

Conflict Management in Outsourced Engineering Projects in South Africa

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Abstract – The aim of this study was to investigate conflict management in engineering projects in South Africa. Improved management of project failure is possible if the relationship between conflict management and project success is known. Organizations turn to project management to unlock opportunities and fulfil strategic objectives. This study provides a framework to address and manage conflict in outsourced engineering projects for the benefit of organizations and engineering professionals who are involved in projects. The constructs of conflict management and project success were delineated and analyzed with structural equation modeling in SPSS. The statistical analysis confirmed that effective conflict management positively impacts project success.

Keywords - Conflict management, project success, project management

I. INTRODUCTION

Modern organizations turn to project management to fulfil their strategic goals and to enhance their competitiveness [1]. In South Africa, the Treasury allocated over R800 Billion for infrastructure projects for the public sector during the South African Medium Term Expenditure Framework (SAMTEF) in 2016 [2]. South Africa is a developing economy and the bulk of infrastructure projects will be undertaken by the private sector. As a result, the outsourcing of engineering projects has become common practice in business. Outsourcing is primarily the shift of a function or activity from in-house management to external administration [3].

Reference [4] indicates that organizations outsource for cost efficiency; as well as a result of lack of internal skills and the massive capital layout required to fulfil or complete the project. According to references [5] and [6] these contract-based outsourcing business relationships are susceptible to distrust, which at times leads to uncooperative business relationships and conflict in projects. The arising conflict needs to be managed as part of project management. Authors [10][12][14] suggest that conflict management involves the recognition of the existence conflict and taking the required steps to deal with the conflict. Several authors concur that conflict management has an impact on project success [7,8,9]. This research sought to assess the relationship between project success and conflict management and to provide a framework with which to understand and manage conflict in outsourced engineering projects in South Africa. Potentially, organizations and project professionals could use the frame work to better understand and address conflict in projects.

The structure of the paper is as follows: Section II discusses the relevant literature, and delineation of conflict management and project success towards the conceptual framework that is proposed for the relationship between the constructs. Section III provides an overview of the research methodology; Section IV discusses the research results and suggests the final model; and Section V concludes the paper.

II. PROPOSED THEORETICAL MODEL: CONFLICT MANAGEMENT AND PROJECT SUCCESS

References [7], [8] and [9] draw attention to the fact that, during the life-cycle of a project, the contractor and the client experience a number of conflicts in the project. In an attempt to meet the project objectives and to ensure successful project performance, the conflict that arises must be effectively managed. Reference [7] identifies conflict management as a fundamental key competency of a project manager that is associated with successful project outcomes.

A. Delineation of Conflict Management

According to reference [10], conflict is an interactive process which is exhibited in disagreement or incompatibility. Reference [11] defines conflict as latent disagreement between members of a team which indicates mismatched goals or interests. Studies by [11], [12] and [13] place conflict into two key categories, namely relational (affective) conflict and task (substantive) conflict. Relational or affective conflict is characterized by emotions and feelings or tension and friction [14].

Authors [10], [12] and [15] indicate that affective conflict hampers project performance. Task conflict reveals dissonance in perspectives concerning tasks [10][11][15]. According to reference [13] and expanding on work by [12], task conflict is characterized by disagreeing about exact activities that must be performed in aid of project advancement.

The work of [15] suggests that task-based conflict can be valuable as it stimulates innovation and creativity. Author [16] agrees that task-based conflict is beneficial. The work of [12] found that task-based conflict encourages dialogue and debate which leads to higher performance and improved decision making.

Conflict management is broader than the cessation, lessening or circumvention of conflict. It includes approaches that reduce the dysfunction of conflict and accentuate the beneficial aspects of conflict. These may

enhance group or individual performance [10][15]. Turning to the work of several authors it was found that conflict management involves the recognition of conflict and the type of conflict, and taking the required steps to apply the appropriate conflict handling style for successful management thereof [10] [12][16].

B. Delineation of Project Success

The success of a project has traditionally been measured according to performance in relation to the triple constraints of scope, cost and time. The work of [17] proposes a model that describes project performance in four clusters, namely skills from an interpersonal perspective; how is knowledge applied; comprehension of the project management environment; as well management knowledge in general.

