

Full Length Research Paper

Does regulation have an impact on project success? An empirical study in the construction industry in South Africa

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South Africa's administration of construction procurement has changed drastically since 2000 when the Construction Industry Development Board (CIDB) was established. Contractor selection in the past was mainly based on the lowest priced tender only, which often led to project failure due to tender under pricing as the contractors did not have the required experience. However, the CIDB regulations ensure that a contractor is only awarded a tender for which they qualify for according to their grading. The CIDB regulations evaluate a contractor according to their work and financial capability. It has, however, not been investigated if there is a relationship between CIDB regulations and project performance. Research results indicate that contractors who are not registered with the CIDB tend to complete projects over budget. This investigation also revealed that the years of experience of the respondent has more impact on project success than CIDB registration. This investigation indicates that the current requirement for CIDB registration is ineffective in ensuring a successful project therefore, public sector clients need to re-assess the necessity of having such a requirement and perhaps explore other requirements for the procurement of contractors.

Key words: Construction Industry Development Board (CIDB), procurement, project success criteria, South Africa.

INTRODUCTION

South Africa's administration of construction procurement has changed drastically since 2000 when the Construction Industry Development Board (CIDB) was established by an Act of Parliament (CIDB Act 38 of 2000). The Act defines construction procurement as procurement in the construction industry, including the invitation, awarding and management thereof (CIDB website). Management of construction procurement involves not only construction works contracts, but also supplies contracts that involve the purchase of

construction and services contracts relating to any aspect of construction including professional services as well as demolitions (<https://registers.cidb.org.za/Default.asp>). The reason for this change in construction procurement is that the construction industry realised that the procurement process needed to be fair, transparent, competitive, equitable and cost effective in order to bring about reforms that improve public sector infrastructure delivery and achieve government policy and objectives (<https://registers.cidb.org.za/Default.asp>). Also, in today's environment stakeholders such as the end-user and the client now demand that projects should be done according to the correct quality, within the budget and should be delivered on schedule. These three aspects of cost, quality and time are known as the traditional measures of project performance.

The board is required to provide strategic leadership within the construction industry, this is provided through

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Abbreviations: CIDB, Construction Industry Development Board; KPIs, key performance indicators; HDI, historically disadvantaged individuals; CLO, Community Liaison Officer.

the CIDB regulations which public sector clients must adhere to when awarding tenders to contractors. Contractor selection in the past was mainly based on the lowest priced tender only, which lead to project failure due to the under pricing of tenders as the contractor did not have the required experience in that type of project. However, the CIDB regulations ensure that a contractor is only awarded a tender for which they qualify for according to their grading.

Contractor grading designation is determined by the contractor's financial capability and works capability. Financial capability relates to the contractor's financial history (turnover) and the amount of working capital the contractor can muster to sustain a contract that is available capital. Available capital is determined from the liquid cash resources available to the contractor, loans that may be leveraged and any financial sponsorship. Works capability is determined by the largest contract undertaken and completed in the contractor's registered class of construction works (completed during the 5 years immediately preceding the application), the number of professionals the contractor employs and the contractor's fulfilment of relevant statutory requirements (<https://registers.cidb.org.za/Default.asp>).

Only contractors that are tendering for projects in the public sector which have a value of R200 000 or more are required to register with the CIDB. The grading ranges from Grade 1 to Grade 9 and the grade which the contractor is designated means that the contractor is considered capable of undertaking a contract less than or equal to the tender value within the contractor's registered class of works (<https://registers.cidb.org.za/Default.asp>). Contractors are required to apply for the class of works they are capable of doing. For example, if the contractor usually does general building, they should apply for general building and not civil engineering or specialist works.

The focus of this research is on procurement of engineering and construction works. Procurement is an essential part of project management. Many clients believe that the more competition there is during procurement then there will be a better opportunity for the best solution to emerge. Government has an important role to provide services to South Africa's citizens. Schools, hospitals, roads and other structures enable the Government to provide these basic services (<https://registers.cidb.org.za/Default.asp>). Public sector clients only award tenders to contractors who are registered with the CIDB. The CIDB regulations evaluate a contractor according to their work and financial capability, thus reducing the risk of choosing an incompetent contractor. It has not, however, been investigated if there is a relationship between CIDB regulations and project performance. This study will focus on the CIDB regulations and explore their impacts on project performance. The main research question addressed in this paper reads: is there a relationship between CIDB regulations

and project performance? If the assumed relationship between CIDB regulations and project performance exists and one finds otherwise, then the CIDB regulations may not be achieving their mandate, or the sections of CIDB regulations may be ineffective and thus need to be evaluated and amended in order to assist with positive project performance.

