TOWARD DETERMINING CRITICAL SUCCESS FACTORS FOR SME ELECTRICAL CONTRACTORS IN THE CONSTRUCTION INDUSTRY IN SOUTH AFRICA

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ABSTRACT

The construction industry in the current South African context is very vibrant. Since 1994 there has been a drive by government and business to promote small and medium size enterprise (SME) contractors. SME contractors often do not succeed in the construction industry project environment. This research study explores the subject of project success by attempting to identify the critical success factors for SME electrical contractors in the South African construction industry. The study delves into the general characteristics of the South African construction industry and the attributes of SME contractors in South Africa. The research strategy and methodology involved the evaluation of literature, interviews with selected industry experts, and a survey through a questionnaire. Various critical success factors were identified, in four logical groupings; Money, Man, Management, and Milieu.

OPSOMMING

Die boubedryf in die huidige Suid Afrikaanse omgewing is lewendig en aan die groei. Vanaf 1994 het die regering en die besigheidswêreld begin om klein en medium kontrakteurs te ondersteun. Hierdie klein en medium kontrakteurs is dikwels onsuksesvol in die boubedryf projekomgewing. Hierdie navorsingstudie ondersoek die onderwerp van projeksukses deur die kritiese suksesfaktore vir klein en medium elektriese kontrakteurs in die Suid Afrikaanse boubedryf te identifiseer. Die studie ondersoek die algemene karaktereienskappe van die Suid Afrikaanse boubedryf sowel as die karaktereienskappe van klein en medium kontrakteurs. Die navorsingstrategie beskik oor 'n literatuurstudie, onderhoude met industrie kundiges, asook 'n vraelys. Verskeie kritiese suksesfaktore is groepeer in vier logiese groepe: Geld, Mens, Bestuur, en Omgewing.

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1. INTRODUCTION

The construction industry is very dynamic by nature [1], and – in the current South African context, with the construction of the Gauteng Rapid Rail Link (also known as the Gautrain) and stadia for the 2010 soccer World Cup – very vibrant. The construction industry is a highly competitive environment, driven mainly by projects. Thus, the success of companies in the construction industry is inextricably linked to the success of the projects they execute. Mbachu and Nkhado [2] argue that construction companies must meet the expectations and requirements of clients when delivering projects, thus creating and retaining satisfied customers, in order to succeed and remain sustainable.

Electrical contractors play an important role in the construction industry. In all building construction projects the primary role of the electrical contractor is to carry out the installation and commissioning of the electrical equipment and services [3]. Horman et al. [4] allude to the fact that electrical work is often complex and difficult in building construction, and claim that electrical machinery, components, and systems are amongst the most technically sophisticated components in a building. Electrical contractors normally assume the role of a sub-contractor, and thus are not the main drivers of a project. This normally results in electrical contractors exercising minimal influence over the planning and early organisation of the project [5].

In a bid to stimulate growth, improvement, and sustainability in the South African construction industry, the Construction Industry Development Board (CIDB) was established in 2000 by the South African government. The CIDB registers construction contractors and projects. The CIDB register [6] contains 599 electrical engineering contractors, of whom more than 80 percent are qualified to undertake projects with a maximum value of R1.5 million. These are typically very small and micro enterprises whose practices border on survivalist business methods. In most of these organisations the owner is the only skilled individual, and hence his/her ability to replicate himself/herself on more than one project/construction site is limited.

The purpose of this paper is to present research that identifies the most critical success factors from a strategic point of view for small, medium and micro enterprise (SME) electrical contractors, with the ultimate aim of achieving growth, stability, and sustainability within the industry. In order to identify these success factors, the following questions had to be answered:

- What is project success in the construction industry?
- What are the key project success factors affecting the electrical contractor in the construction industry?

The intended outcomes of the research were: the first order definition of critical success for SME electrical contractors in the construction industry; the creation of awareness among industry stakeholders, thereby developing intervention strategies to improve and sustain SME electrical contractors; and the enrichment of the body of literature on critical success factors for SME electrical contractors.

2. LITERATURE REVIEW AND CONCEPTUAL MODEL

The literature relating to this research study was surveyed and subsequently reviewed in two sections: (i) Assessment of project success, and (ii) Evaluation of critical success factors in projects. A conceptual model developed from this literature review was used in the research questionnaire.

2.1 Assessment of project success

'Project success' is a concept that can mean so much to so many different people. Because of the varying perceptions, there are often disagreements about whether or not a project is

successful [7] – and so it is vital that the criteria for measuring project success be set out when the project begins.

