MANAGING THE EDGE OF CHAOS

Abstract

The purpose of this research sought to investigate the relationship between project management competencies and project complexity upon project success. A literature review indicates that project complexity is a primary source of project failure. A gap exists concerning how project management competencies and project complexity predict project success. The first research question was, “To what extent do project management competencies predict project success?” The second research question was, “To what extent does project complexity predict project success?” A quantitative method nonexperimental research design, using a correlational approach, was deployed. The theory of complexity explains that the relationship between project management competencies and project success is influenced by project complexity. The standard project management model and the expanded standard project management model were used to relate the three variables. The study population was project management professional certified project managers, who operated in the United States of America, and who completed a project within the last six months from the time of this research. Research results showed that project management competencies positively predict project success. Results were inconclusive concerning whether project complexity predicts project success. The predictive model involving project management competencies and project complexity upon project success is a good model. The predictive model offers insight into managing project complexity. Using project management competencies, project managers can establish an environment built on collaboration and knowledge-sharing. Using collaboration and knowledge-sharing, project managers can seize creativity and ingenuity, available in complex systems through interdependence, to influence project success.

Keywords: Project management competencies, Project complexity, Project success, General Systems Dynamics, Complexity Theory, Standard Model of Project Management, Expanded Standard Model of Project Management

1. Introduction

Imagine standing in front of a serene and calm pool of water. You decide to throw a stone into the water. The disruption causes ripples to emerge, which spread away from the epicenter. Eventually, the waves begin to dissipate. The water emerges into a new and stable pattern. The pool of water is a metaphor for the behavior found in a complex adaptive system. It demonstrates how tensions disrupt stability which eventually reorganizes into a new and stable pattern. Complexity scientists call the moments preceding a new pattern the *edge of chaos*. Evidence shows that project managers who can navigate the edge of chaos trigger creativity, ingenuity, and ultimately success in complex projects (Gransberg, Shane, Strong, del Puerto, 2013). But how do they do this? The answer is possibly available by investigating project management competencies. Using project management competencies, the project manager can tap the knowledge and experiences available in an interconnected team and touch the *edge of chaos*.

The field of project management has its origins in management science and organization science arenas (Davis, 2018). Traditionally, project management is the integrated application of knowledge and best practices centered on coordinating the levels of resources, time, scope, quality, costs, and risks. The project management field continues to mature both in understanding and importance (Pinto & Winch, 2016). However, projects continue to fail despite advancements in project management (Hughes, Rana, & Simintiras, 2017). A chief cause for continued project failures is possibly project complexity (Bosch-Rekveldt, Bakker, & Hertogh, 2018) which disrupts project stability (Bakhshi, Ireland, & Gorod, 2016). The impacts and the definition of project complexity remain debated within the project management community (Teece, 2018). These debates raise several concerns and form the building blocks of this research.

1.1 Statement of the problem

The research problem was a lack of information about project management competencies and project success for complex projects. The extant literature provided limited insight into how project management competencies and project complexity predict project success (Maylor & Turner, 2017). Both Daniel and Daniel (2018) and Poveda-Bautista, Diego-Mas, and Leon-Medina (2018) indicated that project complexity is one of the most critical areas for research in the project management community.

Though evidence exists demonstrating that project complexity deteriorates project success and that project management competencies improve project success, there is a gap in the existing literature concerning the effect of project complexity and project management competencies on project success (Maylor & Turner, 2017). This research aimed to investigate the extent to which project complexity and project management competencies influence project success.

2. Theoretical framework

The theoretical foundation for this research begins with the theory of general systems dynamics. Studying lifeforms at multiple levels of sophistication, von Bertalanffy (1950) posited that a system could be open or closed. Baccarini (1996), the father of project complexity, indicated that superior management was necessary to complete challenging construction projects. Using von Bertalanffy's (1950; 1969) theory of general system dynamics, Baccarini (1996) posited that interrelatedness between internal and external project properties ultimately results in unpredictable outcomes.