LITERATURE REVIEW

The focus of this research study is on the impacts of CIDB grading on project performance, therefore it is necessary to begin the theoretical aspects of procurement of contractors and project performance measures. The results from the literature review will be used to formulate the conceptual framework to evaluate the respondent's experience on contractor procurement practices and project performance.

Project procurement management

Project procurement management includes the processes to purchase or acquire the products, services or results needed from outside the project team to perform the work (PMI, 2008). Project procurement management also includes administering any contracts issued by an outside organisation (buyer); that is acquiring the project from the performing organisation (seller) and administering the contractual obligations placed on the project team by the contract.

In general, the project procurement management processes include the following (PMI, 2008):

1. Plan procurements – The process of documenting project purchasing decisions, specifying the approach, and identifying potential sellers.
2. Conduct procurements – The process of obtaining seller responses, selecting a seller, and awarding a contract.
3. Administer procurements – The process of managing procurement relationships, monitoring contract performance, and making changes and corrections as needed.
4. Close procurements – The process of completing each project procurement.

In the context of CIDB, the CIDB defines procurement as the process which creates, manages and fulfils contracts relating to the provision of supplies, services works, the hiring of anything, disposals and the acquisition or granting of any rights and concessions (<https://registers.cidb.org.za/Default.asp>). Procurement activities commence once the need for procurement is identified and end when the transaction is completed. There are six generic steps that need to be taken to

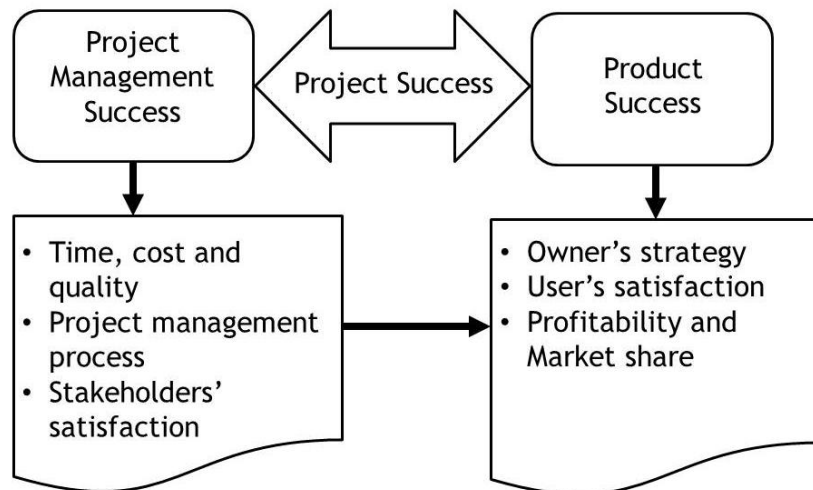


Figure 1. Project success components. Source: (Baccarini, 1999).

proceed from one activity to another. These steps in the CIDB procurement processes are:

- Step 1: Establish what is to be procured
- Step 2: Decide on procurement strategies
- Step 3: Solicit tender offers
- Step 4: Evaluate tender offers
- Step 5: Award contract
- Step 6: Administer contracts and confirm compliance with requirements

These steps may be categorised as inputs towards the attainment of a milestone. Decisions or approvals are required within the procurement process in order to proceed to the next step (CIDB website).

Project performance measurement

Toor and Ogunlana (2009) emphasise that performance measurement is an important aspect of project management and needs to be done continually during a project in order to achieve greater client satisfaction. They further highlight that project performance measurement needs to be more comprehensive than the well known on-time, within budget and according to specifications criteria. Moreover, measures should not only include quantitative and objective criteria but also more qualitative and subjective criteria. Toor and Ogunlana (2009) have found that project success has a different meaning to different stakeholders. Moreover, they (Cookie-Davies, 2002) offer a distinction between project success and project management success. Project success is measured against the overall objectives of the project, whereas project management success is measured against the widespread and traditional measures of performance against cost, time and quality. With a slightly different view,

Baccarini (1999) distinguished project success into two components: project management success and product success. The composition for each component is shown in Figure 1.