Baccarini [8] argues that the criteria for measuring project success have two distinct components: *project management success*, which is primarily aimed at evaluating the management processes followed during project execution, and which focuses primarily on the successful implementation of time, cost, and quality objectives; and *project success*, which focuses on the project's ultimate deliverable.

According to Chan and Chan [1], the criteria for project success can be defined as a set of principles or guidelines by which a favourable outcome may be attained within certain performance objectives. They further assert that a benchmark for measuring the performance of a construction project, and thus helping to ensure project success, can be developed though a set of key performance indicators that are divided into objective measures (time, cost, net present value, etc) and subjective measures (quality, functionality, client satisfaction, etc.)

The construction industry is a highly dynamic and projectised environment. Because they operate in such an environment, construction companies differ fundamentally from traditional organisations. Construction companies are more aimed at producing a certain defined goal, while permanent organisations are focused on achieving efficiency in their routine processes [9].

Lim and Mohamed [10] hold the view that in construction projects, the services of the project should be viewed from different perspectives: those of the individual owner, the developer, the contractor, and the users. In this approach they argue that project success in construction projects has two viewpoints: the *macro* viewpoint, which is the view of the users and owners; and the *micro* viewpoint, which mainly concerns the construction phase of the project. The micro viewpoint can also be called the *production* viewpoint, and it mainly concerns the developer and the contractors.

Morris and Hough [11], Kometa et al. [12] and Mbachu & Nkado [2] further identify the following ten success factors that should be present to achieve successful execution of a construction project:

1. Project definition and formulation
2. Project finance and mechanism
3. Matters relating to contracting
4. Legal agreements
5. Human resource factors
6. Project implementation and management
7. Politics and social factors
8. Schedule and urgency
9. Duration of the schedule
10. Planning activities

Adversarial relationships between owners and contractors create a climate that puts success of the project at risk [13]. Dlungwana et al. [14] also identified adversarial relations between owners and contractors as contributing towards poor contractor performance and ultimately the failure of projects. This was found to be particularly true in the South African construction industry. Mbachu and Nkado [2] add that these adversarial relations also exist between main contractors and sub-contractors in South Africa.

2.2 Evaluation of critical success factors in projects

In most industries there are usually three to six primary factors that determine success. These key factors must be managed exceedingly well for a company to be successful and sustainable [15]. Critical success factors were originally defined by Rockart [16] as "the

limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organisation. They are the few key areas where things must go right for the business to flourish. If results in these are not adequate, the organisation's effort for the period will be less than desired". Belassi and Tukel [17] propose a new framework that groups critical success factors into four key areas (see Figure 1). These relate to (i) the project (size, value, etc.), (ii) the project team (technical and administrative skills required), (iii) the organisation (support from top management), and (iv) the external environment (political, economic, social).

Critical success factors are key strategic factors that are at SMEs' macro level. The critical success factors are key growth and sustainability factors for the organisation and the industry at large.

2.3 Conceptual model: The 4-M Framework

Belassi and Tukel [17] suggest that there must be a cause-and-effect relationship between the identified critical success factors and the response of the system, which leads to project success or failure. This framework is represented in Figure 1 [17] below, and highlights the logical grouping of factors into the four areas mentioned above.

