

WHICH EXPERIENCE FACTORS PREDICT OVERALL EXPERTISE AND PERCENT SUCCESS?

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Abstract: This study aims to contribute to the improvement of the project management skill levels. It focuses on exploring the key factors of project manager experience that correlate with Overall Expertise and project Percent Success. This study differs from current literature because it uses project managers self-reported experience metrics as data for both stepwise linear and ordinal logistic regression analysis. The resulting correlation framework which significantly predicts both Overall Expertise and Percent Success can be useful to project managers and their supervisors as a quick assessment of project manager competency and maturity.

Keywords: career, competency, development, experience, expertise, manage, project, success

1. INTRODUCTION

Our focus in this study is an exploration of key project manager experience factors that influence project manager Overall Expertise and Percent Success. We also address the lack of such quantitative studies which identify the key experience factors that influence Overall Expertise using self-report assessment. In this study, we present an integrated model for identifying the key experience factors that influence Overall Expertise and Percent Success in a sample of project managers. Experience is considered to be a critical factor in project Percent Success, yet 17% of all project managers have less than two years of experience (Bond, 2015; Brandon, 2019). The focus of this phase of the study is the extraction and validation of the experience factors to develop a framework for the measurement of Overall Expertise and its relationship with Percent Success.

1.1 Problem Statement

The problem is very few studies exist clearly identifying the experience factors contributing to Overall Expertise and Percent Success by using self-report assessment by project managers. By not identifying and compensating for these factors, companies are unable to ensure project managers, especially those with few years of experience, are capable of delivering Percent Successful project outcomes. Furthermore, companies risk the cost of project failure, loss of strategic competitive advantage due to project delays, and damage to corporate images due to adoption failures of project products. There is a distinct lack of literature that uses actual project manager self-assessment of their Overall Expertise and career Percent Success.

1.2 Purpose

With the use of this quantitative study, we intend to identify the degree or magnitude that the experience factors influence Overall Expertise and Percent Success in a large sample of project managers. A survey was developed to collect the data using six ratio measures of experience, one ordinal measure of Overall Expertise on a 7-point Likert-type scale, and one ratio measure of project Percent Success. The experience ratio measures are the computed average number of projects per month (New_Ppm), the computed

average number of months per project (New_Mpp), the number of months managing projects (Num_Mon), the number of projects managed (Num_Pro), the highest degree of education achieved (Edu_Deg), the age when transitioned to the project manager role (Age_Tra), and the percent of projects considered successful (Per_Suc). The statistical data analysis used stepwise regression (SWR) and ordinal logistic regression (OLR) to measure the correlation and relative contribution to predict Overall Expertise and Percent Success.

The use of a survey in this study allowed for the discovery of relationships of variables or factors. Stated differently, the questions in the survey relate to variables that define the factors leading to or identified as contributing to Overall Expertise and Percent Success. In keeping with common practice, the analysis of the applied survey is used to describe a snapshot of Overall Expertise and Percent Success for a sample population. The population surveyed is a broad spectrum of English-speaking project managers as a comparative sample frame of project managers worldwide. A random selection of the population is judged to be a statistically valid sample in identifying the key factors. The personal and professional reason for this study centers on achieving a greater understanding of Overall Expertise and Percent Success as a potential model for identifying the lack of education for inexperienced project managers and insights into how experienced project managers increased their expertise.

1.3 Nature of the Study

In this quantitative study, we sought to identify the key experience factors that influence Overall Expertise and Percent Success using self-report assessment by project managers. The lack of academic research into this topic provided an opportunity where this study could contribute to the body of knowledge in the project management area.

A survey was deemed the most appropriate method for data collection as it allowed project managers to respond truthfully and anonymously while identifying what key observed variables significantly influence Overall Expertise and Percent Success. The survey consisted of six responses to questions or variables related to each of the aforementioned factors in order to gather significant data for analysis.

1.4 Research Questions and Hypotheses

The first research question focused on the relationship of the six experience measures and Overall Expertise.