Chan and Chan (2004) distinguished two kinds of measurements for construction project success: objective and subjective measures. Project psychosocial outcomes are measured subjectively, for example stakeholders' subjective opinions on their satisfaction towards certain aspects of the projects. On the other hand, objective measures can be obtained using mathematical formulae. Examples of such measures are cost and time performance. A more recent review on construction project success from Al-Tmeemy et al. (2010) shows three dimensions of success in construction projects, namely project management success, product success and market success, as depicted in Figure 2.

The framework developed by Al-Tmeemy et al. (2010) partially overlaps with Baccarini's framework (1999). Both of them agree upon the two main components of project success, namely project management success and product success. These two overlapping components will be the focus of this study, because CIDB registrations may be more directly related to these two aspects of project success. The reason is that project management success and product success are seen as performance measures during the project, from project initiation up to the hand-over or close-out of the project. Market success is investigated as part of the project's business case and the benefits of the project can only be fully confirmed after the project has been completed and is therefore a post project activity.

Project procurement and project success

One of the most important decisions faced by a client is

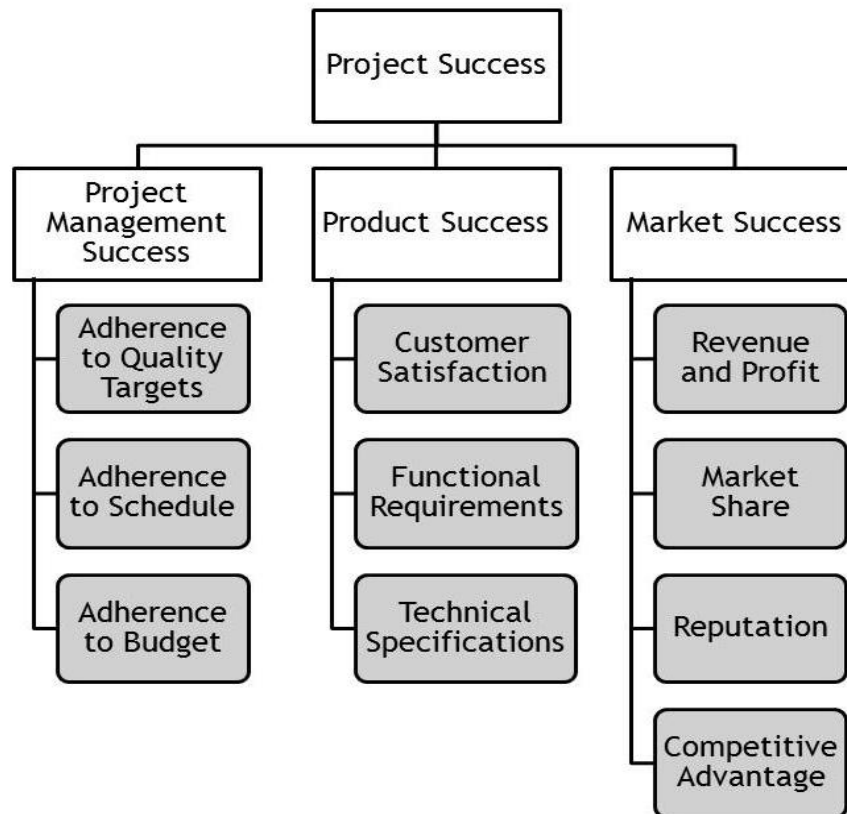


Figure 2. Success criteria for building projects. Source: (Al-Tmeemy et al., 2010).

to entrust a project to a contractor. Contractor selection is a multi-facet decision making process and it plays a vital part in the project management cycle and the overall project performance (Zavadskas et al., 2008; Singh and Tiong, 2006).

The studies of Holt et al. (1995) and Doloi (2009) have proposed that emphasis should be on the contractor's ability to achieve client satisfaction and the choice of contractor should be made on value for money basis rather than automatically accepting the lowest bid.