Reference [18] points out that project success is dependent on one’s perspective and perceptions. In a study of factors affecting project success, reference [19] found that “absolute project success” does not exist in project management, further advancing the notion that there is only the “perceived success of a project”. They further state that the criteria to evaluate project success changes over time. Reference [20] share similar sentiments on the evolution of what project success means. Authors [19], [21] and [22] concur in positing the outlook that different people perceive success in different ways and this would be the case with different interest groups in a project such as management, stakeholders, customers and employees.

Referring to the work of references [18] and [23] it emerges that the success criteria of projects are evolving. Reference [23] concludes that the next level on how to measure project success is moving from a triangle of constraints to a diamond of opportunity whereby budget, scope and schedule are balanced with benefits and business outcomes.

C. Theoretical Model

In order to formulate a research model for the current study, an adapted model by [8] was employed as a starting point. The model is presented in Fig.1.

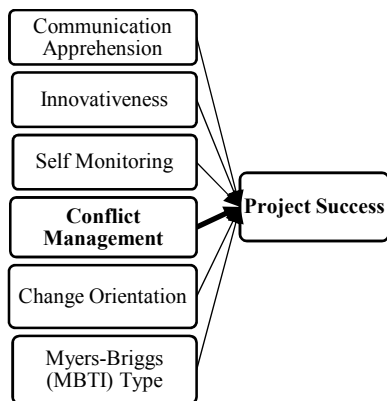


Fig. 1. Model of the link between project manager traits and project success [8]

Literature identified that the following factors broadly characterize conflict management, namely:

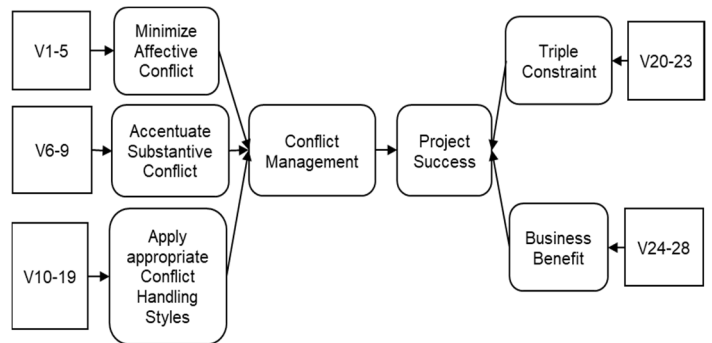


Fig. 2. Proposed theoretical model for the relationship between conflict management and project success

- Factor One: Minimization of affective/negative conflict.
- Factor Two: Accentuation of substantive/constructive conflict.
- Factor Three: Application of the appropriate conflict handling styles.

Similarly, project success is defined by two factors: Factor One: Triple constraints and Factor Two: Business benefit. Three factors for conflict management and two factors for project success yielded twenty-eight indicator variables (V1 to V28) from literature. These indicators were used in the survey. The proposed theoretical model for the relationship between conflict management and project success is depicted in Fig. 2.

Combining all the perspectives from literature the following hypotheses were postulated and tested:

- H1: Minimize affective conflict is positively related to conflict management.
- H2: Accentuate substantive conflict is positively related to conflict management.
- H3: Use of appropriate conflict handling styles is positively related to conflict management.
- H4: Triple constraint is positively related to project success.
- H5: Business benefits is positively related to project success.
- H6: Conflict management has a positive effect on project success.

III. METHODOLOGY

The literature review conducted allowed the researchers to establish a better understanding of conflict management and project success in relation to the theorized relationship. A quantitative research approach was adopted for the study. A questionnaire survey was employed as a tool for empirical data collection to test the hypotheses. A total of twenty eight items were produced from the literature review process. The questionnaire comprised of three sections. The first section consisted of background to the study, and a letter of introduction which

provided the objectives of the study. The demographic information of the respondents were obtained from the second section. This included information relating to level of experience, education, professional registration and nationality. The third section was grouped into the three factors of conflict management (minimize affective conflict, accentuate substantive conflict, use appropriate conflict handling styles) and two factors of project success (triple constraint, business benefits) A five-point Likert scale was employed in the questionnaire with a range of 1= strongly disagree, 2 = disagree, 3 = Neutral, 4 = agree, 5 = strongly agree. A total of 126 responses were received and exploratory factor analysis (EFA) was conducted on the dataset followed by confirmatory factor analysis (CFA). The analysis was completed with structural equation modeling (SEM) in a software package called Amos.