- **RQ1.** What is the relationship of the six experience factors and Overall Expertise?
 - H10. There is no statistically significant relationship between the six experience factors and Overall Expertise.
 - H11. There is at least one statistically significant relationship between the six experience factors and Overall Expertise

The second research question focused on the relationship of the six experience measures and Percent Success.

- **RQ2.** What is the relationship of the six experience factors and Percent Success?
 - H20. There is no statistically significant relationship between the six experience factors and Percent Success.
 - H21. There is at least one statistically significant relationship between the six experience factors and Percent Success.

1.5 Significance of the Study

In this phase of the study, we seek to identify the relationships of the key experience factors that influence Overall Expertise and Percent Success using quantitative analyses of self-report assessments by project managers. This research methodology was chosen to identify the relationships of the key factors that influence Overall Expertise and Percent Success. The lack of academic research into this topic provides an opportunity where this study could contribute to the body of knowledge in the project management area. The results of the study provide a comprehensive measurement scale for the assessment of project manager experience and knowledge levels as a rationale and approach for addressing areas of weakness. This assessment scale can be used for self-assessment and management assessment of direct reports with the intent of fashioning development plans to improve the talent of project managers and teams. This especially important as staff levels are reduced for various reasons and the load of project management is being placed on the shoulders of inexperienced or newly named project managers.

2. LITERATURE REVIEW

The literature included in this review were found using the following search strings and libraries:

- Measuring Project Manager Expertise – NCU Alumni Library Search
- Measuring Project Manager Competency – NCU Alumni Library Search
- Measuring Project Manager Competency – Google Scholar
- Measuring Project Manager Skill – NCU Alumni Library Search

2.1 Project Manager Competencies

Ahmed (2017) performed a comparative analysis of eight studies that examined project manager intellectual capacities as common project success factors and identified leadership, strategic perspective, strong vision, and imagination as having significant influence on project success. Blomquist, Farashah, and Thomas (2016) developed a domain-specific scale to measure project manager self-efficacy (PMSE) using five factors and 22 indicators. The five factors were (a) manage project team, (b) manage stakeholder relationships, (c) development of the plan, (d) manage project execution, and (e) evaluation of project performance. They found that the five factors strongly predicted PMSE (loading from 0.77 to 0.84) and that PMSE weakly predicted project management performance (PMP) ($r = 0.32$, $r^2 = 0.10$). Bond (2015) found (a) a significant relationship between transformational and transactional leadership styles and project success, (b) a positive but not statistically significant relationship between years of experience, and (c) a significant relationship between critical success factors and project success. Crawford (2000) found that while schedule and budget alone are inadequate measures of project success, quality and stakeholder satisfaction with the project outcome are critical to perceived project success. They found the five factors that contribute to project success based on Cronbach's alpha measure of reliability are (a) integrative planning (0.83), (b) integrative monitoring and controlling (0.90), (c) risk monitoring and controlling (0.90), (d) team development (0.90), and (e) lessons learned (0.94). de Araújo, Pedron, and de Oliveira (2018) developed a scale

with five factors and 37 items and found project manager competencies account for 45% of team commitment. The five factors were (a) team management, (b) business domain knowledge, (c) people skills and communication, (d) project management, and (e) professionalism and personal characteristics.

Richardson, Earnhardt, and Marion (2015) found project management remains a destination by accident and that most professional project managers do not intend to be project managers but "fall into" the profession, indicating the need for project management training and mentorship, and implying the need for an effective assessment tool to indicate the areas needing improvement. Bond (2015) reported that 2.1% of the project managers had less than one year of project management experience. Brandon (2019) reported 15.0% of the project managers had one to two years of project management experience.