The overarching conceptual framework for this research is complexity theory. Maylor and Turner (2017) elegantly described project complexity through the dimensions of structural, sociopolitical, and emergent complexity. Interdependencies generate tensions to appear in the project, which eventually disrupts stability. However, complexity theory explains that the project system's instability emerges into new and stable patterns (de Blois et al., 2016; Khan et al., 2018).

2.1 Assumptions

The standard project management model served as the theoretical foundation for the study. The standard project management model explains that the standardization and use of best practices related to managing budget, scope, and schedule constraints are designed to realize improved project performance (Bosch-Rekveldt et al., 2018). Project managers deploy methodologies to realize outcomes improvement.

Globalization and technological advancements led to an increased observance of project complexity. Geraldi et al. (2011) synthesized complex adaptive systems theory, which explains that a project comprises system agents that interact internally and externally, leading to changing and fluid behavior, with the standard project management model. The standard project management model broadens to include five dimensions of complexity serving as a predictor variable in future empirical research. The five dimensions were: structural, uncertainty, dynamics, pace, and sociopolitical. Geraldi et al. (2011) proposed that project management competencies influence the five complexity dimensions. Future research should investigate the effect of project management competencies upon the complexity dimensions (p. 984).

Complexity is multidimensional (Maylor & Turner, 2017). The literature provides several multidimensional complexity frameworks (Bosch-Rekveldt et al., 2018; de Souza Pinto, et al.,

2014; Qazi et al., 2016). This research assumes that Maylor and Turner's (2017) three-dimensional model involving structural, sociopolitical, and emergent complexities represents complexity and guides investigation. Ambiguity, fluid demands, and virtualization caused the emergence of complexity and will continue escalating for the foreseeable future (Project Management Institute, 2017a).

The relationships between the three constructs were assumed linear. Most evidence showed that project management competencies positively influenced project success, and project complexity negatively affected project success (Açikgöz et al., 2016; Boies et al., 2015; Butler et al., 2019; Iqbal et al., 2019). The three constructs are latent because they are not directly observed (Byrne, 2005). Validated and reliable instruments which captured indicators of the three constructs were available (Aga, 2016; de Araújo et al., 2018a; Maylor & Turner, 2017).

3. Research model and hypotheses

This study applied the standard model of project management and the expanded standard model of project management as the relational construct to examine the relationships between project management competencies, project complexity, and project success. The standard project management model offers that project management competencies improve project success since they represent best practices (de Araújo et al., 2018; Ballesteros-Sanchez et al., 2019). The expanded standard project management model offers that project complexity weakens project success since complexity disrupts the project and leads to deteriorated project success (Açikgöz et al., 2016; Butler et al., 2019; Montequín et al., 2018). The study offered insight that refined understanding of complexity theory.

The following offers evidence from the extant literature regarding the relationship between project management competencies, and project complexity upon project success and serves as the basis for this study's research model.

3.1 Project management competencies and project success

There is evidence that project management competencies positively affect project success. De Araújo et al. (2018b) investigated project management competencies. Evidence showed that applying human-centered project management competencies strengthened the team environment leading to knowledge-sharing and collaboration. Technical process-based project management competencies used in project planning and monitoring did not influence success.

Mainga (2017) investigated project management competencies and project efficiency in project-based firms based in the United Arab Emirates. The study offered evidence that project management competencies positively affect project efficiency. The project team members are encouraged to seek improvement and think creatively through the project manager continuously. Mainga (2017) offered that project management competencies are specifically essential to cope with project complexity (p. 467). Using the extent literature, the following research and hypothesis were offered.

RQ1: To what extent do project management competencies predict project success?

$H1_0$: There is no statistically significant correlation between project management competencies and project success.

H1$_A$: There is a statistically significant correlation between project management competencies and project success.

3.2 Project complexity and project success

The literature provided evidence that complexity adversely influences project success since interdependencies lead to instability and the emergence of disruptions found in the project (Bakhshi, Ireland, & Gorod, 2016; Fisher, Pillemer, & Amabile, 2018; Khan et al., 2018; Vidal & Marle, 2008). Butler et al. (2019) empirically showed, through a correlational study, that project complexity negatively influences project success. Bjorvatn and Wald (2018) determined that complexity deteriorates project implementation.

