PROJECT MANAGEMENT PERFORMANCE DRIVERS

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ABSTRACT

The practice of project management has gained enormous importance over the past several years in various business industries. "In industries as diverse as pharmaceuticals, software, and aerospace, projects drive business" (Wheatley). This gain of importance can be attributed to the magnitude of the impact project performance results in terms of time, cost, and scope have over the project performing entity. "On the basis of data released by the Bureau of Economic Analysis, part of the US Department of Commerce, they estimated in 2001 that the US public and private sectors combined spend some $2.3trn on projects every year, an amount equivalent to a quarter of America's GDP" (Wheatley). The Project Management Performance Drivers research was conducted to demonstrate how project performance in terms of time, cost, and scope is dependent on applying generally recognized good project management practices. The research was based on a survey filled by project management professionals and regression analysis was used to elicit the relationship between good project management practice and project performance. The research revealed that a direct linear relationship seems to exist. The attained result demonstrates the importance of applying generally recognized good project management practices when managing projects.

1. INTRODUCTION

The Project Management Body of Knowledge Guide (PMBOK Guide) 2004, the official standard for project management issued by the Project Management Institute Inc. organization, defines a project as "a temporary endeavor undertaken to create a unique product, service, or result" (PMBOK Guide, 2004, p. 5). Although the definition looks simple, this "temporary endeavor" can take up several years in time and billions of dollars in expenditures. A company carrying out a failing project, or a project with less than the anticipated performance results, can end up incurring enormous losses even with deviations as low as 10% or 15% from the planned time and cost. Moreover, the "unique product, service, or result" can be constituted of thousands of specifications that must co-exist to achieve the desired project objectives. Missing a percentage of as low as 10% or 15% of the required specifications can sometimes result in significant reductions in the returns the project is expected to generate. It is, therefore, easy to elicit that a failing project, which took up years of worthless efforts, incurred millions of "sunk" dollars in expenditures, and was eventually

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decided to terminate, can be a company's worst nightmare. While project resources' competencies are important for the success of projects, good project management practice is often equally important. There are generally recognized good practices in the field of project management. Successful project managers are knowledgeable about and experienced in these practices. This report will broadly identify some of these practices and demonstrate their importance through measuring the strength of the relationship between their application and the performance of projects in terms time, cost, and scope.

In the following sections, the study will detail the research methodology, discuss the project management process and the importance of various project management aspects, discuss how project management performance can be measured and quantified, and detail the research's results and their analysis.

II. LITERATURE REVIEW

1. The Project Management Process

In general, projects should be formally initiated, approved, and sponsored prior to their executions. After initiation, projects should be carefully planned to set guidelines for the project team members and a baseline for the measurement of the performance of the projects. Project team members and resources then execute the planned activities and the performance of these activities should be closely monitored and controlled. Required changes to align actual results with estimations are likely to be required. Finally, projects should be formally closed to indicate the completion of the project. The "stages" of initiating, planning, executing, monitoring and controlling, and closing do not necessarily get executed in sequence. Normally, planning, executing, and monitoring and controlling activities iterate. This report will therefore label these "stages" as process groups, in alignment

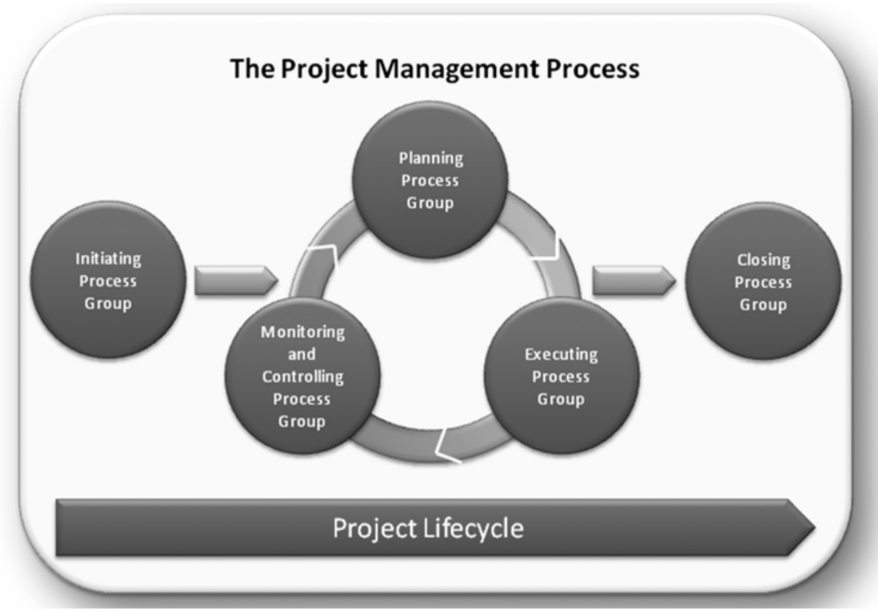

Figure 3.1

with the Project Management Institute (PMI) convention because each of the process groups constitute of logically-related processes performed throughout the life time of the project. Figure 4.1 below broadly demonstrates the project management process.