Brandon (2019) found a significant relationship between the overall, creating, capturing, and reusing project knowledge management (PKM) processed and project success whereas no significant relationship existed between the transferring PKM process and project success. Garvin (1993) identified the five main activities exhibited by skilled learning organizations as (a) systematic problem solving, (b) experimentation, (c) learning from past experience, (d) learning from others, and (e) transferring knowledge. Measurement of learning was by learning curves and the three stages of organizational learning are (a) cognitive, b) behavioral, and (c) performance improvement. Harpham (2020) suggested a talent management tripod comprise of (a) assessing the skills required for delivering the specific project outcomes and matching the skills of the project team to the project tasks, (b) understand the talents and skills of each team member individually, (c) introduce the growth mindset described by Dweck (2008) to team members to encourage them to expand their capacities beyond their current skill levels by working on new skills during the project. Making the development of new skills and talents a formal outcome of the project is a great way to build bench strength by learning from experience. Burga, LeBlanc, and Reznia (2020) found that students studying project management believe they are ready to succeed at work but need more formal training project management skills. Burga,

LeBlanc, and Reznia (2020) observed having the necessary skills and realistic expectations of career adaptability, self-directed career management, and belief in their self-efficacy were career success factors. Floris, Wiblen, and Anichenko (2020) studied 37 leadership skills and 11 career-stalling behaviors that can derail the careers of senior project leaders and found that feedback from the managers who directly impacted the individual was more reliable than that from peers or direct reports and that project leaders have a more modest assessment of their skill levels than their managers assessments.

Burga, LeBlanc, and Reznia (2020) found students studying project management saw project management as a temporary preparation step on their career path to their preferred role in leadership positions in an organization. Geoghegan and Dulewicz (2008) found eight leadership dimensions were significantly related to usability and project delivery success factors were (a) managing resources, (b) empowering, (c) developing, (d) motivation, (e) critical analysis, (f) influencing, (g) self-awareness, and (h) sensitivity. The two project success factors were (a) usability and (b) project delivery. Marzagão and Carvalho (2016) found that only two of 11 identified leadership behavior competencies that positively correlated with project performance were innovation and direction. Müller and Turner (2010) found (a) a need for training for practitioners in soft factors of leadership, (b) the transactional leadership style is appropriate for simple projects, and (c) the transformational leadership style is appropriate for complex projects.

Enterprisers Project (2020) found that the eight core soft skills most needed in an IT organization are (a) communication, (b) collaboration, (c) consulting, (d) coaching, (e) influence, (f) empathy, (g) networking, and (h) problem-solving. Gillard (2009) found technical and management skills are considered minimal requirements whereas excellent interpersonal soft skills and leadership skills are necessary requisites for project manager success. Hamilton (2019) identified the most valuable soft skills that Toronto women in IT share were (a) curiosity, (b) discipline, (c) teamwork and collaboration, (d) self-awareness and humility, (e) influence, (f) communication, (g) adaptability, (h) analytical thinking, (i) empathy, and (j) emotional intelligence.

Ibbs and Kwak (2000) studied project manager maturity using a quantitative survey of 38 international organizations consisting of 148 questions based on eight knowledge areas, six processes, schedule and cost indices, percentage of project management spending, and order of magnitude return on investment estimates using a five-point Likert scale and found the overall maturity averaged 3.26 on a 1 to 5 scale with considerable variability within the industry and across industries. Khattak, Ur Rehman, Mustafa, and Khattak (2016) found project complexity showed a significant negative correlation with project success ($r = -0.48$) at the 0.01 level, while competency showed a significant positive relationship with project success ($r = 0.79$) at the 0.01 level. McHenry (2008) identified the 12 key competencies needed by project managers to be highly successful in rank order of importance are (a) communication, (b) decision making, (c) organizational, (d) teambuilding, (e) computer, (f) problem-solving, (g) conflict resolution, (h) management support building, (i) motivation, (j) organizational politics, (k) delegation, and (l) negotiation. Miranda and Ghimire (2007) reported the top four competencies required by employers were (a) communication, (b) project integration management, (c) scope management and (d) balance between hard and soft competencies.