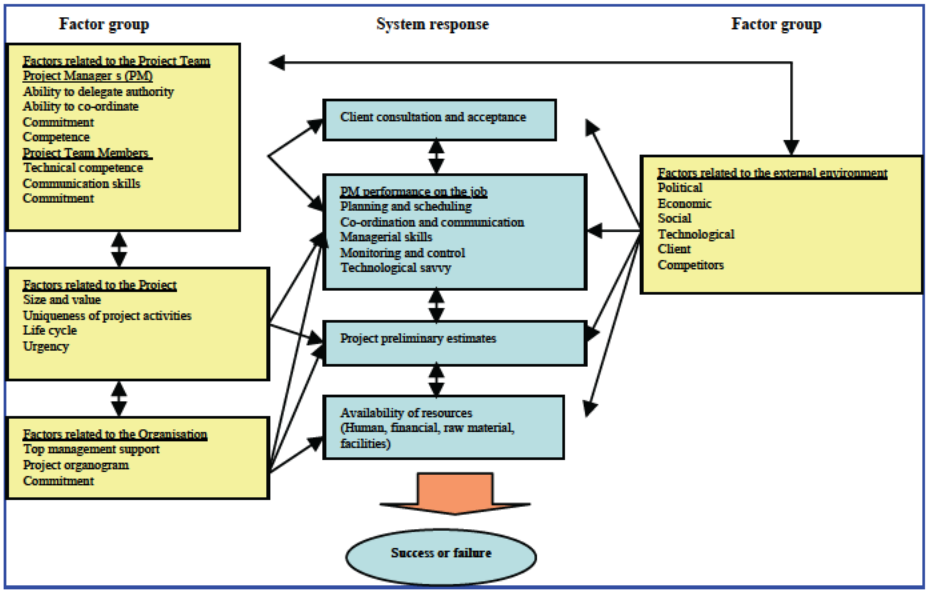

Figure 1: Critical success/failure factors in projects [17]

The four factor framework suggested by Belassi and Tukel [17] shares similarities with the four constructs of the Ishikawa diagram [18], also known as a cause-and-effect diagram. It illustrates how various factors might be linked to achieve a specific effect. By identifying the multiple factors by using the cause-and-effect relationship, and grouping them according to the Belassi and Tukel [17] framework, we achieve the cause-and-effect diagram illustrated in Figure 2.

These factors, which are critical for the success of SME electrical contractors, were identified using the factors highlighted in the literature. The factors were then grouped into the 4-Ms. A summary of them is shown in Figure 3.

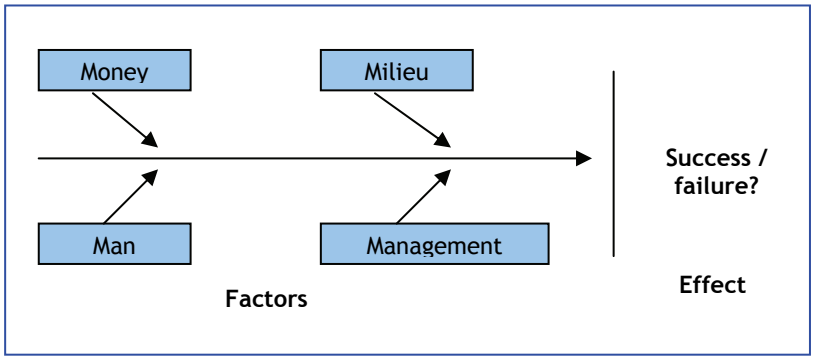

Figure 2: Cause-and-effect diagram for the research problem

Money **(Factors related to the project)** • Access to finance • Working capital management (cash flow) • Payment terms • Construction guarantees	**Management** **(Factors related to the organisation)** • Availability of manpower • Skills and training • Labour relations • Commitment
Man **(Factors related to the project team)** • Top management support • Project management • Business/general management • Contract management	**Milieu** **(Factors related to the environment)** • Construction site relationships • Client organisation • Main contractor behaviour • Legislative environment • Political, social, economic, technological

Figure 3: Summary of factors grouped under the 4-Ms

3. RESEARCH METHODOLOGY

The research design of this study is illustrated in Figure 4.

The literature survey was undertaken to provide the theoretical basis and background to the research undertaking. It evaluated the broader subject of project management, project success, the South African construction industry, and – most importantly – the critical success factors.

During the data-gathering phase, preliminary interviews were undertaken with six selected industry experts. Fifteen questions (on which the interview was based) were distributed to the interviewees two weeks before the interview. All interviews were recorded for future reference.

The information obtained from the literature survey and the preliminary interviews formed the basis for developing a survey questionnaire for distribution to the selected sample group in the built environment. The database of the South African Association of Consulting

Engineers (SAACE) was used as the sample.[2] This is judgmental sampling, and in the opinion of the researchers, these consulting engineers were mainly involved with the SME contractors during the implementation phase of the project. The subset of organisations on the SAACE database that are based in South Africa and are registered in the disciplines of electrical engineering and project management was selected. This was a sample of 54 companies, within which the questionnaire was distributed to 143 individuals using a web-based tool called Survey Monkey.