There are also several project management practice areas. Each project management practice area constitutes of related project management practices and processes. The PMBOK Guide 2004 identifies nine project management practice areas (or "knowledge areas"):

1. Project Integration Management
2. Project Scope Management
3. Project Time Management
4. Project Cost Management
5. Project Quality Management
6. Project Human Resource Management
7. Project Communication Management
8. Project Risk Management
9. Project Procurement Management

The following matrix demonstrates the practice or process coverage of each project management practice area against the project management process groups, according to the PMBOK Guide 2004:

2. The Initiating Process Group

The initiating process group contains processes that initiate a project and formally authorizes one to start. It is important to undergo these processes because they involve "incorporating the needs of the organization" in documents such as "the

Practice Area	Initiating	Planning	Executing	Controlling	Closing
Project Integration Management	✓	✓	✓	✓	✓
Project Scope Management		✓		✓	
Project Time Management		✓		✓	
Project Cost Management		✓		✓	
Project Quality Management		✓	✓	✓	
Project Human Resource Management		✓	✓	✓	
Project Communication Management		✓	✓	✓	
Project Risk Management		✓		✓	
Project Procurement Management		✓	✓	✓	✓

Table 3.1

project charter and the preliminary scope statement" (Rita Mulcahy, 2005). Andy Crowe, in his book, The PMP Exam, states that "if a project is not initiated properly, the end results could range from a lessened authority for the project manager to unclear goals or uncertainty as to why the project was being performed. Conversely, a project that is initiated properly would have the business need clearly defined and would include a clear direction for the scope as well as information on why this project was chosen over other possibilities." (Crowe, 2005).

The Initiating process group activities include:

1. **Performing a Feasibility Study**
   <Summary of item here>
2. **Identifying a Project Sponsor**
   <Summary of item here>
3. **Developing a Project Charter**
   <Summary of item here>
4. **Developing a Preliminary Project Scope Statement**
   <Summary of item here>

3. The Planning Process Group

The planning process group includes project management practices and processes that a project manager or a project team performs to plan the activities for all project management practice areas. Although it seems common sense that projects should be planned before they are executed, many projects are actually executed without proper planning. This can sometimes be attributed to the fact that "time pressure from senior management [sometimes] takes over and most of the time the project is on its way before it has been clearly defined" (New Zealand Management, 2002). "In such cases, people see planning as a waste of time because they believe that time is better spent doing something rather than planning" (Fichter, 2002). "Most large IT projects[, for example,] are planned these days but that is not enough. Most projects have major milestones, and the problem is that the work continues throughout each milestone" (Humphrey, 2005); "implementing sometimes starts before plan completion and continues through most of the testing" (Al Neimat, 2005). It should also be mentioned that there is much more to planning than simply developing the project schedule where project activities are listed with planned execution timelines. As demonstrated in the practice area vs. process group matrix above, the planning processes touch all practice areas.

Project planning activities include:

1. **Planning Project Scope Management**
   <Summary of item here>
2. **Developing the Scope Baseline**
   <Summary of item here>
3. **Developing the Project Schedule**
   <Summary of item here>
4. **Developing the Project Budget**
   <Summary of item here>
5. **Planning Project Quality Management**
   <Summary of item here>
6. **Planning Project Human Resource Management**
   <Summary of item here>
7. **Planning Project Communication Management**
   <Summary of item here>
8. **Planning Project Risk Management**
   <Summary of item here>

4. The Executing Process Group

The executing process group involves the processes and practices that the project manager and the project team perform in accordance with the project plan to carry out the activities of the project and, eventually, produce the planned project deliverables. Expectedly, the efficient and effective execution of a project will result in good project performance indicators. Without efficient execution, project activities tend to take longer and cost more than anticipated, thereby negatively impacting the performance of the project in terms of time and cost. Also, without effective execution, the project will most likely fail to deliver the agreed deliverables or deliverable specifications resulting in poor project performance in terms of scope.