2.2 Theoretical/Conceptual Framework

Project Management Institute (2017) published A guide to the project management book of knowledge (PMBOK guide), which outlines 13 knowledge areas, and 49 processes in five process groups. This theoretical framework has been used as a basis for several project manager competency studies (Bond, 2015; Crawford, 2000; Ibbs & Kwak, 2000; McHenry, 2008; Miranda & Ghimire, 2007). In addition, a subset of the key soft human management skills listed by Enterprisers Project (2020), Gillard (2009), Müller and Turner (2010) are included in the survey structure. Dorst and Reymen (2004) studied the levels of expertise in design education based on a seven-level general skill acquisition model distinguished by Dreyfus (2003a and 2003b). The seven levels (1) Novice, (2) Advanced Beginner, (3) Competent, (4) Proficient, (5) Expert, (6) Master, and (7) Visionary were used as the basis for the 7-point Likert-type measurement scale of Overall Expertise.

3.0 RESEARCH METHOD

The research study was designed as two related studies. The first was a quantitative study and the second was a qualitative study to explore the results of the first study. An online anonymous survey of subjective perceived levels of expertise, collecting categorical, ratio, and quantitative ordinal data was administered to potential participants. Respondents to the online survey were invited to voluntarily submit their name and email address if they wished to participate in follow-up qualitative interviews. Additional respondents were invited by posting to the LinkedIn group PMLink. The personally identifiable information (PII) of all interview respondents was kept in a separate file accessible only by the co-investigators who have signed confidentiality and nondisclosure statements Respondent PII was used only for contacting the volunteer respondents to arrange the interviews and was de-identified after the interview data was collected. The quantitative and qualitative data from a respondent were not directly linked. Only the measures of experience and Likert-style expertise self-assessment information were used to link exploratory qualitative data to quantitative survey response data. The online survey respondents were supplied by the independent survey management services, SurveyMonkey Audience and Qualtrics XM Online Panels. The findings of the study are based on results from aggregated data.

3.1 Population and Sample

The population is the set of experienced project managers, regardless of gender, in the United Kingdom, United States, Canada, India, or Australia. Singh (2016) estimated the size of the population of project managers in the target countries was 1,073,000 compared with the worldwide population of 2,170,000. There were approximately 500,000 certified project management professionals registered with the Project Management Institute and approximately 369,000 members in LinkedIn project manager community groups (LinkedIn, 2018).

The sample of 500 participants was determined using the guidelines of 10 to 15 participants per exploratory factor offered by Field (2000) in *Discovering Statistics Using IBM SPSS Statistics*. The sample size of 500 for 36 subfactor

components would result in 13.9 participants per variable. The sample size of 500 was tested for suitability for multiple linear regression of up to 36 variables. The GPower 3.1 statistical power analysis software for a post-hoc analysis of F test - Linear multiple regression: Fixed model, R2 deviation from zero with effect set at 0.15 (medium), statistical significance level (α) at 0.05, number of predictors of 36, and sample size 500 resulted in a statistical power of 1.000 virtually guaranteeing detection.

3.2 Data Collection and Analysis

The web-based survey using SurveyMonkey Audience and Qualtrics XM Online Panels offered a wide reach to members of the population represented by the large sample frame described earlier, a typically higher response rate than emailed or mailed surveys, less expensive approach, and a relatively short duration compared to other methods (Vaux & Briggs, 2006). The survey was field tested by sending it to a purposeful convenience sample of four university professors and 11 professional project managers requesting constructive feedback on ease of use and suggestions for improvement to assure content validity. Quantitative data was collected using the online survey instrument described earlier. Approval for the solicitation of participants was arranged by SurveyMonkey and Qualtrics. The Northcentral University IRB reviewed and approved the online survey before it was released to SurveyMonkey and Qualtrics to contact individuals to partake in the survey.