Among the 126 respondents the largest category of respondents (31%) fell within the experience range of five to ten years; and a significant number of respondents (27%) had fifteen or more years' appropriate work experience in engineering projects.

Reference [25] states that EFA reliability is tested by computing the Cronbach's alpha (α) for each factor with a requirement to be above 0.7.

IV. RESULTS AND DISCUSSION

A. Exploratory Factor Analysis (EFA)

The correlation among the variables in a dataset is determined using the EFA statistical approach [25], and in this study the EFA was conducted using SPSS software. Three primary methods are employed for factor extraction, viz. principal component analysis (PCA), principal axis factoring (PAF) and maximum likelihood (ML). Reference [25] recommends the use of the maximum likelihood method when AMOS will be used for CFA and structural modeling. The maximum likelihood method was selected as the extraction method. The default Kaiser criterion in SPSS which is set at an Eigenvalue value of 1 was retained for this study. The Kaiser-Guttman or Kaiser criterion advocates that only factors/latent variables that have an Eigenvalue of 1 or above should be retained. The oblique rotation of Promax was selected for the research.

Adequacy Measure	Threshold	Results
Kaiser-Meyer-Olkin(KMO)	Marvellous>0.9 Unacceptable<0.5	0.532
Communalities	Extraction values> 0.3	>0.771
Total variance explained	Cumulative percentage of factors explaining variance> 50%	86.945%
Goodness-of-fit	Significance value<0.05	0.000
Non redundant residuals	<5%	4%

The key output of a Promax rotation is a pattern matrix which will be used for assessment of the EFA convergent validity as well as the CFA. The EFA adequacy measures and results are indicated in Table I.

The factors extracted from the EFA were: *Individuality, Debate and consensus, Business benefit, Triple constraint, Competition and Avoidance, and Dealing with difference*. These factors are then used in the confirmatory factor analysis phase of the modeling. The EFA was deemed adequate based on the results in Table I.

B. Confirmatory Factor Analysis (CFA)

The confirmatory factor analysis (CFA) confirms the factor structure extracted during the exploratory factor analysis (EFA). A CFA is the next step after the EFA to determine the factor structure of the dataset [24].

The pattern matrix generated during the EFA phase was imported into the structural equation modelling software AMOS using a plugin "pattern matrix model builder". The creation of the measurement model is autogenerated based on the pattern matrix using a plugin. During the estimation phase AMOS performs a number of calculations in order to provide the required output data. Prior to the execution of the estimation calculations, a configuration of the output options within AMOS is required. The analysis properties option in the output tab was configured such that the standardized estimates was included to provide interpretable results for model discussion. Table II provides the results of the CFA model.

MODEL(THRESHOLD)	1	2	3	4	5
χ^2/df (<33 good; <5 sometimes permissible)	3.64	3.64	3.62	3.32	3.35
GFI (>0.90)	0.691	0.698	0.722	0.744	0.764
RMR (<0.09)	0.030	0.030	0.029	0.027	0.027
RMSEA (<0.05 good; 0.05- 0.10 moderate; > 0.10 bad)	0.145	0.145	0.145	0.136	0.137
PCLOSE (>0.05)	0.000	0.000	0.000	0.000	0.000
CFI (>0.95 great; > 0.90 traditional; >0.80 sometimes permissible)	0.879	0.886	0.893	0.909	0.921
TLI (>0.90)	0.855	0.861	0.868	0.887	0.901
NFI (>0.90)	0.842	0.850	0.859	0.876	0.892