Executing activities include:

1. **Directing, Managing, and Executing the Project**
   <Summary of item here>
2. **Performing Quality Assurance**
   <Summary of item here>
3. **Developing the Project Team**
   <Summary of item here>
4. **Distributing Project Information**
   <Summary of item here>

5. The Monitoring and Controlling Process Group

Just like the planning process group, the monitoring and controlling process group touches all project management practice areas. This is because the various project management practice area plans are subject to change as the project progresses. The changes to the various project management practice plans required have to be formally requested, assessed for their impact, and approved in order to reflect them in the respective plans. In addition, changes can take the form of activity corrective and activity improving actions. These changes, again, should be requested, assessed, and approved in order to perform them. The common aim of both kinds of changes is to align the project work with the project plan. Moreover, monitoring and controlling related processes and practices ensure compliance to planned measures, such as the quality control and scope verification processes, and evaluate the performance of projects.

Monitoring and controlling activities include:

1. **Integrated Change Control**
2. **Scope Verification**
3. **Scope Control**
4. **Schedule Control**
5. **Cost Control**
6. **Quality Control**
7. **Project Team Management**
8. **Performance Reporting**
9. **Stakeholder Management**
10. **Risk Control**

6. Project Performance Indicators

There are several ways to measure the performance of projects. Typically project performance is measured in terms of time, cost, and scope. In terms of time, project performance can be measured by using the Schedule Performance Index (SPI), which is calculated by dividing the planned execution time over the actual execution time. An SPI value of 1 means the project is performing on schedule, an SPI value greater than 1 means the project is performing ahead of schedule, and an SPI value smaller than 1 means that the project is behind in schedule. Similarly, project performance in terms of cost can be measured using the Cost Performance Indicator (CPI), which is calculated by dividing the planned expenditures over the actual expenditures. Again, a CPI value of 1 means the project is within budget, a CPI value greater than 1 means the project is below budget, and a CPI value less than 1 means the project is over budget. Project performance in terms of scope can be measured by validating the project delivered the required requirements or deliverable specifications. A quantification of this measurement is possible by calculating the average percentage of specifications delivered for each deliverable.

III. RESEARCH METHODOLOGY

As introduced earlier, one of the main objectives of this research was to establish a relationship between good or bad project management practice and project management performance results. Accordingly, an intensive literature review was performed to investigate and put together generally recognized good project management practices and general project management knowledge. A number of references contributed to the obtained material and knowledge. After the literature review, a web-based survey was developed and published on one of Qatar University's web servers. The on-line survey required respondents to perform four main steps. These steps are summarized below:

Step 1: General Project and Respondent Information

The first step required the respondent to answer a set of questions about the project he or she is filling the survey for and about his or her professional experience and status. The step was necessary to assign response weights for the filled questionnaires (explained at a later step) based on the size of the project in terms of time and cost and the respondent's role on the project.

Step 2: Questionnaire

The second step required respondents to answer a total of 46 objective questions covering various areas in the good practice of project management, as drawn from the literature review. Mainly, each question asks whether or not a certain generally recognized good project management practice or process was performed on the project the respondent is filling the survey for. The respondents indicate whether they strongly agree, agree, have no opinion (or the question is inapplicable), disagree, or strongly disagree that the presented practice or process was performed on the project.

Step 3: Project Performance Information

The third step required respondents to indicate how the project performed in terms of time, cost, and scope. Time performance is measured by how much the project deviated from the planned schedule. Cost performance is measured by how much the project expenditures deviated from the intended budget. Scope performance is measured by the average percentage of specifications the project delivered for each deliverable.

Step 4: Respondent Input Weights

The fourth and last step of the survey required respondents to evaluate from their own points of view how they perceive the importance of the input provided by respondents playing various project roles for the survey. This step was necessary to determine response weights objectively instead of relying on subjectivity and the personal judgment of the surveyor.

A URL link to the survey was distributed through the Project Management Institute – Arabian Gulf Chapter (PMI-AGC) to all its members. After gathering the data of respondents through the surveys, statistical tools were applied to analyze the collected data and develop the research's results.

IV. RESEARCH RESULTS AND ANALYSIS

1. Analysis Methodology

To elicit a relationship between how good or bad project management is practiced and how the project performs, a practice score and a performance score are calculated for each survey response. After calculating the practice and performance scores, weighted regression is used to elicit a relationship between the two scores. The response weights are assigned based on the size of the project in terms of time and cost and based on the respondent's role on the project that he or she filled the survey for.