A literature review revealed that research into the effect of project complexity upon project success remains limited. Ma and Fu (2020) conducted a mixed methods investigation into mega construction projects in China to understand the relationship between project complexity and project success. Project complexity is the variation caused by the project system's interaction with internal and external subsystems (p. 2431). Both project complexity and project success involved the five dimensions of technology, organizational, environmental, cultural, and information. Results supported that all dimensions of project complexity negatively predicted project success.

Yu (2017) presented evidence that project complexity positively influences project success using hierarchical multiple regression analysis. High levels of project complexity encourage project team members to share knowledge and think creatively. Project complexity involved two questions that equated project complexity with perceived project newness.

Serrador and Pinto (2015) found no evidence that project complexity influenced project success using agile project management methods. Although, project complexity involved one question centering on the project manager's perception of complexity present in the project. Based on the available literature, the following research question and hypothesis are posited.

RQ2: To what extent does project complexity predict project success?

$H2_0$: There is no statistically significant correlation between project complexity and project success.

$H2_A$: There is a statistically significant correlation between project complexity and project success.

This study's research model depicting the dependent and independent variables and associated hypotheses is shown in Figure 1.

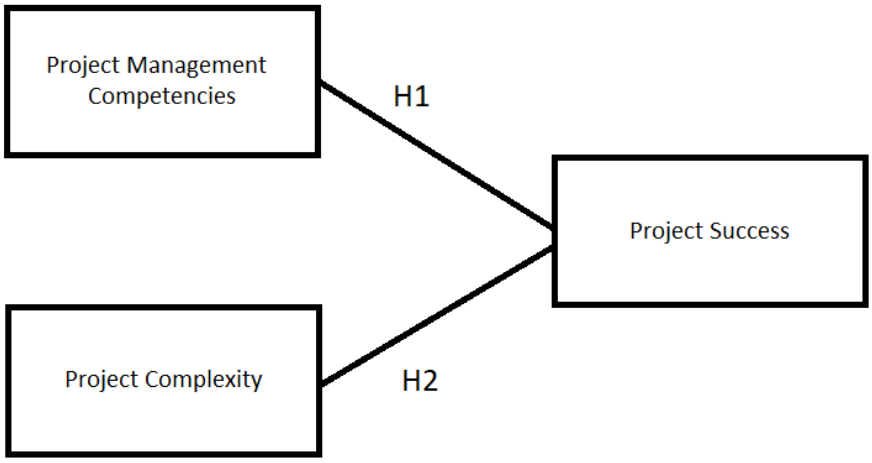

Figure 1. Research Model

4. Methodology

This section describes the study methodology. The research setting and participants are described along with sampling and data collection procedures. The section concludes with a description of the research instruments and associated evidence of validity and reliability.

4.1 Research setting and participants

The study population was PMP-certified project managers who operated in the USA and completed a project within the last six months from this research. Potential participants in the first phase came from membership in the LIMC Facebook page or the HU Project Management LinkedIn page. Members of the two sites were also members of the study population (HU, 2020; LIMC, 2020). The sites were selected based on association with the two institutions. The sampling method was self-selection sampling (Paas & Morren, 2018). Potential participants in the second phase came from Qualtrics Panel Services.

4.2 *Sample and data collection procedures*

The sample frame for this study was project managers, who were PMP certified, and based in the USA. Each participant had to meet the conditions of being a certified PMP based in the USA and completed a project within the last six months. SurveyMonkey was used to collect the first phase of data collection. Qualtrics Panel Services was used to collect data in the second phase. Both services only granted access to participants who met all the inclusion criteria. Interested participants who worked in an organization not based in the USA, or were not a certified PMP, or did not complete a project within the last six months were excluded from the research and not granted access to the survey.