The initial participants were recruited using the SurveyMonkey Audience tool which allows collectors by country to be defined by the targeted selection of employment job function or role, SurveyMonkey provides a pool of pre-qualified potential responders with guaranteed delivery of completed surveys for the quota specified for each collector. For this study five country-based collectors are defined with the selection criteria of employment job function or role being Project Management. SurveyMonkey was not able to supply sufficient respondents for the United States, Canada, and Australia so Qualtrics XM was enlisted to manage collection of the remaining respondents to the anonymous online survey through their Online Panels feature. Because of the need to use Qualtrics as a second source of targeted survey respondents, the lower cost per

respondent with Qualtrics provided the opportunity to substantially increase the number of respondents from the original target of 500 to a final sample size of 679 qualified and validated respondents with no missing data in any of the variables.

The data was exported from SurveyMonkey and Qualtrics XM to Excel where it was validated for completeness and reasonability of responses, aligned to a common format, merged into one file, and imported into SPSS for quantitative statistical analysis participants. The measured experience factors were input to a set of multiple regression analyses to determine the strength of the relationship of each of the independent variable factors using measured Overall Expertise and Percent Success rate as the dependent variables.

3.3 Analysis

The descriptive statistics for the six experience factors and the two independent variables Overall Expertise and Percent Project Success were run and examined. The descriptive statistics included the frequency distribution, measures of central tendency, variability, and ranking.

To address RQ1, the data analyses of the measured ratio experience factors were applied against the measured Overall Expertise value within the context of a predictive model with the goal of determining if the independent variables were significant predictors of Overall Expertise. The data were analyzed for reliability and for statistical test assumption compliance for stepwise linear regression (Laerd, 2015a) and ordinal logistic regression (Laerd, 2015b).

To address RQ2, the data analyses of the measured experience factors were applied against the measured Percent Success (q07_PerSuc) value as the dependent variable within the context of a predictive model with the goal of identifying only the significant predictors of Percent Success ($p \leq .05$). The data were analyzed for reliability and for statistical test assumption compliance for stepwise linear regression (Laerd, 2015a).

3.4 Validity of Self-Report Assessments

Self-report assessments are widely used in psychological tests and are valuable tools in assessing abilities (Leong &

Austin, 2006). Even though self-assessment is used by large numbers of researchers, the validity and accuracy are considered by some to be questionable due to potentially inflated perception and self-interest which introduce construct-irrelevant variance (Ross, 2006). However, multiple research studies of psychometric properties indicate self-assessment is a reliable technique with consistent results across items and contexts (Ross, 2006). To address any concerns of the validity of self-reported assessments from professional project managers, the data was analyzed for reliability and for internal validity using both stepwise linear regression (Laerd, 2015a) and ordinal logistic regression (Laerd, 2015b). The relative Pratt index (RPI) (Ochieng & Zumbo, 2001) was used to determine the degree of contribution of each independent variable to the dependent variable.

3.5 Validity of Likert-Type Ordinal Data

When it comes to validity of using Likert-type ordinal data as interval data, there are two theoretical camps, (a) the strict interpreters like Stevens (1946), Bürkner and Vuorre (2019) and Owuor (2001) and (b) the practical interpreters like Abelson and Tukey (1963), Velleman and Wilkinson (1993), and Pasta (2009). Owuor (2001) studied the implications of using Likert-type data in multiple regression analysis and found the practice resulted in substantial loss of information and biased regression coefficients and recommended ordinal regression, and logistic regression models when using Likert-type data. Pasta (2009) argued that it was nearly always useful to treat ordinal variables as continuous and examine the linear component of ordinal variables for possible useful relationships under the assumption that an underlying continuous latent variable exists behind any ordered construct. To accommodate both viewpoints, this study used both stepwise linear regression and ordinal logistic regression to identify the significant key factors related to project manager level of expertise and success rate

