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Project Manager 'Management Competency' vs. 'Technical Competency'. Which Is More Important to Overall Project Management Success?

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RESEARCH ARTICLE OPEN ACCESS

Project Manager 'Management Competency' vs. 'Technical Competency'. Which is more important to overall project management success?

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ABSTRACT
Project managers apply multiple skills and competencies in the course of successfully delivering projects. Management and technical competencies represent two major competency categories associated with project management. In this study, the relationship between management and technical competency was investigated and a weak, yet positive correlation was observed as an outcome of this quantitative study.
Keywords – Project Success, Project Managers, Project Management Competencies

I. INTRODUCTION

Project managers play a critical role in an aerospace corporation's success in today's highly technical and fiercely competitive business environment, and their selection, assignment, and ongoing development is often the key to a project's ultimate success. Too often project managers are selected primarily based on their technical competence, but are lacking in management competency. In support of this claim, research conducted by Nellore and Blachandra [1] concluded that it is common for project managers to be promoted to the position based on technical ability, despite their lack of important management skills. Pressman [2] claims that the number one cause of project failure is poor project management.

Within the aerospace industry, project managers are generally selected based on their technical expertise, which relates primarily to competency in the engineering or science disciplines. The problem is that while selection of project managers based on technical competence may lead to brilliant solutions to the customer's stated or written technical needs, a lack of management ability can lead to failed projects that over-run on cost, are late to critical path schedules, fail to fully utilize the diversity of talent available within the project team, neglect to address a customer's unspoken needs, or otherwise do not meet the expectations of key stakeholders [3].

II. PROJECT MANAGER COMPETENCIES

The maturity of the project management methodology has changed the skill requirements of effective project managers [4, 5, 6]. In the early days of project management, emphasis was placed on technical skills – traditional project management. Over time however, project teams involved more and more non-engineering personnel, and behavior skills became equally important as technical skills [7]. Projects, and the organizations which execute them, are becoming so large and complex that it was simply no longer possible for a project manager to remain a technical expert in all aspects of a project [8]. Project managers were spending more of their time scheduling, performing cost control, and monitoring progress rather than providing technical direction [9].

1.1 Technical Competency

According to Murch [10], project managers should possess sufficient technical knowledge and skill to perform their jobs. This is particularly vital in the aerospace industry where projects are highly technical and complex, and an understanding of engineering principles and scientific application are essential. In this environment, the project manager should have at least a working level understanding of the technical challenges the project team is facing. Technical skills enhance the ability of the project manager to lead and manage, through an understanding of the complex issues that develop during a project life cycle [11]. However, according to research conducted by Monson [12], "… technical expertise does not correlate directly to successful project management. This is commonly reflected in the organizational structure, as the most technically competent personnel are frequently used as consultants rather than as project managers" (p. 3).

1.2 Management Competency

The Project Management Institute (PMI) views management competency as tightly integrated

within the five process groups – a set of relationships "is such that if one factor changes, at least one other factor is likely to be affected" (p. 6) [13]. The PMI view is in contrast to the classical management functions that are commonly aligned to a command and control mentality, focusing on managerial control [14]. As illustrated in Fig 1, this is a paradigm-shift change from the prevailing status quo. In the classical paradigm, functional management serves as a performance driver through the techniques of managerial control, applied through the five management functions of: planning, organizing, staffing, leading, and controlling [15, 16]. In the PMI paradigm, command and control is replaced by: leading, communicating, negotiating, problem-solving, and influencing the organization [17], all of which connote a more interactive and proactive relationship between the skill sets and the process groups that are integral to the project: initiating, planning, executing, controlling, and closing.

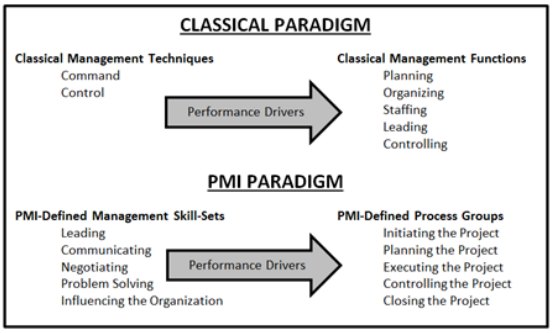

Figure 1: Comparison of Classical Management Functions to PMI Model

III. PURPOSE OF THIS STUDY

The purpose of this quantitative correlational study was to identify the relationship of management competency versus technical competency to project management success at a Fortune 100 aerospace corporation based in the United States. The study seeks to determine the perceived degree of importance ascribed to management versus technical competency as it influences project management success for a major aerospace corporation providing products and. As shown in Fig 2, the study considered the perceived effect of the independent variables of technical competence versus the perceived effect of management competence on the dependent variable of project management success.

