Proc. of the Sixth Intl. Conf. Advances in Civil, Structural and Mechanical Engineering - CSM 2018

ISBN: 978-1-63248-150-4 doi: 10.15224/978-1-63248-150-59

Establishing the relationship of monitoring and review with project success of small and medium contractors in South Africa

Berenger Yembi Renault, Justus Ngala Agumba, and Nazeem Ansary

***Abstract*—Monitoring and review are very essential management tools for ensuring that project objectives in construction are fully accomplished and that the project remains on track. However, it appears that little research has been conducted in South Africa, on the relationship of monitoring and review with project success of contractors especially within small and medium contractors (SMEs). Hence, the current study aims to empirically establish this relationship at project level of construction SMEs. To achieve this aim, a structured questionnaire was used to collect data from SMEs who were conveniently sampled in the Gauteng province of South Africa. The data was analysed using the Statistical Package for the Social Sciences (SPSS) version 23, computing inferential statistics. Empirical findings revealed that project success was positively influenced by monitoring and review. This was an indication that project monitoring and review in construction are important risk management practices that enhance project management decision making and hence influence project success. The findings recommend contractors to fully implement monitoring as part of their project risk management activities.**

***Keywords*—contractor, monitoring and review, relationship**

I. Introduction

Monitoring and reviewing the project progress is one of the most important tools of project management within the effort in achieving success in construction projects. Project participants need to be aware of the progression of the project; that is if deadlines are met; budgets are carefully measured and followed. Monitoring and review are often considered as a solitary activity because they are both project management tools, consecutive and closely correlated [1]. This correlation is acknowledged and considers as separate activities because monitoring leads to review [2]. Monitoring and review provides the necessary checks and balances for ensuring that the plans and overall project objectives are realized [2]. Plans cannot produce the required end results by themselves; they must be supplemented by monitoring and review to attain their goals. Monitoring is the on-going collection and analysis of data that informs project managers if progress toward established goals is being achieved [1]. Review helps document the results of the project; it is undertaken at the end of each project phase to identify the current status of the project by identifying the deliverables which have been produced to date and determines whether or not the project has met the objectives set.

Though there is a rich body of literature that examines the importance of monitoring and review activities in construction projects in South Africa, there is a lack of empirical studies to establish the relationship of monitoring and review with project success. Hence, the current study aims to fill the research gap by determining the relationship between monitoring and review and project success.

II. Literature review

This section presents a review of the relevant literature related to the research topic. The concepts used in this study, which include project success, critical success factors, monitoring, review, and hypothesised conceptual framework, are first presented.

A. *Critical project success factors*

Critical success factors are defined as those inputs to the project management system that directly increase the likelihood of achieving project success [3]. The presence of these factors in a project is no guarantee of a success however; their absence may lead to failure. Many authors [4] [5] [6] have identified and grouped project success factors under four categories namely; comfort, competence, commitment and communication. Proper planning of the project determines a baseline which outlines a course to steer in the execution of the project. In project execution, actual progress usually deviates from the baseline plan. [7] Indicated that the deviations can be due to the following: inadequate constructor experience, owner interference/ scope creep, financing and payments, absenteeism, labour productivity due to learning curve, sickness, slow decision-making, improper planning, and subcontractor's late deliveries.

Berenger Yembi Renault
University of Johannesburg
South Africa

Justus Ngala Agumba
University of Johannesburg
South Africa

Nazeem Ansary
University of Johannesburg
South Africa

Proc. of the Sixth Intl. Conf. Advances in Civil, Structural and Mechanical Engineering - CSM 2018

ISBN: 978-1-63248-150-4 doi: 10.15224/978-1-63248-150-59

B. *Conceptual framework for the study*

Figure 1 represents the theoretical conceptual framework proposed in the study. The framework depicts the influence of the factors to project success as well as the hypothesized relationship between the constructs. On the other hand, project success is dependent on the level of practice of the factor namely; monitoring and review. Assign responsibilities, identify and select monitoring and review techniques, assess control effectiveness, conduct control enhancement, and reporting new results of monitoring and review were employed as the variables of project monitoring and review. The relationship between the variables is discussed in section 2.2. For project success, [8] maintained that time, cost and quality have been the leading success metrics of construction projects. However, [4] [9] [1]; posited that project success should not be limited to just the traditional view. [1] Further suggested incorporating the absence of legal claims as a measure of project success. This indicates the importance of including safety as a success measure since it is logical to anticipate that if accidents and/or injury materialise. For the purpose of this study, time, cost, quality and health and safety were used as project success variables.