3.6 Validity of the Data Collected for the Study

The threats to internal validity of history, maturation, testing, mortality, regression to the mean, and selection were controlled because the survey data were collected over a relatively short period of a few weeks and the study sample was randomly selected from the pool of respondents. The threat of instrumentation was controlled by field testing the survey for accuracy before being actually released for automated delivery and data collection by a respected independent third party. The threats to external validity were addressed by targeting the broad population of experienced project managers who were members of professional associations in the United Kingdom, United States, Canada, India, and Australia and randomly selecting a sample from the pool of respondents of a size large enough to detect with high power (1.00) a medium effect (0.15) with a statistically significant alpha level (0.05). Sample bias was addressed by randomly selecting a large sample of 679 participants from the population, however there was still a possibility of sample bias due to the voluntary nature of the sample, the use of self-report assessment, and the limitation of the sample to individuals who were English-speaking project managers.

4.0 RESULTS

4.1 Selection and Filtering of Outliers

Prior to running the SWR and OLR regressions for Overall Expertise, the observation data were tested for outliers which would have caused the residuals (errors) of the regression line to not be normally distributed. There were 54 cases out of 679 observations with residual outliers greater than 1.500 which were excluded from the predictive models for Overall Expertise resulting in 625 observations. A variable (New_Out_Lie) was added to identify the outliers and was used by the Select Cases function to exclude the outliers.. Prior to running SWR regression for Percent Success, the observation data were tested for outliers which would have caused the residuals (errors) of the regression line to not be normally distributed. There were 53 cases out of 679 observations with residual outliers greater than 1.500 which were excluded from the predictive model for Percent Success resulting in 626 observations. A variable (Suc_Out_Lie) was added to identify the outliers and was

used by the Select Cases function to exclude the outliers.

4.2 Descriptive Statistics

The descriptive statistics for the six experience actors and the Overall Expertise factor included the mean, standard deviation, variance skewness, and kurtosis as shown in **Table 1**. The mean, standard deviation, and variance of the six factors are inconsistent indicating differing scales of measurement. The negative skewness and negative kurtosis of some of the factors indicate the distribution is less extreme than a normal distribution and more data is concentrated to the right with the tail extended towards the left.

4.3 Regression Analyses

4.3.1 RQ1 – Stepwise Linear Regression of Experience Factors versus Overall Expertise Factor

A stepwise regression was run to predict Overall Expertise from six factors based on self-reported experience factors. After four steps, four factors were identified as significant contributors to Overall Expertise. There was linearity as assessed by partial regression plots and a plot of studentized residuals against the predicted values. There was independence of residuals, as assessed by a Durbin-Watson statistic of 1.836. There was homoscedasticity, as assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values, by insignificant results in Kolmogorov-Smirnov and Shapiro-Wilk tests of normality, and by Q-Q plots for unstandardized residuals, standardized residuals, and studentized residuals. There was no evidence of multicollinearity, as assessed by

tolerance values greater than 0.1. There were no studentized deleted residuals greater than ±3 standard deviations, no leverage values greater than 0.2, and values for Cook's distance above 1.0. The assumption of normality was met, as assessed by a Q-Q Plot. The stepwise regression model statistically significantly predicted Overall Expertise, $F(4, 620) = 10.874, p < .0005, \text{adj. } R^2 = .066$. Four variables added statistically significantly to the prediction, $p < .05$.

4.3.2 RQ1 – Ordinal Logistic Regression of Experience Factors versus Overall Expertise Factor

An ordinal logistic regression (OLR) was run to predict Overall Expertise using both the PLUM and the GENLIN methods from six experience factors. There was no collinearity as assessed by the Tolerance values which were all greater than 0.100 and the variance inflation factors (VIF) which were all less than 10. There were proportional odds, as assessed by a full likelihood ratio test comparing the fit of the proportional odds model to a model with varying location parameters, $\chi^2 = 0.000, p = .1000$. The probability distribution was multinomial and the link function was cumulative logit. The Omnibus Test indicated that the model outperformed the null model, $\chi^2 = 44.262, df = 6, p < .0005$. The tests of model effects identified four significant factors.