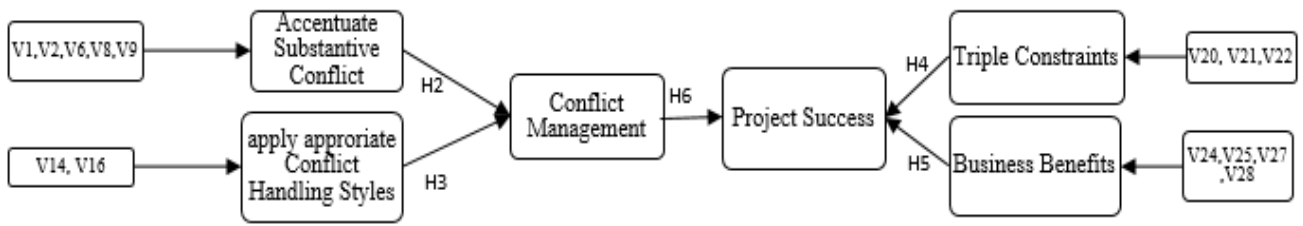


Fig.3 Final model for the relationship between conflict management and project success

The initial results in Table II under Model 1 indicate that the P-value, RMSEA, GFI, CFI, TLI, NFI, CMIN/DF fell outside the requisite levels of acceptance. The RMR is within tolerance at .034 falling well below the .09 maximum threshold. The implication of the results is that the initial structural model was not acceptable as none of the model fit measures were satisfactory.

Based on the results, modification of the model was required to improve the model fit measures. AMOS generated modification indices that can be used to conduct further model modification. Modification indices from AMOS revealed relationships that were initially not defined in the model and as a result a covariance was required to indicate the relationships. Modification indices showed items that could be modified to improve the model fit. Covariances may be added whilst observing the rules that only error terms on the same factor can be covaried; and an error term cannot be covaried with a factor. Consequently the model was rerun.

The next step towards attaining a satisfactory model fit was that the observable variables with the lowest regression weighting was deleted as the first modification step. This was repeated until results for Model 5 were obtained as reflected in Table III. The variables for factor one that are related to hypothesis H1 were removed to enable model fit. The model fit showed an improvement in GFI, CFI, TLI, NFI and Chi-Square/df values while RMSEA and P-value remained the same. Reference [26] notes that a good-fit model is not necessarily a valid model. It is the view of reference [27] that the aim of factor analysis is not to obtain a better fit but to obtain information that enhances the understanding of the relationship amongst the variables. The researchers accepted that Model 5 was not perfect fit but, given that most of the fitness measures were above the required threshold, the model was considered final. The model is presented as Fig.3.

C. Final Model Reliability and Validity

Reference [28] suggests thresholds for Composite Reliability (CR), Average Variance Explained (AVE) and Maximum Shared Variance (MSV) to establish reliability and validity of a model. The thresholds are:

- Reliability (CR > 0.7)
- Convergent Validity (AVE > 0.5)

- Discriminant Validity (MSV < AVE and square root of AVE greater than inter construct correlations)

	CR	AVE	MSV
Triple Constraint	0.973	0.898	0.064
Individuality	0.951	0.906	0.029
Debate and Consensus	0.987	0.940	0.064
Business Benefits	0.964	0.870	0.019
Competition and Avoidance	0.966	0.934	0.014

The convergent validity of the final model was attained as evidenced by the AVE values for all latent variables above 0.5. The discriminant validity was achieved given that the square root of AVE was greater than any inter-factor correlation on the final model matrix. The reliability also displayed good levels as the CR values were all above 0.7.

The Chi-square/df with value (within 2.00 and 5.00) showed a good model fit. The TLI, CFI and GFI were all acceptable. The standardized coefficients were positive thus proving positive relationships amongst the factors. The relationship suggested for hypothesis H1 was rejected as the variables were deleted during the CFA phase to enable a better model fit. The positive relationships posited in hypotheses H2, H3, H4, H5 and H6 were all supported.

V. CONCLUSION

The current research investigated the relationship between conflict management and project success in outsourced engineering projects in South Africa. The constructs of conflict management and project success were delineated into three and two factors respectively, and six hypotheses were proposed for testing. Statistical analysis was employed to test the theoretical model. The practical implication deduced from the research is that eliminating conflict should not be the goal. When conflict arises it should be openly addressed. Conflict management

entails encouraging robust debate on issues. This supports the notion that when all parties know where they stand with each other the conflict is consequently diminished. It was concluded that the application of conflict management by accentuating substantive conflict and applying appropriate conflict handling styles leads to project success; and project professionals may apply the framework towards a better understanding of the impact of conflict management in engineering projects within South Africa.

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