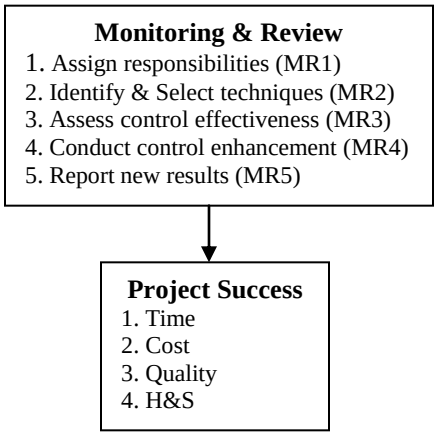

Figure 1. Conceptual Framework

C. *Hypothesised relationship of monitoring and review with project success*

A study by [10], pointed that Monitoring and review influenced project success. Likewise, [11] also asserted that the likelihood of achieving project success seemed to be enhanced by other factors by regularly monitoring the project progress. In addition, [12] [13], established that project monitoring and review allow management to verify that the control actions that were applied are efficacious to achieve project success. If controls actions are found to be ineffective, these should be revised or new control actions implemented, thus enabling continuous improvement in future projects. [14] indicated that project monitoring and review is, even more, critical than planning in achieving project success. Equally many researchers, [15] [16] indicated that one of the elements of the project management methodology whose main aim is to achieve project success is monitoring project progress. The above discussion brought us to conclude that there is a relationship between monitoring, review and continuous improvement and project success; therefore, we propose that:

$H1_0$: Monitoring and review do not influence project success
H1: Monitoring and review positively influence project success

III. Research methodology

A. *Population and data collection*

The population of the study comprised of top management of SMEs (mostly owners, owner-managers, managers and project managers) who were selected from the Construction Industry Development Board (CIDB) register of contractors. In identifying potential respondents, the researcher ensured that all respondents were graded 1 to 6 (indicating small and medium contractors) and that they had a valid registration with the body they were from in order to participate in the study. Both secondary and primary data were used in the study. An extensive review of literature was carried out to gather secondary data included in the questionnaire which was later pre-tested. Primary data on the other hand was collected by administrating a questionnaire, via personal hand delivery method.

B. *Sample and sampling method*

The survey consisted of forty two statements/measures addressing nine risk management factors of which monitoring, review and continuous improvement comprised of five statements/measures. Following the questionnaire pre-testing, the final refined version of the questionnaire was distributed to 225 conveniently sampled SMEs using personal hand delivery and collect method of which 187 questionnaires were returned of which 6 were excluded from the study due to various ambiguity (questionnaire incorrectly answered, respondents' information missing and inadequate information provided). Consequently, the remaining 181 questionnaires were deemed usable representing approximately 80% response rate.

C. *Data analysis*

SPSS version 23 was employed computing descriptive statistics, Exploratory Factor Analysis (EFA) and Multiple Regression Analysis (MRA). EFA was performed to gather information about the uni-dimensionality of the variables, to confirm their validity and reliability using Oblimin with Kaiser Normalisation rotation and to assess the strength of the interrelationship among the variables. MRA was conducted to ascertain the relationship of monitoring and review with project success by determining the influence monitoring, review and continuous improvement on project success.

Proc. of the Sixth Intl. Conf. Advances in Civil, Structural and Mechanical Engineering - CSM 2018

ISBN: 978-1-63248-150-4 doi: 10.15224/978-1-63248-150-59

D. *Validity and reliability*

The measurement instrument was also tested for validity and internal consistency. Validity was ensured as a result of conducting an extensive literature review by consulting previous related studies, this was requisite to specify the variables. The questionnaire was reviewed and revised by experts (academics, researcher's promoter, and a professional statistician) before the pilot study took place. Internal consistency was tested using Cronbach's Alpha. A generally agreed upon minimum limit for Cronbach alpha is 0.70 [17]. However, a cut-off value of 0.60 is common for exploratory research and values closer to 1 suggest good reliability [18]. For this study, a cut-off value of 0.60 was adopted as used by [19].