1.1. Practice Score Calculation

The practice score for a response is calculated by first evaluating the score of each answer. The score for each answer ranges from 1 (strongly disagree) to 5 (strongly agree). Answer scores are then summed for each response, divided by the maximum possible score (number of questions [46] x strongly agree score [5] = 230), and multiplied by 100 to get the final practice score in a percentage format.

1.2. Performance Score Calculation

The performance score is calculated by adding the schedule performance index (SPI), cost performance index (CPI), and average scope coverage percentage (SP) of each response. Each of the previously mentioned performance indicators are estimated based on the respondent's response to the ***Step 3: Project Performance Information*** section of the survey

1.3. Response Weights

Projects vary in size in terms of time and cost. Responses filled for large projects should be given more focus over those filled for small projects. In addition, responses coming from respondents with better reach to information on the project they filled the survey for should also be given more focus than responses from respondents with less reach to this information. Accordingly, each response is assigned a weight based on the size of the project in terms of time and cost

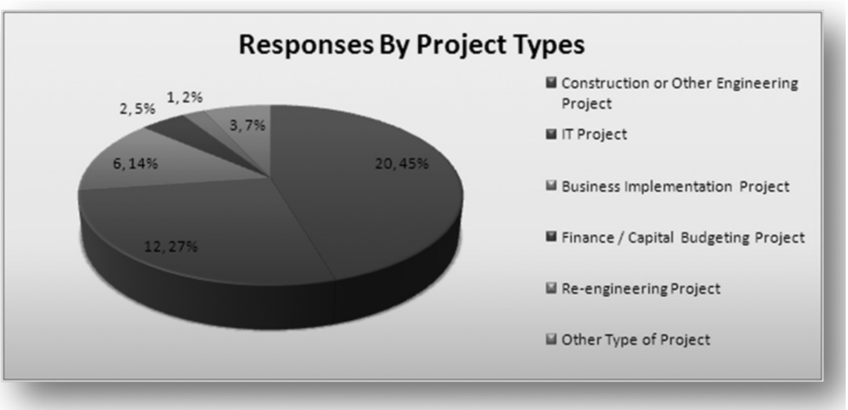

Figure 5.1

and based on the role of the respondent on the project he or she filled the survey for. The total weight for each response is the sum of the weight corresponding to the size of the project in terms of time, the weight corresponding to the size of the project in terms of cost, and the weight corresponding to the role of the respondent on the project divided by the maximum weight possible.

2. Results and Analysis

The total number of responses received for this survey was 44. The following pie-chart demonstrates the project type distribution of the responses:

Practice scores for responses ranged from 50 to 90 with a mean of 75.84 and a standard deviation of 8.35. The following histogram shows the frequency distribution of the practice scores:

As one can see above, the practice scores are almost normally distributed.

Performance scores ranged from 0.97 to 3.28 with a mean of 2.44 and a standard deviation of 0.45. The following histogram shows the frequency distribution of the performance scores:

Again, the above histogram shows that performance scores are nearly normally distributed.

In the following subsections, weighted regression is used to elicit a relationship between overall practice score and performance score for the entire sample, between overall practice score and performance score for the two leading project types: construction or other engineering and IT projects, as shown above, and between practice scores for each of the initiating, planning, executing, and monitoring and controlling process groups and performance score for the entire sample.