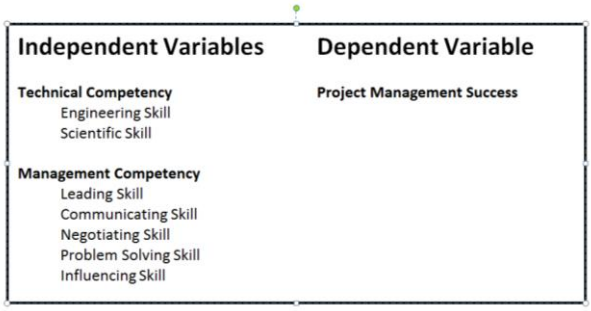

Figure 2: Variables List

In the context of this study, technical competency is defined as proficiency in the engineering skill (the effective application of scientific and mathematical principles to practical ends such as design, manufacture, and operation of efficient and economical structures, machines, processes, and systems) or scientific skill (the effective application of physics, aerodynamics, thermodynamics, chemistry, astronomy, and so forth, toward investigation and analysis of the properties of matter and energy). Management competency is defined as proficiency in the key management skills promulgated by the Project Management Institute's Guide to the Project Management Body of Knowledge (PMBOK), which include: leading, communicating, negotiating, problem solving, and influencing the organization [18]. In the framework of this study, project management success is defined "as having achieved the project objectives: within time, within cost, at the desired performance/technology level, while utilizing the assigned resources effectively and efficiently, accepted by the customer" (p. 3) [19].

IV. METHODOLOGY

The purpose of this quantitative correlational study was to identify the relationship of management competency versus technical competency to project management success at a Fortune 100 aerospace corporation in the United States. The researcher utilized a non-experimental quantitative survey evaluation design. The results obtained enabled the researcher to generalize the findings so that inferences may be made to the general population of project managers involved in the survey, and also the aerospace industry in general.

The survey data was collected from a sample of managers currently employed with one strategic business unit of a Fortune 100 aerospace corporation, and was administered through the use of e-mail and an online questionnaire. Based on the quantitative methods research, and analysis of data regarding the independent and the dependent

variables, a degree of correlational relationship was investigated.

The researcher used the survey questionnaire which was developed in collaboration with academic mentors, industry subject matter experts, and members of a focus group. The SurveyMonkey web-based platform was used to create the survey, control the logic of the responses, provide guidance to respondents, and automate collection of responses, and reporting of results.

V. RESEARCH HYPOTHESES

In order to accomplish the stated purpose of this research study, the following research hypotheses were investigated:

H1*0*: There is no relationship between project managers' management competency and technical competency in achieving *overall project management success* in the aerospace industry.

H1*A*: There is a significant perceived relationship between project managers' management competency versus technical competency in achieving *overall project management success* in the aerospace industry.

VI. SURVEY INSTRUMENT DESIGN

Due to the uniqueness of this research study, no preexisting instruments were found during the literature review that could be tailored to this peculiar application. Accordingly, the survey instrument was created with the end in mind – to draw out information needed to complete the data analysis. In order to gain an appreciation for the demographics of survey participants, the researcher solicited information regarding gender, role in project management, years of professional experience, years of project management experience, dollar value of the largest program ever managed, and beliefs about project management competencies.

VII. VALIDATION AND RELIABILITY

Quality and robustness of the research was dependent on the survey instrument, and driven by the insight and experience of the researcher and his advisors. The survey questions were developed for each of the independent and dependent variables, with the recognition that there was potential to introduce measurement error if questions were not appropriately presented to or framed for the respondents [20].

VIII. SURVEY POPULATION

The population of interest for this research study included persons with project management experience exposure at a Fortune 100 aerospace corporation located in the United States. For the primary survey, the researcher selected 95% as the degree of confidence and maximum error allowed (confidence interval) for the survey sample, which is commonly used for this type of research [21, 22]. In order to calculate the sample size needed, the researcher used The Survey System (http://www.surveysystem.com/sscalc.htm), which provided a web-based sample size calculator. To determine the sample size needed for a 95% confidence level, the researcher specified a confidence interval of 3.64, and a population of 177. These specifications resulted in a needed sample size of 142.

IX. DATA CLEANING

Prior to analysis, the survey data was examined to discover any obvious errors in input or other discrepancies or inconsistencies within the data sets. There were a total of 177 persons included in the survey population. Of those, there were 153 responses to the survey, four of which were discarded during the data cleaning process (149 valid responses). Seven persons declined to participate, and 17 did not respond. The overall participation rate was 86.5 percent.

X. DATA ANALYSIS

The researcher used Microsoft Excel (spreadsheet) as a tool for downloading the survey data from Surveymonkey.com, organizing the data, and performing data cleaning. The data was examined to determine the degree to which overall management competencies versus technical competencies correlate to project management success. If the data were found to be significant, and fail to reject the null hypotheses, the alternative hypotheses may be accepted.