Watt et al. (2009) propose that performance and expertise are key considerations when evaluating contractors. However, Watt et al. (2009) also proposed that when pre-qualification measures are evaluated for the selection of contractors and suppliers of management service, emphasis should be placed on the following:

1. Experience
2. Expertise
3. Performance
4. Reputation
5. Workload
6. Capacity of contractors

Another significant finding of Watt et al. (2009) is that the tendered price is the third most important criteria in the

selection of a contractor. Watt et al. (2009) referred to Holt et al. (1994) who previously identified that the most important criteria in an evaluation of a contractor are:

1. Capability
2. Past performance
3. Management skills
4. Cost
5. Organisational experience

Watt et al. (2009) support the high levels of importance placed on past performance, management skills and cost as identified by Holt et al. (1994), but organisational experience was rated the least important for all the criteria implemented in their study.

Doloi (2009) performed an analysis on the pre-qualification criteria in contractor selection and their impacts on project success. Doloi (2009) found that there is a relationship between contractor selection attributes and project success measures in delivering a successful project. Moreover, Doloi (2009) also discovered that technical expertise, success in past projects and sound programming and capability has a significant influence in achieving overall success. Luu et al. (2008) research findings indicate that benchmarking can improve the contractor's performance as well as learning from others

can assist with continual improvement.

RESEARCH METHODOLOGY

The research methodology consists of a standardised survey issued to a random sample in the civil engineering industry and project management as well as engineering management population. The following groups were approached to respond to survey questionnaires: project managers, consultants, government department managers and engineers from the South African civil engineering industry.

The intention of this sampling group is to target respondents of varying levels of experience who work in the construction industry, or work with people in the construction industry such as contractors, on government and/or private sector projects. A standardised survey was conducted electronically through the use of Survey Monkey. The great strength of the survey as a primary data-collecting approach is its versatility (Blumberg et al., 2008). This research approach allowed structured questions to be posed to respondents. There were a total of 158 respondents who participated in the survey, of which 76 were completed and valid, resulting in responding rate of 48%. Statistical package for the social sciences (SPSS version 17.0) was used to perform the statistical analysis on the data gathered from the valid questionnaires. Independent samples t-test was used to explore group differences in project performance. Correlations were performed to explore any relationships between CIDB grading and project performance.

Table 1 shows all the variables and the associated questions in the questionnaire for their measurements. There are three parts in the questionnaire. Part A is related to demographic information with regards to the respondent, the respondent's organisation and the project's tender value. Part B consists of questions relating to contractors with or without CIDB registrations. Part C represents the indicators used for project success.

EMPIRICAL RESULTS

Descriptive statistics

The following is a summary of the demographic information of the respondents and their organisations as well as the CIDB variables:

- i. Respondents' occupation - 29% are project managers, 32% engineers and 21% project engineers, 10% are directors and 8% are technical managers.
- ii. Respondents' years of experience - 36% have 5 years or less, 34% have 6 - 10 years, 14% have 11-15 years, 4% have 16 - 25, 3% have 26 - 30 and 5% have more than 30 years of experience.
- iii. Organisation type - 55% are consulting firms, 41% are government departments and 4% are local municipalities.
- iv. CIDB registration - 68% of respondents' organisations are not registered with the CIDB while only 32% of respondents' organisations are registered with the CIDB.
- v. Tender values of projects - 46% of the contractors work on projects that have a tender value from R40 million to an unlimited amount, 39% of respondents work on projects that have a tender value from R4 million to R13 million and 15% respondents work on projects that

have a tender value from R650 000 to R2 million. Number of CIDB (un) registered contractors per project - On average, there are 46 and 10 of CIDB registered and unregistered contractors per project respectively.

vi. Time spent working with CIDB (un)registered contractors - From the frequency counts, 46% of the respondents spent 100% of their time working with CIDB registered contractors and 54% of them spent less than 100% of their time working with CIDB registered contractors (in other words, they spent their time working with both CIDB registered and unregistered contractors). These two independent groups of respondents (with similar group sizes) will be discussed in detail later in the independent samples t-test.

The following is a summary of the respondents' experience on project success:

1. Respondents indicated that 70% of projects are behind schedule, only 20% are on time and 8% are ahead of schedule. The remaining 2% of respondents did not know.
2. Respondents indicated that 47% of their projects are over budget, 24% are within budget or the respondent is unsure and only 5% are under budget. The remaining 24% of respondents did not know.