G*Power version 3.1.9.4 with an *F* test was applied to generate statistical reliability for a multiple linear regression statistical technique. For business research, Hair, Sarstedt, Ringle, and Mena (2012) recommended a .95 statistical power and a medium effect size of .15. The G*Power software yielded a minimum of 107 responses to attain a .95 statistical power.

4.3 Measures

This study used three instruments to measure the variables under investigation. Specifically, the project management competencies questionnaire (PMCQ) was used to measure project management competencies. The complexity assessment tool (CAT) was applied to measure project complexity. Lastly, the project success questionnaire (PSQ) was used to measure project success. A description of the types of questions, scales, the reasoning for selection, validity, and reliability for each instrument continues.

4.3.1 Project Management Competencies Questionnaire (PMCQ)

The project management competencies questionnaire (PMCQ) was used to measure project management competencies (de Araújo et al., 2018b). The instrument was selected since it aligned with the Project Management Institute's framework, emphasizing the importance of developing both technical and personal project management competencies (Project Management Institute, 2017b). The instrument was initially designed for assessing project management competencies for IT project managers but was transferable to other project manager types (de Araújo et al., 2018b). Discriminate validity was checked by determining the average variance extracted (AVE). AVE values above .500 indicate support for discriminate validity (Hair et al., 2011). The instrument had an AVE value of .632, indicating discriminate

validity (de Araújo et al., 2018b). The instrument was tested using Cronbach's alpha and demonstrated internal consistency at .90 (de Araújo et al., 2018b).

4.3.2 Complexity Assessment Tool (CAT)

The complexity assessment tool (CAT) was selected since it integrated previous complexity research into structural, sociopolitical, and emergent (Maylor & Turner, 2017). The instrument was constructed using the theory of complexity (Geraldi et al., 2011; Maylor et al., 2013; Maylor & Turner, 2017). The instrument was initially designed to serve as a focal point for discussions with project managers coping with project complexity. The CAT demonstrated face validity since it was designed by Dr. Maylor and Dr. Turner, who are considered experts in project complexity. The instrument was tested using Cronbach's alpha demonstrated internal consistency at .90 (Williams, 2018).

4.3.3 Project Success Questionnaire (PSQ)

The project success questionnaire (PSQ) was selected since it encouraged participants to evaluate project results in usability, sustainability, and customer service (Aga et al., 2016). The instrument had an AVE value of .642, indicating discriminate validity (Aga, 2016). The instrument was tested using Cronbach's alpha demonstrated internal consistency at .93 (Aga et al., 2016).

4.4 Data analysis

The research aimed to study the extent that project management competencies and project complexity predict project success. A quantitative research approach was applied since theory and measurement of variables related to theory existed (Goduka, 2012; Scharff, 2013). The study was quantitative nonexperimental correlational research. Additionally, a quantitative approach was used since insight into the relationship between the three variables was attainable

through measurement, science, and examination. A multiple linear regression was applied since the statistical technique was used to gain insight into the extent predictor interval variables relate to a criterion interval variable (Hayes, 2018; Martin & Bridgmon, 2012).

4.4.1 Hypothesis testing

To use the multiple linear regression statistical technique, the regression coefficient, R^2, was determined for each relationship between the predictor and criterion variables to measure the influence of the independent variable on the dependent variable (Hair et al., 2011; Martin & Bridgmon, 2012). The standard alpha level.05 ($\alpha = .05$) was applied to determine the significance of the relationships in hypothesis testing (Field, 2018). Three multiple regression models were examined using stepwise multiple regression analysis. Martin and Bridgmon (2012) recommended using stepwise analysis when empirical evidence exists that supports relationships between the predictor and criterion variables. Model one contained only project management competencies and project success. Model two contained only project complexity and project success. Model three contained project management competencies, project complexity, and project success.

