), two sets of values that make up this construct are particularly important (Model 2): *the commitment to learning* which is the fundamental value an organization holds towards learning, and *open-mindedness*, which has been linked to the concept of unlearning and which is crucial to organizational change (Sinkula et al. 1997). Shared vision, on the other hand, which is viewed as a crucial foundation for proactive learning as it provides direction (Sinkula et al. 1997) was not a significant predictor of post-project reviews in the present study. This finding may stem from the nature of the projects that constituted the basis for this study. The fact that project size in terms of development costs was not a significant predictor of post-project reviews was not surprising and is consistent with previous research (e.g., Hamilton 1982). The same holds true for the IT budget as a predictor variable. On the other hand, the number of IT employees played a significant role in both models which is consistent with Kumar's (1990) study that found unavailability of qualified personnel among the greatest inhibitors of post-project evaluation efforts. IT departments with more personnel may have a greater pool of qualified personnel available for reviews than departments with fewer people.

Contributions

This study makes several contributions. First, it adds to the sparse body of empirical research on post-project reviews and sheds light on current practices. It also provides support for previous studies' findings regarding predictors that explain if organizations perform post-project reviews. Most importantly, the present study extends prior research by introducing organizational culture as a new and important predictor and applying a construct from the marketing literature, learning orientation, to explain the use of IT project reviews. This study thus establishes a crucial link between organizational values and the behaviors of the IT organization and suggests that IT project performance must be addressed not only at the IT department level by at the organizational level as well.

Limitations and Further Directions

The major limitation of this study is its focus on one type of project (Year 2000 projects). While the use of one type of project enhances comparability across cases within this study, the findings may not extend to other types of IT projects, particularly with respect to prevalence of post-project reviews. In addition, all the projects in this study were considered a success in that all of them were completed by the specified deadline. Future research may incorporate a wider range of projects and explicitly distinguish between different types of projects (e.g., new system versus system enhancements projects, successful versus unsuccessful projects). In addition, this study uses the conduct of a post-project review as a dependent variable. Future studies may incorporate other post-project review related factors as dependent variables such as use of a review methodology, the degree of formalization of the review process, or the duration of reviews. Also, the use of lessons learned can be conducted throughout the project life cycle, not just at the end of the project (Kotnour 1999). Future research may investigate the timing of producing lessons learned to determine if organizations with a greater learning orientation are more inclined to learn continuously from project experiences. Finally, in addition to learning orientation, other organizational variables such as overall IT strategy (e.g., innovator versus laggards) and business /IT alignment may be incorporated in future research. Also of interest to IT managers will be an identification of factors that are under their control and which can be changed to increase the value of the post-project review.

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