Table 2 shows the mean values and standard deviations of the other variables in project success which were measured using five point Likert scale.

From the table, it is seen that all mean values are around 2 (that is disagree). In other words, the subjective measures for project success in this study are not at satisfactory level.

Independent samples t-test

As previously discussed in the descriptive analysis, two independent groups of respondents were found based on their involvement with contractors (Table 3). One group of the respondent works 100% of the time with CIDB registered contractors (denoted as Group 0). The time spent working with CIDB registered and unregistered contractors were expressed by the respondents in percentages and these two percentages need to add up to 100% as specified in the questionnaire. One may interpret that Group 0 as respondents who do not spend time working with CIDB unregistered contractors (that is 0% time was spent working with CIDB unregistered contractors). The other group works less than 100% of the time with CIDB registered contractors (denoted as Group1). One may regard that respondents in Group 1 work with a mixture of contractors with and without CIDB registration, therefore, they work with contractors without CIDB to a certain extent. From Table 1, two significant group differences with regards to project success were observed:

Table 1. Measurements of variables.

Part A: demographic variable		Measurement	
Respondent	A1: Job title	What is your job title in your organisation (project manager, project engineer, engineer, director, technical manager, other)	
	A2: Years of experience	How many years of experience do you have in construction projects?	
Organisation	A3: Organisation type	What type of organisation are you currently working for (consultant, local municipality, government department, others)	
	A4: CIDB registration	Is your organisation currently registered with CIDB (yes/no)	
Project	A5: Tender values	In the past 2 years, what is the average tender value of the construction projects you were involved?	
Part B: CIDB variable		Measurement	
Number	B1: Number of CIDB registered contractors per project	In the past 2 years, how many CIDB registered contractors were appointed on average per construction project?	
	B2: Number of CIDB unregistered contractors per project	In the past 2 years, how many CIDB unregistered contractors were appointed on average per construction project?	
Time spent	B3: Time spent with CIDB registered contractors	In the past 2 years, how often have you worked with CIDB registered and unregistered contractors on construction projects (<i>express in percentage of the time spent working with them respectively; two percentages should add up to 100% in total</i>)	
	B4: Time spent with CIDB unregistered contractors		
Part C: project success variables		Measurement	
Project management success	C1: Adherence to quality targets	The contractor has put in effort during project management processes to ensure the project will meet its specification. (5 point Likert scale: 1= totally disagree to 5= totally agree)	
	Adherence to schedule	C2: Ahead of schedule (y/n)	Was the project completed ahead of the planned schedule? (yes/no)
		C3: Ahead of schedule (%)	How much was the project completed ahead of the planned schedule (in % of the planned schedule)
		C4: Behind schedule (y/n)	Was the project completed behind the planned schedule (yes/no)
		C5: Behind schedule (%)	How much was the project completed behind the planned schedule (in % of the planned schedule)
	Adherence to budget	C6: Under budget (y/n)	Was the project completed under the planned schedule? (yes/no)
		C7: Under budget (%)	How much was the project completed under the planned budget? (in % of the planned budget)
		C8: Over budget (y/n)	Was the project completed over the planned schedule (yes/no)
	C9: Over budget (%)	How much was the project completed over the planned budget? (in % of the planned budget)	
Product success	C10: Customers satisfaction	The customers are satisfied with the project (5 point Likert scale: 1= totally disagree to 5= totally agree)	
	C11: Stakeholders satisfaction	The stakeholders are satisfied with the project (5 point Likert scale: 1= totally disagree to 5= totally agree)	
	C12: Functional requirements	The project has met its functional requirement (5 point Likert scale: 1= totally disagree to 5= totally agree)	
	C13: Technical specifications	The project has met its technical specifications (5 point Likert scale: 1= totally disagree to 5= totally agree)	

Table 2. Means and standard deviations of project success factors.

Project success variable	Mean	Standard deviation
Adhere to quality targets	2.11	0.869
Stakeholders' satisfaction	2.10	0.730
Clients' satisfaction	2.03	0.702
Functional requirement	1.88	0.661
Technical specifications	2.00	0.776

Table 3. Results of independent t-tests of project success.