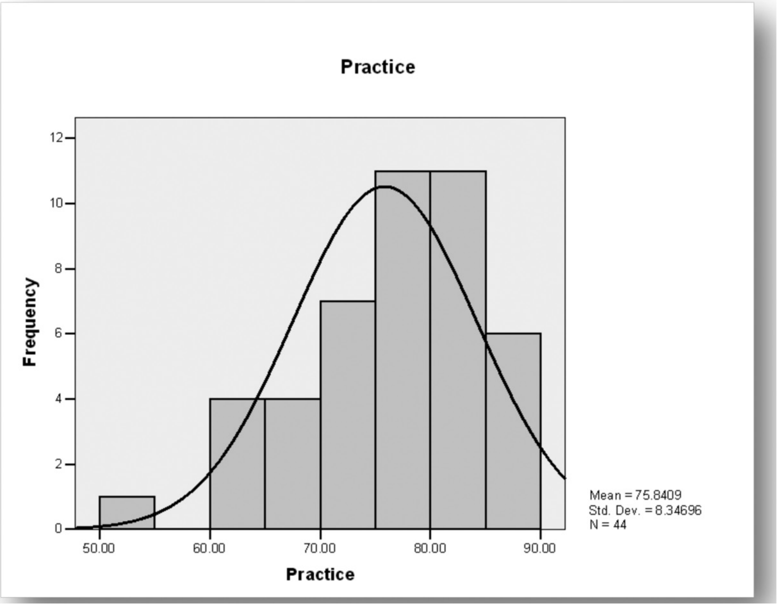

Figure 5.2

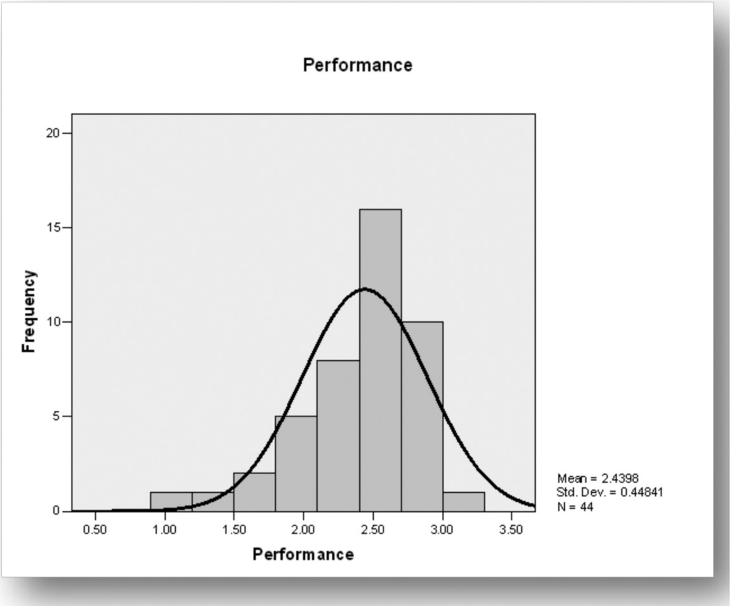

Figure 5.3

2.1. Practice and Performance Score Correlation for the Entire Sample

Regression model to be tested:

Performance Score (Per) = Intercept (I) + Coefficient (C) x Practice Score (Pra) + Error (Er)

Hypothesis (H_1): There is a direct linear relationship between practice score and performance score. That is, C is not equal to 0 in the above equation.

Null Hypothesis (H_0): There is no direct linear relationship between practice score and performance score. That is, C is equal 0 in the above equation.

The analysis above shows that the predicted model is represented by the following equation:

Per = 0.047 x Pra – 1.104

The model summary table above shows that 71.3% of the variation in performance score is explained by the practice score, while 28.7% remains unexplained. In addition, the value of the adjusted R^2 is close to that of R^2, which indicates that the sample size is relatively large. These values suggest that the model's fit is good.

The rejection region for a confidence level of 99% is $F > F_{0.01,1,43} \approx 4.08$. Since F = 104.152 is large enough compared to the critical value of F, there is a great deal of statistical evidence to infer that the model is valid.

The coefficient of the practice score in the equation above is 0.047. This means that, in this model, for every additional practice score point, the project performance is expected to increase by 0.047. The p-value of the coefficient is significantly small (shown as 0 in the table above), which means

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.844[a]	.713	.706	.20593

a. Predictors: (Constant), Practice

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.417	1	4.417	104.152	.000[a]
	Residual	1.781	42	.042		
	Total	6.198	43			

a. Predictors: (Constant), Practice

b. Dependent Variable: Performance

c. Weighted Least Squares Regression - Weighted by Weight

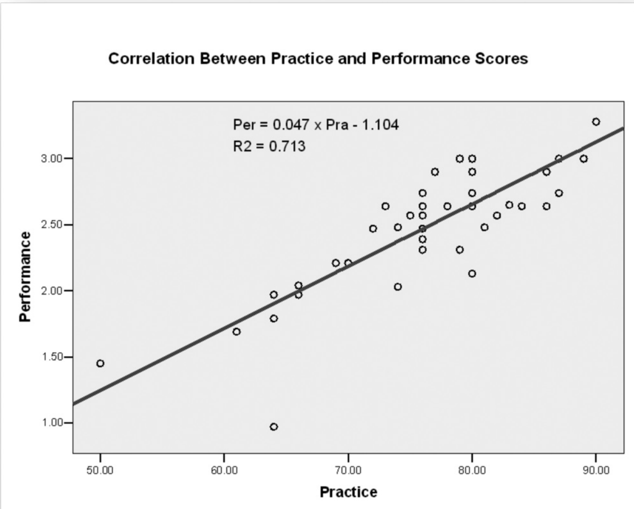

Figure 5.4

there is enough statistical evidence to infer a linear relationship between the practice and performance scores.