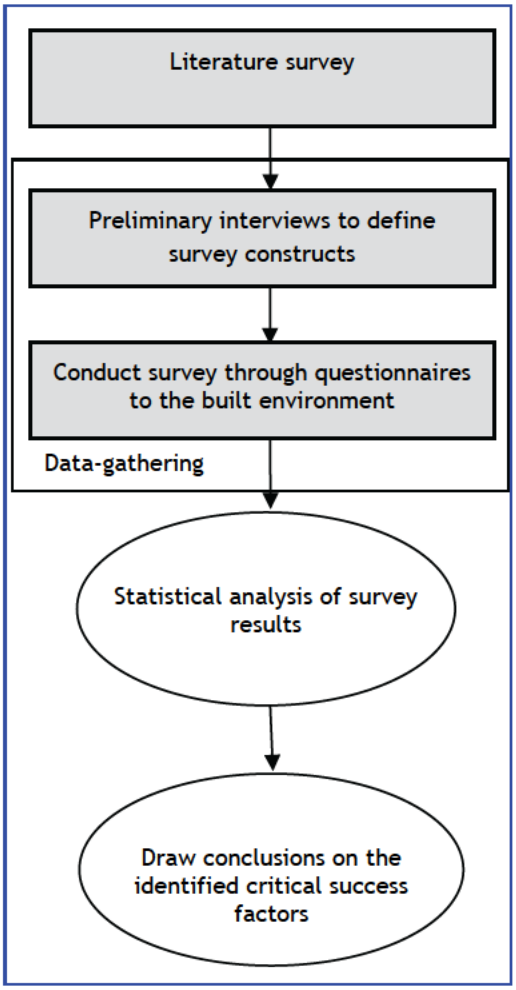

Figure 4: Design of the research study

Through cooperation with the Department of Statistics of the University of Pretoria, the completed questionnaires were analysed using statistical techniques, specifically frequency and modal analysis.

[2] SAACE is a highly-organised voluntary association of independent consulting engineers in private practice.

3. RESULTS

Preliminary interviews were conducted with experts in the industry in order to gather more relevant data after the literature survey, before compiling the survey questionnaire. Six industry experts were selected, based on their experience in working with SME electrical contractors. The average experience of the panel was 28 years. Due to budgetary constraints, the experts interviewed were limited to Johannesburg and Pretoria.

In each face-to-face interview, the interviewees were asked to respond to a set of precompiled questions. The interviewees mostly had similar comments on the factors that are critical for success. Depending on the environment they came from and their past experience, however, they emphasised different critical success factors. The responses were grouped according to the 4-M framework, as shown in Figure 5.

Money **(Factors related to the project)** ▪ Size of the project. This has largely been taken care of by the CIDB grading system ▪ Access to credit with material suppliers ▪ Working capital management ▪ Ability to obtain construction guarantees from financial institutions ▪ Payment terms – must work 60 days before first payment ▪ 'Fast-track' projects are mainly difficult to handle	**Management** **(Factors related to the organisation)** ▪ Most SME electrical contractors are owned by individuals with no built environment knowledge. Leads to lack of empathy from top management ▪ Limited general business skills ▪ Tendering and general procurement skills are limited ▪ Contract management and understanding of the legal framework
Man **(Factors related to the project team)** ▪ Most SME are owner-managed. Difficulty in self-replication ▪ Skilled project resources (workers) difficult to find ▪ Retention of skilled employees ▪ Commitment and loyalty of employees ▪ Project managers do not communicate with sub-contractors	**Milieu** **(Factors related to the environment)** ▪ Construction programmes are normally set by main contractor with no participation from sub-contractors ▪ Competition too tight. Too many competitors ▪ Adversarial relations between main contractors and sub-contractors ▪ Too much interference – especially for community-based projects

Figure 5: Critical success factors identified during interviews

The information obtained during the literature survey and the expert interviews was combined into the questionnaire. Because the interviewees made similar comments, emphasis was placed on the critical success factors identified during the interviews. The seventeen factors identified and used in the questionnaire are shown in Figure 6.

The purpose of the questionnaire was to determine which of the identified factors are the most critical for SME electrical contractors. Biographical information was sought, followed by a set of questions based on the seventeen factors. Respondents were required to indicate their agreement or disagreement with the statements using the five-point Likert scale with the following options: 'Strongly agree', 'Agree', 'Neither agree nor disagree', 'Disagree' and 'Strongly disagree'. A five-point Likert scale with a neutral option was selected, as the researchers did not wish to force respondents to take a stance if they had no clear opinion.

At the end of the questionnaire respondents were given the option of entering their e-mail addresses in order to get a summary of the results of the survey.