IV. Results and discussion

A. *Demographic results*

This sub-section reports on the profile of the respondents and the company. Results revealed that among the respondents, 81.80% was male while 18.20% was female, 87.56% were either owners or manager of their enterprise, 56.40% were African/Black, had either matriculation (22.70%) or a certificate (20.40%), 43.10% of respondents had 10 years' or less experience in construction. Furthermore, it was found that 37.60% of SMEs were subcontractors or general contractors (31.50%), working mostly in Johannesburg (41.40%) and Tshwane (30.90%) Metropolitan Municipalities. Nevertheless, the subcontractors either operated for the main contractor or were sole trade contractors.

B. *Exploratory Factor Analysis (EFA) results*

Monitoring and review was subject to EFA using SPSS version 23 which was used to gather information about the unidimensionality of the variable as well as to evaluate its reliability, discriminant validity and convergent validity. The Cronbach's Alpha of each measure ranged from 0.850 to 0.890 with an overall Cronbach's alpha value of 0.892 (Table 1). These results were all greater than the recommended value of 0.6 which indicated good reliability [19].

Results of correlation matrix coefficient (Table 2) revealed that the coefficients ranged from 0.426 to 0.751. These coefficients were all greater than the cut-off value of 0.30 suggesting that the four measures (MR1, MR2, MR3, MR4 and MR5) were good measures of the factor. These results indicated suitability of data for factor analysis.

The KMO value (Table 3) was 0.802, which was above the cut-off value of 0.60. The Bartlett's Test of Sphericity was statistically significant at p=0.000 (<0.05). These results supported the factorability of the correlation matrix [20].

TABLE I MONITORING AND REVIEW MEASURES

Code	Monitoring and review measures	Cronbach's Alpha (0.892)
MR1	I/We assign responsibility for monitoring and review actions	0.876
MR2	I/We identify and select monitoring and review techniques	0.850
MR3	I/We assess control effectiveness, measured in terms of meeting departmental/organizational objectives.	0.890
MR4	I/We do control enhancement by revising ineffective controls identified	0.877
MR5	I/We report the new results from monitoring and review activities.	0.868

TABLE II. CORRELATION MATRIX FOR MONITORING AND REVIEW MEASURES

		MR1	MR2	MR3	MR4	MR5
Correlation	MR1	1.000				
	MR2	**0.739**	1.000			
	MR3	**0.426**	**0.682**	1.000		
	MR4	**0.751**	**0.653**	**0.481**	1.000	
	MR5	**0.564**	**0.739**	**0.702**	**0.591**	1.000

TABLE II. TEST OF DATA FACTORABILITY

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**0.802**
Bartlett's Test of Sphericity	Approx. Chi-Square	596.218
	df	10
	Sig.	**0.000**

Results of EFA further revealed that only one measure (shown in bold, Table 4) had an eigenvalue above 1 (3.540). It explained 70.80% of the variance and accounting for 70.80% of the total variance. Since only one component was extracted, the solution cannot be rotated as it shows that this component is meaningful and it defines only a one-dimensional component as indicated by [21]. Therefore, sufficient evidence of convergent validity was provided for this construct.

TABLE IV. PERCENTAGE VARIANCE EXPLAINED-MONITORING AND REVIEW

Component/Item	Eigen value	% of explained Variance	Cumulative %
1- MR1	**3.540**	**70.796**	**70.796**
2- MR2	0.716	14.328	85.124
3- MR3	0.304	6.087	91.211
4- MR4	0.277	5.531	96.742
5- MR5	0.163	3.258	100.000

In addition, the decision to retain only one component was based on Kaiser's criterion by looking at eigenvalues greater than 1 and by inspecting the screeplot which revealed a clear break after the second component. Using Catell's (1966) scree

Proc. of the Sixth Intl. Conf. Advances in Civil, Structural and Mechanical Engineering - CSM 2018

ISBN: 978-1-63248-150-4 doi: 10.15224/978-1-63248-150-59

test, it was decided to retain one component for further investigation (Figure 1). This was further supported by the results of principal axis factoring which revealed that the four measures loaded strongly together on one component. Their factor loadings presented in Table 5, were greater than the recommended value of 0.40 as suggested by [17] [20].