4.3.3 RQ2 - Stepwise Linear Regression of Experience Factors versus Percent Success Factor

A stepwise regression was run to predict Percent Project Success from six factors based self-reported experience factors. After two steps, two factors were identified as

Table 1 Descriptive Statistics

	N	Mean	Std. Deviation	Variance	Skewness	Kurtosis
Projects per month	625	0.83	2.150	4.620	8.306	88.514
Months per project	625	5.56	13.691	187.444	14.981	255.919
Number of months managing projects	625	84.72	175.000	30625.161	13.607	262.531
Number of projects managed to date	625	50.62	151.269	22882.354	6.864	61.939
Highest degree of education	625	4.14	1.094	1.196	-0.889	2.008
Age when first made project manager	625	32.23	8.793	77.321	1.106	1.139
Overall expertise	625	4.36	1.296	1.680	-0.438	-0.206
Valid N (listwise)	625					

significant contributors to Percent Success. There was linearity as assessed by partial regression plots and a plot of studentized residuals against the predicted values. There was independence of residuals, as assessed by a Durbin-Watson statistic of 2.034. There was homoscedasticity, as assessed by visual inspection of a plot of standardized residuals versus standardized predicted values. There was no evidence of multicollinearity, as assessed by tolerance values greater than 0.1. There were two studentized deleted residuals greater than ±3 standard deviations, no leverage values greater than 0.2, and values for Cook's distance above 1.0. The assumption of normality was met, as assessed by a Q-Q Plot. The stepwise regression model statistically significantly predicted Percent Success, $F(2, 623) = 7.955, p < .0005, \text{adj. } R^2 = .022$. Two variables added statistically significantly to the prediction, $p < .05$.

4.4 Comparison of Regression Results

The ordinal logistic regression (OLR) results were compared to the results of the stepwise linear regressions (SWR) to select the key factors that appeared in at least two of the three regression models as shown in **Table 2**.

5.0 DISCUSSION

5.1 Regression Analyses

The purpose of the regression study was to test to what degree six experience variables predicted the measured Overall Expertise variable and measured Percent Success variable.

5.1.1 RQ1 – Stepwise Linear Regression of Experience Factors versus Overall Expertise Factor

Four of the six experience factor variables predicted the Overall Expertise variable (q15_Ove) with statistical significance. The null hypothesis H10 was rejected and the alternate hypothesis H11 was accepted. This means that the Overall Expertise level of a project manager can be significantly predicted by accurately measuring only four of the six experience factors. The regression equation for the model was:

$$\text{Predicted Overall Expertise} = 4.063 + (0.002 * \text{Number of months managing projects}) + (-0.015 * \text{Months per project}) + (0.147 * \text{Highest degree of education achieved}) + (-0.012 * \text{Age when first transitioned to project manager})$$

When the regression equation was applied to the filtered 625 cases, it predicted the self-reported Overall Expertise with an accuracy rate of $\mu = 1.146, \sigma = 0.587$, 80% confidence interval of 1.119 to 1.173, and 95% confidence interval of 1.100 to 1.193.

5.1.1 RQ2 - Stepwise Linear Regression of Experience Factors versus Percent Success Factor

Two of the six experience factor variables predicted the Percent Success variable (q07_Per_Suc) with statistical significance. The null hypothesis H20 was rejected and the alternate hypothesis H21 was accepted. This means that the Percent Success level of a project manager can be significantly predicted by accurately measuring only two of the six experience factors. The regression equation for the model was:

$$\text{Predicted Percent Success} = 81.980 + (0.168 * \text{Age when first made project manager}) + (0.066 * \text{Number of months managing projects})$$

When the regression equation was applied to the filtered 626 cases, it predicted the self-reported Percent Success with an accuracy rate of $\mu = 1.077, \sigma = 0.190$, 80% confidence interval of 1.086 to 1.086, and 95% confidence interval of 1.062 to 1.092.