The intercept value of -1.104 has no statistical interpretation since a practice score of 0 is practically impossible.

The following scatter diagram shows the correlation between practice and performance scores, along with the predicted regression line:

The above analyses demonstrate that there seems to be a direct relationship between following generally recognized good project management practices and project performance for all projects in general.

2.2. Practice and Performance Score Correlation for Construction or Other Engineering Projects

The following summarizes the weighted regression analysis performed to elicit the relationship between overall practice score and performance score for the construction or other engineering project type:

Regression model to be tested:
Performance Score (Per) = Intercept (I) + Coefficient (C) x Practice Score (Pra) + Error (Er)

Hypothesis (H_1): There is a direct linear relationship between practice score and performance score. That is, C is not equal to 0 in the above equation.

Null Hypothesis (H_0): There is no direct linear relationship between practice score and performance score. That is, C is equal 0 in the above equation.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.919[a]	.845	.836	.13321

a. Predictors: (Constant), Practice

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.738	1	1.738	97.932	.000[a]
	Residual	.319	18	.018		
	Total	2.057	19			

a. Predictors: (Constant), Practice
b. Dependent Variable: Performance
c. Weighted Least Squares Regression - Weighted by Weight

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.542	.301		-1.798	.089
	Practice	.040	.004	.919	9.896	.000

a. Dependent Variable: Performance
b. Weighted Least Squares Regression - Weighted by Weight

The analysis above shows that the predicted model is represented by the following equation:

Per = 0.04 x Pra – 0.542

The model summary table above shows that 84.5% of the variation in performance score is explained by the practice score, while 15.5% remains unexplained. In addition, the value of the adjusted R^2 is close to that of R^2, which indicates that the sample size is relatively large. These values suggest that the model's fit is good.

The rejection region for a confidence level of 99% is $F > F_{0.01,1,18} = 8.29$. Since F = 97.932 is large enough compared to the critical value of F, there is a great deal of statistical evidence to infer that the model is valid.

The coefficient of the practice score in the equation above is 0.04. This means that, in this model, for every additional practice score point, the project performance is expected to increase by 0.04. The p-value of the coefficient is significantly small (shown as 0 in the table above), which means there is enough statistical evidence to infer a linear relationship between the practice and performance scores.

The intercept value of -0.542 has no statistical interpretation since a practice score of 0 is practically impossible.

The following scatter diagram shows the correlation between practice and performance scores, along with the predicted regression line:

The above analyses demonstrate that there seems to be a direct relationship between following generally recognized good project management practices and project performance for construction or other engineering projects.

2.3. Practice and Performance Score Correlation for IT Projects

The following summarizes the weighted

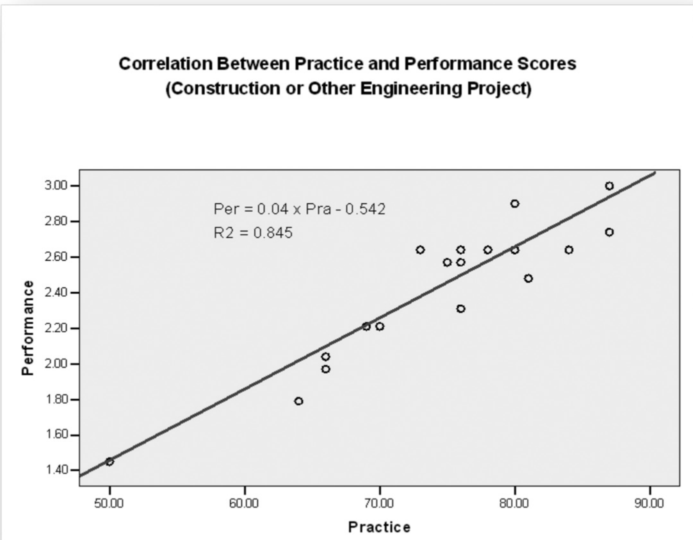

Figure 5.5

regression analysis performed to elicit the relationship between overall practice score and performance score for the IT Project type:

Regression model to be tested:
Performance Score (Per) = Intercept (I) + Coefficient (C) x Practice Score (Pra) + Error (Er)

Hypothesis (H_1): There is a direct linear relationship between practice score and performance score. That is, C is not equal to 0 in the above equation.

Null Hypothesis (H_0): There is no direct linear relationship between practice score and performance score. That is, C is equal 0 in the above equation.