Table 1 is the descriptive statistics from 149 survey participants regarding gender.

What is your gender?

	Female	Male	Total
Responses	25	124	149
Percent	17%	83%	100%

Table 1: Gender details. NOTE: This gender sample is representative of the organization's population.

Table 2 is the descriptive statistics from 149 survey participants regarding current role in project management, years of professional experience, years of project management experience, and the dollar value of the largest program respondents have ever personally managed (in Millions)?

What is your current role in project management?
Subordinate manager (SM)
Leadership Development Program (LDP)
Manager of project managers (M of PM)
Functional manager (FM)
Project manager (PM)

	SM	LDP	M of PM	FM	PM	Total
Responses	10	19	26	32	62	140
Percent	7%	13%	17%	21%	42%	100%
Mean Professional Experience in years	24 years	2 years	27 years	24 years	26 years	N/a
Mean Project Mgt Experience in years	9 years	1 year	15 years	11 years	13 years	N/a
Avg value of largest project in US Million Dollars	$29M	$4M	$184M	$116M	$72M	N/a

Table 2: Descriptive breakdown of respondents

Of the 149 survey participants, all 149 (100 percent) agreed that project management is vital to corporate success. A total of 144 (97 percent) participants stated a belief that continuing education is important to project manager success. A total of 141 (95 percent) participants felt that management competency has a positive effect on technical competence. In contrast, only 127 (85 percent) felt that technical competency has a positive effect on management competence.

Recognizing that the data set associated with the survey is small, and many responses are ranked equally due the five-point Likert scale used in the survey instrument, the researcher concluded that Kendall's Tau is an appropriate statistical test of the hypotheses [23, 24].

XII. HYPOTHESES TESTING

The set of descriptive statistics and correlation test results represent the survey data regarding the perceived importance of project management competency to overall project management success.

1.1 Hypothesis – Overall Project Management Success

H1*0*: There is no relationship between project managers' management competency and technical competency in achieving *overall project management success* in the aerospace industry.

H1*A*: There is a significant perceived relationship between project managers' management competency versus technical competency in achieving *overall project management success* in the aerospace industry.

Table 3 is the descriptive statistics from 149 survey participants regarding the perceived importance of management competency to overall project management success.

1 = Very unimportant 2 = Unimportant 3 = Neutral 4 = Important 5 = Very important

	1	2	3	4	5	Total
Responses	0	0	0	24	125	149
Percent	0	0	0	16%	84%	100%
	Mean = 4.84	Std Dev = 0.369	Variance = 0.136	Skewness = -1.863	Std Error = 0.199	Kurtosis = 1.490

Table 3: Perceptions of management competency importance results.

Table 3 is the descriptive statistics from 149 survey participants regarding the perceived importance of technical competency to overall project management success.

1 = Very unimportant 2 = Unimportant 3 = Neutral 4 = Important 5 = Very important

	1	2	3	4	5	Total
Responses	0	1	20	97	31	149
Percent	0	.01%	13%	65%	21%	100%
	Mean = 4.06	Std Dev = 0.607	Variance = 0.368	Skewness = -0.212	Std Error = 0.199	Kurtosis = 0.445

Table 3: Perceptions of technical competency importance results.

Table 4 represents mean score 'Management Competency' and 'Technical Competency' to overall project management success.

Subordinate manager (SM)
Leadership Development Program (LDP)
Manager of project managers (M of PM)
Functional manager (FM)

	SM	LDP	M of PM	FM	PM
Management Competency	4.60	4.84	4.85	4.88	4.85
Technical Competency	3.80	3.95	4.15	4.19	4.15

Table 4: Descriptive statics of managerial and technical competency.

1.2 Test of Hypothesis

A test of the hypothesis using Kendall's Tau revealed a weak positive correlation of 0.158 between management competency and overall project management success. Although the correlation test itself is significant at 0.05 using a two-tailed test, the small value of Kendall's tau suggests a very weak association. Although the association is weak, it is greater than zero, so the null hypothesis is rejected. Comparatively, there was no positive correlation between technical competency and project management success. In the case of technical competency, the Tau value was negative, very small, and not significant at the 95% level.

Skill	Process	Correlation	Significant (2 Tailed)	N
Management	Overall Project	0.158	0.043	149
Technical	Overall Project	-0.018	0.810	149

XIII. DISCUSSION AND CONCLUSIONS

The presence of a positive but weak correlation suggests to researchers that the perception exists that the overall management of a successful project does include some level of technical capability. If faced with a choice of management expertise versus

technical capability in the choice of project manager, the data suggests, albeit weakly, that both domains of competence are related.

XIV. RECOMMENDATIONS FOR FUTURE RESEARCH

The population for this research was taken from the aerospace industry. It is recommended that this study be carried out in other industries to determine if the relationship observed in this research holds within other industries.

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