5.1.3 RQ1 – Ordinal Logistic Regression of Experience Factors versus Overall Expertise Factor

To address the implications of using Likert-type data in multiple regression analysis potentially resulted in substantial loss of information and biased regression coefficients, an ordinal regression was run to independently identify which of the measured six experience factors significantly correlated and predicted the measured Overall Expertise variable. Four of the six experience factor variables predicted the Overall Expertise variable (q15_Ove) with statistical significance. The null hypothesis H10 was rejected and the alternate hypothesis H11 was accepted. This means that the Overall Expertise level of a project manager can be significantly predicted by accurately measuring only four of the six experience factors.

5.2 Comparison of Regression Results

By comparing the results of the three regressions, four significant factors were identified as shown in Table 2. Two factors (Number of months managing projects and Age when first made project manager) were in the intersection of the stepwise (SWR) and ordinal (OLR) regression results. The other two factors (Highest degree of education achieved and

Months per project) were positively correlated with Overall Expertise SWR but not correlated with Percent Success SWR. Interestingly, Age when first made project manager was negatively correlated with Overall Expertise but positively correlated with Percent Success indicating the earlier in life a project manager became practice, the higher their Overall Expertise whereas those that started later in life the higher the Percent Success.

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The goal of this study was to extract key experience factor variables and to test to what degree they predicted the measured Overall Expertise and Percent Success variables was accomplished. Both stepwise linear regression and ordinal logistic regression were used to identify the significant factors and only those factors identified by both methods were identified as the top two of the four selected key experience factors. The self-assessed experience levels of a broad sample of project managers indicated four of six experience factors significantly predicted Overall Expertise, while two of six experience factors significantly predicted Percent Success.

The correlation coefficients for the six experience factors with Overall Expertise ($R^2 = 0.060$ and 0.068) and Percent Success ($R^2 = 0.025$) were very weak effect sizes according to Cohen (1988), indicating experience was not as powerful as the correlation coefficients for the 36 expertise factors with Overall Expertise ($R^2 = 0.874$ and 0.963) and Percent Success ($R^2 = 0.050$) found in our related research paper in this study which focused the relationship of expertise factors with Overall Expertise and Percent Success.

Interestingly, the regression constant where the effect of the independent variables on Percent Success was 81.980 for the experience measures. This suggests that the probability of project success is essentially random until the 83% level before experience seems to have any significant effect. The primary contribution of this paper to the body of knowledge is using project managers' self-assessments of their technical and interpersonal expertise to derive a reliable and accurate psychometric framework which can be generalized to predict the Overall Expertise level and

TABLE 2 SELECTION OF SIGNIFICANT EXPERIENCE FACTORS

Rank	Factor Label	# Models	Overall Expertise (SWR)		Percent Success (SWR)		Overall Expertise (OLR)	
			Beta	R Square	Beta	R Square	Exp(B)	R Square
	Model Correlation Coefficients			0.060		0.025		0.068
1	Number of months managing projects	3	0.274		0.088		1.003	
2	Age when first made project manager	3	-0.084		0.130		0.981	
3	Highest degree of education achieved	2	0.124				1.257	
4	Months per project	2	-0.163				0.978	

Note: Sorted by # Models, Overall Expertise SWR Beta, Percent Success SWR Beta, and Overall Expertise OLR Average Exp(B) descending

Percent Success rate of project managers. The framework can be applied to self-assessment, peer-assessment, manager-assessment, stakeholder-assessment or a combination of all four in a 360 degree review. This is especially important as, during our qualitative interviews, "accidental" project managers reported they were thrown into new responsibilities for which they have had no training and little or no management guidance.

6.2 Recommendations

Recommendations for future study are the development of an independent web-based tool for experience assessment to be used to compare subjective assessments to empirical scores for use by all members of the project organization to learn about their blind spots. The tool would provide a quick 15 minute spot-check of project management expertise without the need for hours-long certification tests. The tool could also provide a basis for reconciling the perceptions of project employees and their managers, as well as providing a baseline and longitudinal measure of career development needs and progress.

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