The analysis above shows that the predicted model is represented by the following equation:
Per = 0.043 x Pra – 0.781

The model summary table above shows that 70.4% of the variation in performance score is explained by the practice score, while 29.6% remains unexplained. In addition, the value of the adjusted R^2 is close to that of R^2, which indicates that the sample size is relatively large. These values suggest that the model's fit is good.

The rejection region for a confidence level of 99% is $F > F_{0.01,1,10} = 10.04$. Since F = 23.743 is large enough compared to the critical value of F, there is a great deal of statistical evidence to infer that the model is valid.

The coefficient of the practice score in the

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.839[a]	.704	.674	.15171

a. Predictors: (Constant), Practice

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.546	1	.546	23.743	.001[a]
	Residual	.230	10	.023		
	Total	.777	11			

a. Predictors: (Constant), Practice
b. Dependent Variable: Performance
c. Weighted Least Squares Regression - Weighted by Weight

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.781	.710		-1.100	.297
	Practice	.043	.009	.839	4.873	.001

a. Dependent Variable: Performance
b. Weighted Least Squares Regression - Weighted by Weight

equation above is 0.043. This means that, in this model, for every additional practice score point, the project performance is expected to increase by 0.043. The p-value of the coefficient is significantly small (shown as 0.001 in the table above), which means there is enough statistical evidence to infer a linear relationship between the practice and performance scores.

The intercept value of -0.781 has no statistical interpretation since a practice score of 0 is practically impossible.

The following scatter diagram shows the correlation between practice and performance scores, along with the predicted regression line:

The above analyses demonstrate that there seems to be a direct relationship between following generally recognized good project management practices and project performance for IT projects.

2.4. Relationship Between Practice Scores for Each Process Group and Performance Score for the Entire Sample

The following summarizes the weighted regression analysis performed to elicit the relationship between the practice scores for each process group and the performance score for the entire sample:

Regression model to be tested:
Performance Score (Per) = Intercept (I) + Initiating Coefficient (Ci) x Initiating Practice Score (In) + Planning Coefficient (Cp) x Planning Practice Score (Pl) + Executing Coefficient (Ce) x Executing Practice Score (Ex) + Monitoring and Controlling Coefficient (Cm) x Monitoring and Controlling Practice Score (Mo) + Error (Er) That is,

$$Per = I + Ci \cdot In + Cp \cdot Pl + Ce \cdot Ex + Cm \cdot Mo + Er$$

Hypothesis (H_1): There is a direct linear relationship between the practice score of at least one process group and performance score. That is, either Ci, Cp, Ce, or Cm is not equal to 0 in the above equation.

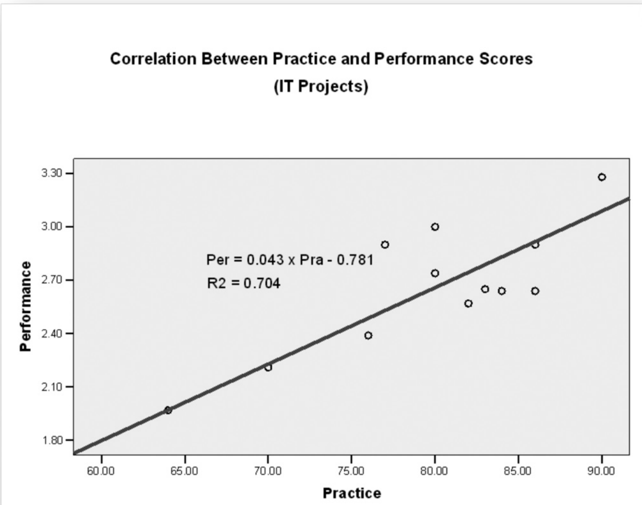

Figure 5.6

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.881[a]	.776	.753	.18875

a. Predictors: (Constant), Controlling, Initiating, Planning, Executing

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.809	4	1.202	33.743	.000[a]
	Residual	1.389	39	.036		
	Total	6.198	43			

a. Predictors: (Constant), Controlling, Initiating, Planning, Executing

b. Dependent Variable: Performance

c. Weighted Least Squares Regression - Weighted by Weight

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.102	.323		-3.409	.002
	Initiating	.007	.004	.170	1.606	.116
	Planning	.005	.005	.096	.954	.346
	Executing	.022	.006	.470	3.868	.000
	Controlling	.014	.004	.330	3.133	.003

a. Dependent Variable: Performance

b. Weighted Least Squares Regression - Weighted by Weight

Null Hypothesis (H_0): There is no direct linear relationship between the practice score of any of the process groups and performance score. That is, Ci = Cp = Ce = Cm = 0 in the above equation.