Money **(Factors related to the project)** ▪ Lack of access to finance ▪ Lack of finance for construction guarantees ▪ No knowledge of cash flow management ▪ Late payment by clients	**Management** **(Factors related to the organisation)** ▪ Lack of management support for workers ▪ Lack of understanding of contract management ▪ Lack of understanding of project management ▪ Lack of understanding of business/general management ▪ No improvement in management skills ▪ Lack of knowledge of the construction industry
Man **(Factors related to the project Team)** ▪ No capacity for training workers ▪ Lack of provision of opportunities for workers to improve skills ▪ Non-availability of skilled manpower ▪ Delay due to labour relations matters	**Milieu** **(Factors related to the environment)** ▪ Lack of assistance from main contractors ▪ Lack of understanding of SME problems by clients (Q)

Figure 6: Factors used for the questionnaire

The survey questionnaires were distributed with the assistance of the South African Association of Consulting Engineers (SAACE). A total of 143 questionnaires were successfully distributed. A total of 31 respondents completed the questionnaires on time, yielding a response rate of 22%.

From the biographical data, it was gathered that the main work responsibility of most of the respondents was project management (31%), followed by management (34%), and design (31%). The geographical location of most of the respondents was Gauteng (58%, followed by the Western Cape (14%), the Eastern Cape (11%), and Kwazulu-Natal (8%).

The nine most critical success factors identified by this survey, as indicated by the number of participants who strongly agreed with the statements, were:

(a) Lack of understanding of contract management
(b) Lack of understanding of project management
(c) Lack of understanding of business/general management
(d) Lack of knowledge of cash flow management
(e) Lack of access to finance
(f) Lack of access to construction guarantees
(g) Late payment by clients
(h) No capacity for training workers.
(i) Non-availability of skilled manpower

The top three most critical success factors all relate to management issues. The next four critical factors relate to finance, and the last two critical factors relate to workers' training and skills.

4. CONCLUSIONS AND RECOMMENDATIONS

The identification of project success criteria is important at the beginning of a project, to ensure that all the project stakeholders have the same perceptions of 'project success'. Since most projects are conducted in phases (i.e. concept, planning, design and tender, implementation), it is important that the stakeholders are thoroughly briefed at the beginning of each phase. Critical success factors are key strategic factors that are at the enterprises' macro level. These are the key growth and sustainability factors for the organisation at large. It is from this point of view that the research study focuses on the strategic issues rather than on the day-to-day micro issues.

The data gathered in this study indicates that the critical success factors (macro-level factors) of SME electrical contractors are multi-faceted. These were identified and grouped in terms of the 4-M framework as Money, Man, Management, and Milieu-related factors. The eight most important critical success factors were identified.

As was expected, the top three factors identified relate to the management of the business by SME contractors. This was expected because these SME contractors have no formal training in business management. The literature on project management success and project success mainly assumes that existing tools and techniques are being applied. This is not the case for SME contractors.

The next three factors deal with financial issues for SME contractors. Due to the size of these operations (normally two to three employees), it is to be expected that financial institutions would be reluctant to provide finance to them. The lack of knowledge of cash flow management obviously stems from the lack of general/ business management skills. Lack of understanding of cash flow can also lead to late payment by clients as correct payment milestones are not implemented.

Lastly, it was expected that SME contractors would not have the capacity to train their staff. The lack of skilled manpower in South Africa is also a well-known fact. The fact that SME contractors are unable to train their staff exacerbates this problem.

A two-pronged approach to training for SME contractors is necessary. These findings confirm the urgent need to train SME contractors in business management, project management, and contract management. Once the contractors have received training, they will be able to manage their businesses better. Proof of better management will most probably encourage financial institutions to provide financing options to SME contractors.

On the other hand, training SME contractor staff by government and other interested NGOs is recommended. It will take a while for SME contractors to grow their businesses to the level where they have the spare capacity to train staff. In the meantime, this study has indicated that one of the reasons for their failure is the lack of trained staff. The general lack of skill levels in South Africa can also be improved by providing training for the staff of these SME contractors.

Based on the findings, it is suggested that collaboration between the CIDB and the ECA should be established, mainly to investigate methodologies to help SME electrical contractors to improve their business management and project management skills.

Incentives should be introduced to main contractors in order to encourage them to provide the necessary mentorship and support on the construction sites. This includes aspects of cash flow management and construction programme management.

Financial institutions, through their project finance and cost management divisions, should provide training for SME electrical contractors on business planning and the financial management of a project.

It is recommended that further survey research be undertaken to confirm the findings of this study, due to the limited number of respondents. The questionnaire can be modified to a level where the SME contractors themselves can provide input to the study.

Further research should also be undertaken in a form of a case study to implement interventions practically, based on the identified critical success factors, and to validate that this intervention is indeed improving the success of SME electrical contractors.

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