Using SPSS, the *R*-value was applied to measure the correlation between the predictor and criterion variables (Hair et al., 2011). The adjusted R^2 was applied to examine how the model generalizes to the population. The *F*-statistic was used to measure the prediction improvement in the model compared to the level of inaccuracies found in the model (Field, 2018). Using the *t*-statistic, the hypothesis was tested such that if *b*-value = 0, then the alternate hypothesis was rejected. Evaluation of the significance levels of the computed probability values (*p*-values) indicated the best model fitting a straight line to the collected data. If $p \leq .05$, then *b* was

significantly different from 0 and suggested that the independent variable was a significant contributor to predicting the dependent variable (Field, 2018; Hair et al., 2011). The *β*-values ascertained the strength and direction of the relationship between the independent and dependent variables for the three models.

5. Results

This section describes the data collected and the results stemming from the statistical technique used.

5.1 Descriptive Statistics

Descriptive statistics were run on the independent and dependent variables. Results are indicated in Table 1. It was observed for project management competencies, μ = 142.77, CI [93, 165], *S* = -.824, *K* = 1.057; for project complexity, μ = 124.95, CI [57, 155], *S* = -1.324, *K* = 1.951; and for project success, μ = 57.48, CI [18, 70], *S* = -1.486, *K* = 3.489.

Table 1
Frequency Distributions

Statistic		Project Management Competencies	Project Complexity	Project Success
Mean		142.77	124.95	57.48
Median		145.00	128.00	59.00
Mode		146	140	63
Standard Deviation		13.507	20.720	8.795
Skewness		-8.24	-1.324	-1.486
Kurtosis		1.057	1.951	3.489
Minimum		93	57	18
Maximum		165	155	70
Range		72	98	52
Percentiles				
	25	133.00	116.00	54.00
	50	145.00	128.00	59.00
	75	153.00	140.00	63.00

5.2 Hypothesis Testing

Two multiple linear regression models were examined. Model one contained project management competencies as the predictor variable. The second model contained project management competencies and project complexity. Linear regression was used to compare variances of mean values between multiple groups. These computations are encapsulated in the analysis of variance (ANOVA).

Recall that $H_0$1 was, there is no statistically significant correlation between project management competencies and project success. The first null hypothesis was rejected since F (1, 105) = 17.628, $p < .001$. The first alternative hypothesis was accepted. Recall that $H_0$2 was, there is no statistically significant correlation between project complexity and project success. Evaluation of the second null hypothesis was inconclusive since an F-statistic was not generated through the SPSS software. Additionally, the second model indicated that project management competencies (b = .083, β = .143, t = 2.111, $p < .05$); and project complexity (b = .295, β = .700, t = 10.346, $p < .001$) was a good model such that as project management competencies increases and project complexity increases, project success increases. Regression coefficient results are indicated in Table 2.

Table 2
Results of Regression Coefficients

Model		B	Std. Error	β	t	Sig.	Tolerance	VIF
1	(Constant)	27.00	7.555		3.574	.001		
	Project Mgt Competencies	.220	.052	.379	4.199	.000	1.000	1.000
2	(Constant)	8.96	5.607		1.597	.113		
	Project Mgt Competencies	.083	.039	.143	2.111	.037	.886	1.129
	Project Complexity	.295	.028	.700	10.346	.000	.886	1.129

The adjusted R^2 is used to gauge how well the model generalizes to the population. The results indicated that project management competencies contributed 13.6% of the variance in the first model. The second model added project complexity which explained 57.0% of the variance. Results of the linear regression models are shown in Table 3.

Table 3
Regression Model Summary

Model	*R*	*R* Square	Adj *R* Square	Std Error	*R* Square Change	*F* Change	*df*1	*df*2	Sig. *F* Change
1	.379	.144	.136	6.372	.144	17.628	1	105	.000
2	.760	.578	.570	4.495	.434	107.044	1	104	.000

Model 1 – Project Management Competencies and Project Success
Model 2 – Project Management Competencies, Project Complexity, and Project Success

Results for the model involving project complexity and project success were inconclusive. The SPSS software generated an excluded variable report indicated in Table 4.