Variable	Time spent with CIDB registered contractors				Difference in mean values t-test ^a
	Group 0		Group 1		
	Respondents who spent 0% of their time with CIDB unregistered contractors		Respondents who spent time with CIDB unregistered contractors to a certain extent		
	Mean	Standard deviation	Mean	Standard deviation	
Adhere to quality targets	2.2	0.901	2.03	0.843	0.174
Projects are completed behind schedule	33.1	20.372	32.08	18.645	1.02
Projects are completed over budget	0.197	0.097	0.244	0.076	-0.047*
Performance in schedule	0.17	0.382	0.38	0.493	-0.213**
Performance in budget	0.46	0.508	0.3	0.466	0.164

^aMean difference between the two groups; *, mean difference is significant at $p < 0.1$; **, mean difference is significant at $p < 0.05$.

1. Group 0 completed 19.7% over budget while Group 1 has projects completed 24.4% over budget. The mean difference between the two groups is significant ($p < 0.1$). In other words, when respondents spend time with CIDB unregistered contractors, the projects tend to be completed over budget.

2. Data for performance in schedule is coded in the following way. If projects are completed mostly within or ahead of schedule, the variable (performance in schedule is coded) is denoted as 1 to indicate that the performance is good. If projects were completed behind the schedule, then it is denoted as 0 (poor schedule performance). From Table 3 one can observe that 17% of respondents in Group 0 perform well in terms of project schedule. 38% of respondents in Group 1 perform well in terms of project schedule. The difference in the mean values between the two groups is significant ($p < 0.05$). Therefore, if respondents work 100% of their time with CIDB registered contractors, the project tends to be completed behind schedule.

Data for performance in budget is coded as the following. If projects are completed mostly within or under budget, the variable is denoted as 1 (that is good budget performance). If the projects were completed over the

budget, then it is denoted as 0 (poor budget performance). From Table 3 it can be viewed that there are 46% of respondents in Group 0 and 30% of respondent in Group 1 performing well in terms of the project budgets. However, the difference in the mean values between the two groups is not significant. Therefore, time spent working with CIDB unregistered contractors does not influence the budget performance of projects.

Correlation statistics

A correlation analysis was performed by using Pearson correlation coefficients. Table 4 shows the correlation coefficients of the analysis which indicates the relationships between the the following variables and project success:

1. Years of experience of the respondent
2. Number of CIDB registered and unregistered contractors per project
3. Time spent working with CIDB registered and unregistered contractors

From Table 4 the following significant correlations can be found:

Table 4. Correlation analysis on project performance.

Project performance	Years of experience of the respondent	Number of CIDB registered contractors per project	Number of CIDB unregistered contractors per project	Time spent working with CIDB registered contractors	Time spent working with CIDB unregistered contractors
Adhere to quality targets	0.231*	0.125	-0.01	0.013	-0.013
The stakeholders are satisfied with the project	0.235*	-0.02	0.043	-0.157	0.157
The clients are satisfied with the project	0.086	-0.053	0.073	-0.044	0.044
The project has met its functional requirement	0.266*	-0.14	0.051	-0.003	0.003
The project has met its technical specifications	0.235*	-0.016	0.047	-0.117	0.117
How much behind schedule projects are completed	0.313*	0.018	-0.044	0.01	-0.01
How much over budget projects are completed	0.007	-0.023	0.322*	-0.186	0.186

*Correlation is significant at the 0.05 level (2-tailed).

1. There are several positive correlations found between the years of experience of the respondents and project success variables. The more years of experience that the respondent has, the more successful the project may be with regards to adherence of quality targets, stakeholders satisfactions, functional requirement and technical specifications. However the more years of experience the respondent has, may result in projects being behind schedule. One reason could be that respondents are more concerned with obtaining project success in terms of the variables previously mentioned which may lead to a delay in projects.

2. Number of CIDB unregistered contractors perproject is positively correlated with projects com-pleted over budget. This means that the more the CIDB unregistered contractors are involved per project, the more over budget (expressed in terms of % of the planned budget) the project will be completed.