TABLE V. COMPONENTS MATRIX FOR MONITORING AND REVIEW MEASURES

	Component
	1
MR2	0.912
MR5	0.856
MR1	0.830
MR4	0.826
MR3	0.777

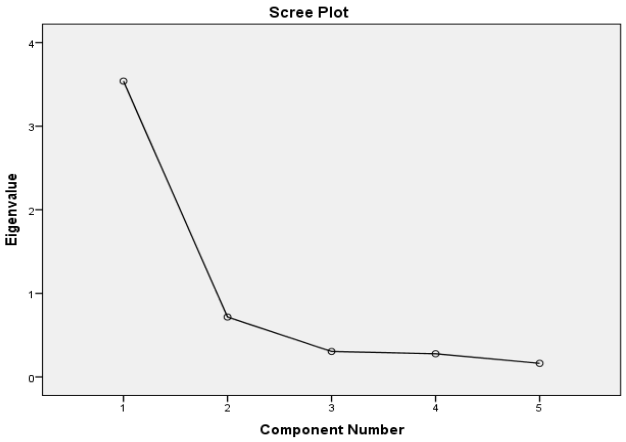

FIG 1. OUTPUT FROM SCREE PLOT FOR RISK MONITORING AND REVIEW MEASURES

C. *Influence of monitoring and review on project success*

MRA was conducted to establish the relationship of monitoring and review with project success by determining the influence of monitoring and review on project success. Regression results presented in Table 6 indicated that of the five measures (MR1, MR2, MR3, MR4 and MR5) only two items (MR3 p=0.013; and MR4 p=0.000) were statistically significant at 0.05 level. Of the two measures, MR4 made the largest significant unique contribution of 66% (beta=0.066) while MR3 made a low score of beta=-0.244. This result indicated that MR3 made less of a unique contribution.

The results in Table 7 further show that monitoring and review explained 29% (R^2=0.286) of the variance in project success at SMEs level. The ANOVA results (Table 8) indicated that the model reached statistical significance at p=0.000 (i.e., <0.05). This indicated that project success was influenced by two measures (MR3 and MR4) of monitoring and review and that this influence was significantly different by the value of 14.001 (F value). Consequently, the null hypothesis ($H1i_0$) that project monitoring, review, and continuous improvement does not influence project success could not be supported. This means that the alternate hypothesis ($H1i$) could not be rejected.

TABLE VI COEFFICIENTS-INFLUENCE OF MONITORING AND REVIEW ON PROJECT SUCCESS

Model	Unstandardized		Standardized	Sig.	Zero-order correlations
	B	Std. Error	Beta		
(Constant)	18.532	0.505		0.000	
MR1	-0.292	0.183	-0.182	0.113	0.278
MR2	-0.084	0.205	-0.051	0.684	0.219
MR3	-0.413	0.165	**-0.244**	**0.013**	0.094
MR4	1.000	0.155	**0.660**	**0.000**	0.484
MR5	0.286	0.159	0.190	0.074	0.268

TABLE VII MODEL SUMMARY-INFLUENCE OF MONITORING AND REVIEW ON PROJECT SUCCESS

Model	R	R^2	Adjusted R^2	Std.Error of the Estimate
	0.535	0.286	0.265	1.26452

TABLE VIII ANOVA-INFLUENCE OF MONITORING AND REVIEW ON PROJECT SUCCESS

	Sum of Squares	df	Mean square	F	Sig.
Regression	111.941	5	22.388	14.001	0.000
Residual	279.827	175	1.599		
Total		180			