Table 4
Excluded Variable: Project Complexity and Project Success Model

Model	*β*	*t*	Sig.	Partial Correlation	Tolerance	VIF	Min Tolerance
1	.700	10.346	.000	.712	.886	1.129	.886

Model 1 – Project Complexity and Project Success

6. Discussion

The first research question, to what extent do project management competencies predict project success, was answered. As expected, the research results provide evidence that the integration of project management competencies and project complexity predict project success. The null hypothesis, there is no statistically significant correlation between project management competencies and project success, was rejected since F (1, 105) = 17.628, $p < .001$.

Project managers who can encourage collaboration and knowledge-sharing guide project stakeholders to transform ambiguity into creativity. New solutions and approaches become

possible. Project management competencies enable project managers to relieve conflicts and encourage collaboration. This research offers evidence that by applying project management competencies, the project manager can tap the hidden creativity and knowledge available in the team, leading to project success.

The second research question, to what extent does project complexity predicts project success, was inconclusively answered. Project complexity emerges through ambiguity and influences the relationship between project management competencies and project complexity. Project managers, who embrace the complexity and encourage the project stakeholders to partner, can adapt and realize project success. Though results were inconclusive concerning the second research question, the perspective regarding harnessing the opportunities available in complex projects is essential. It serves as the focal point in explaining this study's predictive model results.

The second predictive model involving project management competencies, project complexity, and project success is a good model since F (2, 104) = 71.238, $p < .001$. Both chaotic and complex systems are defined through interconnectivity between system agents. The presence of equifinality separates complexity from chaos. Tensions disrupt both chaotic and complex systems. Complex systems eventually emerge into a new and stable pattern. Complexity scientists call the moments preceding a new pattern in a complex system the edge of chaos.

6.1 Theoretical and practical implications

This study's evidence supports managing the edge of chaos. Using project management competencies, project managers can establish an environment built on collaboration and knowledge-sharing. Project managers possessing strong project management competencies can

embrace project complexity. Applying project management competencies, the project manager can leverage the interconnected experiences and knowledge available in the project team, leading to creativity and ingenuity.

The use of project management competencies enables the project manager to build trust with the project stakeholders. Complex projects, which do not involve project management competencies, lack the element of trust. Instead, collaboration, fortified by trust, is necessary for finding innovative solutions to contemporary problems. Project management competencies encourage building a trusting environment in the project team, leading to innovativeness and ingenuity.

The first research question, to what extent do project management competencies predict project success, was answered. Project management competencies positively influence project success. This research provides evidence that project managers skilled in project management competencies, including people skills and team management, likely experience improved project performance. The literature is replete with evidence that supports that the use of project management competencies improves project success (Mainga, 2017; Ordoñez et al., 2019; Raziq et al., 2018). Consequently, the first research question results agree with the extant literature.

The research supports that project management competencies improve the prediction of project success. Collaborative commitment between the project manager and the project stakeholders facilitates project execution. The project manager must integrate the knowledge and experience of the project stakeholders. The application of project management competencies encourages partnership and knowledge-sharing among the project stakeholders resulting in project success.

The expanded standard project management model indicates that project complexity influences the relationship between project management competencies and project success (Bjorvatn & Wald, 2018; Geraldi et al., 2011). This study's predictive model provides insight into the expanded standard project management model. This research evidence supports that project management competencies positively improve project success. When project management competencies are used in complex projects, project success potential is higher than that of noncomplex projects.

Project management competencies encourage building an environment supportive of collaboration, partnership, knowledge-sharing, and openness. Cooperation and collaboration transform the project team into behaving like a complex adaptive system. Project managers who can transform uncertainties into opportunities can make complex projects successful. Ambiguity and uncertainty, associated with project complexity, are converted into clarity and creativity.

The human brain interprets the presence of complexity as missing information and ambiguity. The predictive model shows that project management competencies involving knowledge-sharing and collaboration address the ambiguity that emerges through complexity. The application of project management competencies encourages involvement and action. Project management competencies are ineffective without stakeholder participation. The results support using project management competencies. The project manager can leverage knowledge and abilities available to the project stakeholders and transform threats and weaknesses into strengths and opportunities that improve project performance.