CONCLUSIONS AND RECOMMENDATIONS

Contractor selection in the past was based mainly

on the lowest price tendered only, which often led to project failure. Due to this reason, CIDB regulations were established by an Act of Parliament in South Africa in 2000 to ensure that a contractor is only awarded tenders for which they qualify for according to their grading. One may assume that CIDB regulations may have a positive influence in construction projects, but this assumption has not been investigated yet. This study empirically explores and answers the research question: Is there a relationship between CIDB regulations and project performance? The following is a summary of the main findings from both the independent t-test and the correlation analysis:

1. From the t-test, this study found that time spent working with CIDB unregistered contractors tend to result in projects being completed over budget. While time spent working with CIDB registered contractors tend to result in projects being completed behind schedule.

2. From the correlations performed in this study, it is found that there is no correlation between the numbers of CIDB registered contractors per

project and project performance. Moreover, there is no correlation between the time spent working with CIDB registered contractors and project performance.

3. There is a positive and significant correlation between the numbers of CIDB unregistered contractors and projects being over budget.

4. This investigation also revealed that the years of experience of the respondent has more impact on project success than CIDB registration.

From the aforementioned findings, one may conclude that the current requirement for CIDB registration cannot be an indicator of project success. The only finding that may support CIDB towards project success is that CIDB unregistered contractors tend to result in projects being over budget; and that having CIDB registration implies project are completed with being less over budget, although, this finding is not significant. The respondents’ years of experience in construction projects is an important factor contributing positively towards the success of projects. This does not, however, mean that the attributes of respondents (for example, years of experience in

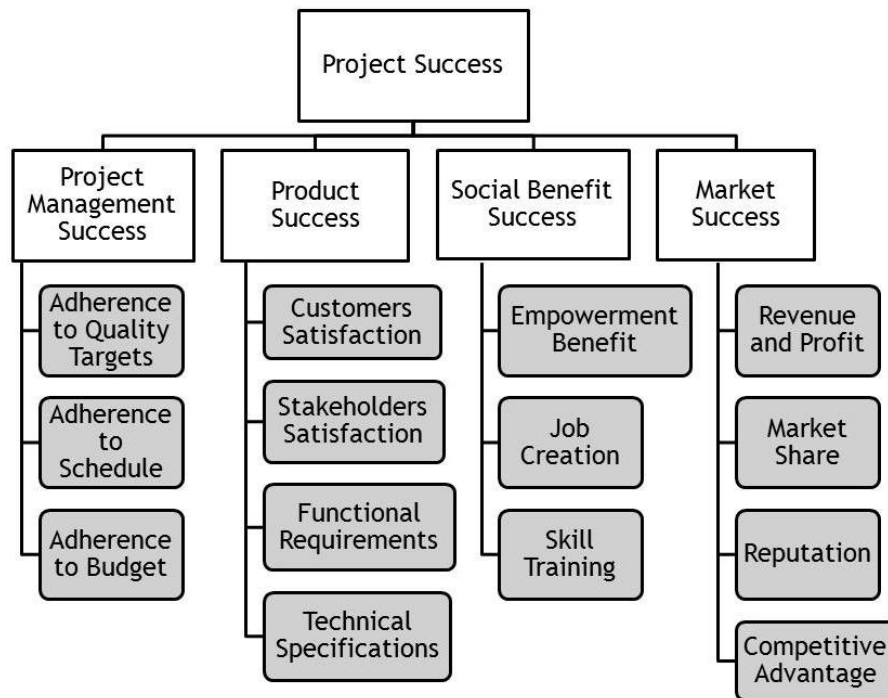


Figure 3. Proposed success criteria for building projects in South Africa for future study.

this study) are more important than the attributes of the contractors (for example, CIDB registration in this study) in projects. The findings found that this research tend to have two implications. Firstly, the findings imply CIDB registration is less effective than anticipated (and not the unimportance of CIDB registration).

This study recommends deeper investigations on the effectiveness of CIDB registration awarding process to policy makers and to include other aspects of contractors' capabilities (other than financial and work capabilities) as additional requirements in the CIDB registrations. The second implication is that there might be other factors contributing to the project success framework. This study took seven close-out reports from construction projects in the public sector. One of the requirements in these projects is CIDB registered contractors. A detailed examination into these reports found the following requirements that contribute to the uniqueness of South African procurement procedures:

1. Job creations: Tenders that are able to employ labour intensive work methods were given preference.
2. Tenders reflecting a high proportion of ownership by historically disadvantaged individuals (HDI) were given preferences.
3. Preferences were given to tenders that sub-contract work to enterprises with HDI equity ownership.
4. Community participation: The Community Liaison Officer (CLO) were appointed by the contractors and provided the contractors with lists of local labour to be

employed.