The analysis above shows that the predicted model is represented by the following equation:

Per = 0.007 . In + 0.005 . Pl + 0.022 . Ex + 0.014 . Mo – 1.102

The model summary table above shows that 77.6% of the variation in performance score is explained by the practice score of each of the process groups, while 22.4% remains unexplained. In addition, the value of the adjusted R^2 is close to that of R^2, which indicates that the sample size is relatively large. These values suggest that the model's fit is good.

The rejection region for a confidence level of 99% is $F > F_{0.01,4,39} \approx 3.83$. Since F = 33.743 is large enough compared to the critical value of F, there is a great deal of statistical evidence to infer that the model is valid.

The coefficient of the initiating process group practice score in the equation above is

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0.007. This means that, in this model, when all other process group practice scores are held constant, for every additional initiating process group practice score point, the project performance is expected to increase by 0.007. However, the p-value of the coefficient is large (0.116), which means there is not enough statistical evidence to infer a linear relationship between the initiating process group practice and performance scores. This can be attributed to certain hidden multicollinearity between the process groups. In fact, it makes perfect sense that process group practice scores are dependent on each other because projects that apply generally recognized good project management practices normally do so across all process groups.

The coefficient of the planning process group practice score in the equation above is 0.005. This means that, in this model, when all other process group practice scores are held constant, for every additional planning process group practice score point, the project performance is expected to increase by 0.005. However, the p-value of the coefficient is large (0.346), which means there is not enough statistical evidence to infer a linear relationship between the planning process group practice and performance scores. This, again, can be attributed to certain hidden multicollinearity between the process groups.

The coefficient of the executing process group practice score in the equation above is 0.022. This means that, in this model, when all other process group practice scores are held constant, for every additional executing process group practice score point, the project performance is expected to increase by 0.022. The p-value of the coefficient is significantly small (0), which means there is enough statistical evidence to infer a linear relationship between the executing process group practice and performance scores.

The coefficient of the monitoring and controlling process group practice score in the equation above is 0.014. This means that, in this model, when all other process group practice scores are held constant, for every additional monitoring and controlling process group practice score point, the project performance is expected to increase by 0.014. The p-value of the coefficient is significantly small (0.003), which means there is enough statistical evidence to infer a linear relationship between the monitoring and controlling process group practice and performance scores.

The intercept value of -1.102 has no statistical interpretation since a practice score of 0 is practically impossible.

The above analyses demonstrate that there seems to be a direct relationship between following generally recognized good project management practices at the executing and monitoring and controlling process groups and project performance for IT projects. Statistically, it wasn't possible to prove a direct relationship between the initiating and planning process group practice scores and performance scores. The reason can be attributed to existing multicollinearity between the process groups.

V. CONCLUSION AND LIMITATIONS

Realizing the importance of project performance, this research aimed at demonstrating the importance of applying generally recognized good project management practices and how the application of these practices improves project performance. To achieve the research objectives, first the literature was reviewed to identify and understand generally recognized good project management practices. A survey was then developed based on the literature review and distributed to members of the Project Management Institute – Arabian Gulf Chapter (PMI-AGC). The survey evaluated the level at which projects followed generally recognized good project management practices and the performance of these projects. Analyses were then performed to elicit a relationship between applying these practices and the performance of projects. There was significant statistical evidence to elicit a direct linear relationship between applying these practices and project performance in general. In addition, a relationship between applying good practices in each of the initiating, planning, executing, and monitoring and controlling process groups and project performance was also tested. While there was significant statistical evidence to elicit a relationship between good executing and monitoring and controlling process group practices and project performance, it was not possible to infer statistically a relationship between good initiating and planning process group practices and project performance. This, however, does not mean that a relation does not exist. The inability to infer a relationship is most likely attributed to the existence of multicollinearity between good project management practices across all process groups.

Although the results and analyses proved successful, there were certain limitations faced. First, the sample size is relatively small, especially when considering the number of people who received the survey (approximately 3,000). With a larger sample size, it is expected to see improvements to the built regression models and better insight to the mentioned relationship. Second, a simple scoring system was applied to quantify project management practice. The quantification process can be improved by applying weights to questions, depending on the importance of the practice or process the question describes for the project. However, this research avoided applying such weights to eliminate subjectivity since it wasn't possible from the literature review to quantify the differences in importance of the various project management aspects described in the questionnaire. Finally, it was not possible to evaluate the relationship between good project management practice and project performance for all individual project types due to lack of enough responses. The individual project type analyses included only two project types, construction or other engineering projects and IT projects, because there were relatively high numbers of responses for these project types.

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