6.2 Limitations and future research directions

Though the study conformed to the research design, limitations did exist. Specifically, limitations were identified concerning the statistical technique used and the predictor variables examined. This section continues with an explanation of the specified limitations. This study investigated whether project management competencies and project complexity predict project success. Both project management competencies and project complexity were treated aggregately. Project management competencies were measured using the project management competencies questionnaire, which involved team management, business domain knowledge, people skills, project management, personal characteristics competency types (de Araújo et al., 2018b).

The instrument affords for investigation of analysis at the project management competencies level. Similarly, project complexity was measured using the complexity assessment tool, which involves structural complexity and sociopolitical complexity types (Maylor et al., 2017). To attain 95% statistical power using seven predictor variables, and using multiple linear regression as the statistical technique, requires a minimum sample size of 153 participants. Results are indicated in Table 5. Investigation at the project management competency type and project complexity type levels was limited since additional research participants and funding were unavailable.

Table 5

G*Power Input Parameters for A Priori Power Analysis Using Seven Predictors

G*Power Parameter	Value
Test family	*F*-test
Statistical test	Multiple linear regression
Type of power analysis	*A* priori
Effect size f^2	.15
α probability	.05
Power (1-β error probability)	.95
Number of predictors	7
Total sample size	153

The research design was nonexperimental. The scope of this study was limited to correlational examination. This study treated the project complexity variable as a mediator variable. Baron and Kenny (1986) indicated that a variable is considered a mediator variable, in general, since the variable is investigated to examine a correlational relationship. Based on the literature, treating the project complexity variable as a mediator variable was valid and suitable (Hall & Sammons, 2013). However, when considering treating project complexity as a moderator variable, a limitation in the research design emerges.

Rather than gaining insight into the correlation examined through a mediator variable, research into a moderator variable offers insight into a causal relationship (Baron & Kenny, 1986). The moderator variable is measured to examine the differential effect of the presence or the absence of the moderator variable upon the other two variables. As a result, a moderator variable is treated as a categorical variable rather than a continuous variable. Since project complexity was treated as a mediator variable, this research was limited in gaining insight into the interactive effect of project complexity upon project management competencies and project success.

Recommendations are offered to seek additional insight into project management competencies, project complexity, and project success. The use of a moderator variable, treated as a categorical variable, provides insight into the interactive effect between two other variables (Hall & Sammons, 2013). Treatment of project complexity as a moderator variable is supported in the literature (Geraldi et al., 2011). It would be interesting to treat project complexity as a moderating variable since it would examine the causal effect of project complexity on project management complexity and project success.

In the spirit of parsimony, this study limited the number of predictor variables to two, though the data collection instruments stratified project management competencies and project complexity levels. The data collection instruments and multiple linear regression as the statistical technique would remain unchanged. As indicated in Table 5, the number of participants would need to be raised to at least 153 individuals. Insight into the predictive effect of project management competency types and project complexity types upon project success would be gained through modification of the research design.

7. Conclusions

The model involving project management competencies, project complexity, and project success is explained through knowledge transfer. Knowledge transfer, the exchange of knowledge and experiences between various stakeholders, addresses complex projects' ambiguity and uncertainty. Project management competencies encourage knowledge-sharing. The use of project management competencies facilitates the project manager to identify, navigate, and connect sources of knowledge shared throughout the project environment.

The project is a holistic entity. The project manager, who interprets the project as a complex adaptive system, can encourage team members to behave flexibly. Treating projects holistically encourages adaptive behavior. The evidence stemming from the predictive model supports that using project management competencies enables the project manager to integrate the project team members into a holistic entity since knowledge-sharing and communication are emphasized, leading to improved project performance in complex projects.

Negotiation skills are a specific classification of project management. Project managers who balance project constraints with project expectations can manage project complexity. Project managers who encourage team members to seek opportunities to partner continuously can realize successful complex projects. The evidence supports that applying project management competencies that promote partnership and collaboration enables the project stakeholders to transform ambiguity into clarity since knowledge and resources are shared, leading to tapping project performance potency.

Conflict of interest

The author declares that there is no conflict of interest.

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