5. Skills training: Accredited trainings or on-the-job trainings.

For future studies, it is recommended to include three additional indicators for project success in the South African context: empowerment benefit, job creation and skills training. These success criteria are associated to social benefits that the projects bring to the society. The proposed framework is shown in Figure 3.

There are several factors, which do not do not relate to CIDB or poor craftsmanship specifically, that were accountable for projects being overtime or over budget found in these reports:

1. Environmental protection concerns
2. Climate change (unexpected long period of rainfall)
3. Delay caused by local authorities (for example, Water management department, Telkom)
4. Xenophobia (protests against foreigners, due to their willingness to work as cheap labour)
5. Delays in payment
6. Accidents

These factors may contribute to the weak relationship between CIDB and project success. For future study, one may include these factors as control variables in regression analysis. Thus the true reflection of CIDB and project success can be revealed. There are certain limitations in this study and these limitations lead to

further future study directions. The respondents of the survey have projects located mostly in the Gauteng province. Although, most economic activities are concentrated in Gauteng as compared to other provinces, this investigation could be done throughout South Africa in order to get more clarity on whether these findings are mainly in Gauteng or can be generalised for the whole country.

Secondly, CIDB registration requirements include financial and work capabilities of the contractors as part of the requirements. This study does not perform detailed investigation of these two types of capabilities and their direct contribution to project success (for example, using regression analysis). If these capabilities do not contribute significantly towards project success, there may be other capabilities that one can include in the future studies to improve the research framework.

REFERENCES

- Al-Tmeemy SMHM, Abdul-Rahman H, Harun Z (2010). Future criteria for success of building projects in Malaysia. *Int. J. Proj. Manag.*, 29(3): 337-348.
- Baccarini D (1999). The logical framework method for defining project success. *Proj. Manag. J.*, 30(4): 25-32.
- Blumberg B, Cooper DR, Schindler PS (2008). *Business Research Method*. (2nd European ed). Berkshire, UK: McGraw-Hill Education.
- Chan APC, Chan APL (2004). Key performance indicators for measuring construction success. *Benchmarking: An Int. J.*, 11(2): 203-221.
- CIDB, Website. Construction Industry Development Board. <https://registers.cidb.org.za/Default.asp>. accessed 01/02/2010.
- Cookie-Davies T (2002). The real success factors on projects. *Int. J. Proj. Manag.*, 20(3): 185-190.
- Doloi H (2009). Analysis of pre-qualification criteria in contractor selection and their impacts on project success. *Constr. Manag. Econ.*, 27(12): 1245-1263.
- Holt GD (1994). Applying multi-attribute analysis to contractor selection decision. *Eur. J. Purch. Supply Manag.*, 1(3): 139-148.
- Holt GD, Olomolaiye PO, Harris FC (1995). A review of contractor selection practice in the U.K. construction industry. *Build. Environ.*, 30(4): 553-561.
- Luu T-V, Kim S-Y, Cao H-L, Park Y-M (2008). Performance measurement of construction firms in developing countries. *Constr. Manag. Econ.*, 26(4): 373-386.
- PMI (2008). *A Guide to the Project Management Body of Knowledge*. (4th ed). Newtown Square, USA: Project Management Institute Inc.
- Singh D, Tiong RLK (2006). Contractor selection criteria: Investigation of opinions of Singapore construction practitioners. *J. Constr. Eng. M., ASCE*. 132(9): 998-1008.
- Toor SR, Ogunlana SO (2009). Beyond the 'iron triangle': Stakeholder perception of key performance indicators (KPIs) for large-scale public sector development projects. *Int. J. Proj. Manag.*, 28(3): 228-236.
- Watt DJ, Kayis B, Willey K (2009). Identifying key factors in the evaluation of tenders for projects and services. *Int. J. Proj. Manag.*, 27(3): 250-260.
- Zavadskas EK, Turskis Z, Tamošalitiene J (2008). Contractor selection of construction in a competitive environment. *J. Bus. Econ. Manag.*, 9(3): 181-187.