The relationship between monitoring and review with project success was found to be significant, suggesting that the practice of monitoring and review, positively influence the success a project. This finding is similar to those of [10] [11] [16] [12] who also found that project success was influenced by monitoring and review activities. In addition, [1] incorporated project monitoring, review, and continuous improvement as part of their risk management system and was referred to as project review. Likewise [15], using a regression analysis determined that there was a statistically significant and positive relationship between each of the five critical success factors (CSFs) and project success. The five critical success factors include monitoring, coordination and design, training and Institutional environment. [15] Further explained that, consistent with theory and practice, the most prominent CSFs for project supervisors are design and monitoring. [15] Ranks M&R highly as one of the major project success factors. The current are also in line with the study of [16] which established that project success was insensitive to the level of project planning efforts but on the other hand ascertained that a significant correlation does exist between the use of M&R tools and project "profile," a success criterion which was an early pointer of project long-term impact. Once again [16] accentuates that M&R is even more critical than planning in achievement of project success. M&R as such enhance the

Proc. of the Sixth Intl. Conf. Advances in Civil, Structural and Mechanical Engineering - CSM 2018

ISBN: 978-1-63248-150-4 doi: 10.15224/978-1-63248-150-59

project management decision making during the implementation phase thus securing the success of the project [1].

CONCLUSION

The study attempted to ascertain the relationship of monitoring and review with project success. Inferential statistics were used to achieve the aim of the study. The research hypothesis presented herein provides a means for correlating monitoring and review with project success. Project success was significantly influenced by monitoring and review. This result corroborates with current literature regarding the relationship of monitoring and review with project success. This was an indication that project monitoring in construction is an important risk management practice that enhance project management decision making and hence influence project success. Regardless of the achievement of the study objective, there are boundaries to the conclusions.

The study was conducted in South Africa; however, it was delimited to the province of Gauteng. The surveyed respondents were small and medium enterprises in the CI. Moreover, the framework presented in the study concern the prediction of project success rather than failure; hence, the findings of this study may not be representative of the entire country. Furthermore, data were collected quantitatively. Other methods such as interviews could have been used to gather in-depth information from respondents. The findings recommend contractors to fully implement monitoring as part of their project risk management activities.

Acknowledgment

The authors wish to acknowledge their gratitude to all the contractors, in particular the practitioners who actively participated in our survey questionnaire.

References

[1] Berssaneti, F.T., and Carvalho, M.M. (2015). Identification of variables that impact project success in Brazilian companies, *International Journal of Project Management*, 33: 638-649.

[2] Kamau, C. (2015). Efficacy of monitoring and evaluation functions in achieving project success in Kenya: A conceptual framework, *Science Journal of Business and Management*, 3(3), 82-94.

[3] Nguyen, L.D., Ogunlana, S.O. and Lan, D.T.X. (2004). A study on project success factors in large construction projects in Vietnam, *Engineering, Construction and Architectural Management*, 11(6), 404-413.

[4] Yang, J., Shen, Q. and Ho, M. (2009). An overview of previous studies in stakeholder management and its implications for the construction industry, Journal of Facilities Management, 7(2), 159-175.

[5] Malach-Pines, A., Dvir, D. and Sadech, A. (2009). Project manager - Project (PM-P) fit and project success, International Journal of Operations & Productions Management, 29(3), 268-291.

[6] Melkonian, T. and Picq, T. (2010). Opening the "black box" of collective competence in extreme projects: Lessons from the French Special Forces. Project Management Journal, 41(3), 79-90.

[7] Rozenes, S, Vitner, G and Spraggett, S (2006) Project control: literature review. Project Management Journal, September 2006, 37(4), 5-14.

[8] Toor, S., and Ogunlana, S. (2010). Beyond the iron triangle: stakeholder perception of key performance indicators (KPIs) for large-scale public sector development projects, International Journal of Project Management 28, 228-236.

[9] Ojiako, U., Johansen, E., and Greenwood, D. (2008). A qualitative re-construction of project measurement criteria, Industrial Management and Data Systems, 108 (3), 405-417.

[10] Prabhakar, G. P (2008). What is Project Success: A Literature Review? International Journal of Business and Management, 3 (9), 1-10.

[11] Papke-Shields, K. E., Beise, C., and Quan, J. (2010). Do project managers practice what they preach, and does it matter to project success? International Journal of Project Management, 28(7), 650-662.

[12] Hwang, B. and Lim, E. (2013). Critical Success Factors for Key Project Players and Objectives: Case Study of Singapore, Journal of Construction, Engineering Management, 139(2):204-215.

[13] Kamau, C.G., and Mohamed, H.G. (2015). The efficacy of monitoring and evaluation function in achieving project success in Kenya, Science Journal of business and Management, 3(3), 82-94.

[14] Rezakhani, P. (2012). The current state of existing project risk modeling and analysis methods with a focus on Fuzzy risk assessment. School of Civil and Architectural Engineering. Kyungpook National University.

[15] Korea. Andersen, K. and Terp, A. (2006). Risk Management: Perspectives on Strategic Risk Management. Copenhagen Business School Press, Denmark.

[16] Walke, R.C., Topkar, V.M, and matekar, N.U. (2011). An approach to risk quantification in construction projects using EMV analysis, International Journal of Engineering Science and technology (IJEST), 3(9), 6847-6855.

[17] Hair,J.F, Black, W,C., Babin, J.B., Andersen, R.E. and Taham, R.I.(2006) Multivariate data analysis, 6th edition. Upper Saddle River, New Jersey: Pearson/Prentice Hall.

[18] Zaiontz, C. (2014). Real statistics using excel: Cronbach"s alpha. Word Press Online.

[19] Sekaran, U. (1992). Research Methods for Business-A skill building approach, 2nd Edition. United States of America: John Wiley & Sons, Inc.

[20] Pallant, J. (2013). SPSS survival manual: A step by step guide to data analysis using IBM SPSS. 5th edition. Allen and Unwin, Australia.

[21] Bolarinwa, O.A. (2015). Principles and Methods of validity and reliability testing of questionnaires used in social and health science researches, Nigerian Postgraduate Medical Journal, 22(4),195-201.

About Author (s):

Berenger Y. Renault was born in Gabon on June 26, 1989. He obtained his National Diploma in Construction Management and Quantity Surveying and Bachelor's Degree in Quantity Surveying from University of Johannesburg, South Africa in 2012 and 2014 respectively. He has been a Tutor at the Faculty of Engineering and The Built Environment since 2013. Renault is also a member of the Association of South African Quantity Surveyors. He is currently a Master student at the Department of Construction Management and Quantity Surveying at the University of Johannesburg under the supervision of Dr. Justus N. Agumba and N. Ansary. His work is animated by an interest in the area of risk management.

ISBN: 978-1-63248-150-4 doi: 10.15224/978-1-63248-150-59

Justus N. Agumba (PhD, MTech, BTech, PrCM, MCIOB, MAQS) holds a Bachelor's Degree in Construction Management and Quantity Surveying and also obtained in 2006 his Master's Degree in Construction Management, from University of Johannesburg, South Africa. In 2013, he received his PhD in Engineering Management, from University of Johannesburg, South Africa. He is a Professional Construction Manager, and also a Member of the Association of South African Quantity Surveyors and has many years of working experience in the Construction Industry. He is currently a Senior lecturer and academic researcher at the Department of Construction Management and Quantity Surveying, University of Johannesburg. He has published extensively in various refereed journals and has also presented papers in many international conferences all over the world. His main research interests are construction project management, construction management, risk management and Health and Safety in construction.

N. Ansary (NHD, BTech QS, MCPM, PrQS, PMAQS, MRICS, MCIOB) holds a National Higher Diploma in Building Surveying and Bachelor's Degree in Quantity Surveying from Cape Peninsula University of Technology, South Africa and Tshwane University of Technology respectively. He received in 2010 his Master's Degree, Master of Construction Project Management from University of New South Wales, Australia. He is a Professional Quantity Surveyor and has many years of working experience in the construction industry and currently working as a senior lecturer and Head of Department Construction Management and Quantity Surveying at the University of Johannesburg, South Africa. He has published several accredited articles in refereed journals and has presented papers in many international conferences all over the world. His main research interests are construction project management, construction management, dispute resolution, risk management in construction.