MEASURES TO IMPROVE THE PERFORMANCE OF CONSTRUCTION PROJECTS IN SOUTH AFRICA

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Construction projects are complex, risky and time-consuming undertakings that are usually commissioned by governments and delivered by national and international participants with a variety of cultural differences, backgrounds, political systems, and languages. The South African construction industry operates in a uniquely project-specific and complex environment, combining different investors, clients, contractual arrangements and consulting professions. It impacts directly on communities and the South African public at large, and its improved efficiency and effectiveness will enhance quality, productivity, health, safety, environmental outcomes and value for money. Therefore, this paper will investigate measure that can be used to improve the performance of construction projects in the South Africa construction industry. Data for this paper were obtained from both primary and secondary sources. For the primary data; a structured questionnaire was distributed to construction professionals both from the contracting companies, consultant offices & public owners sectors. Findings from the questionnaire surveys revealed that the measures to be taken for the improvement of the performance of construction projects in Gauteng, South Africa, include: proper project planning and scheduling, use of effective project management techniques, clear information and communication channels, adherence to construction drawings and specifications, proper material procurement, adequate planning, effective strategic planning, proper project implementation and management, frequent coordination between the construction team, use of appropriate construction methods, site management and supervision amongst others. The study contributes to the body of knowledge on the subject of measures to improve the performance of construction projects in the South Africa construction industry.

Keywords: construction projects, construction project performance, improvement, performance, South Africa

INTRODUCTION

The construction industry plays an indispensable role in the South African economy, and is a significant contributor to economic growth (CIDB, 2012; Stats SA, 2010; Windapo & Cattell, 2013:65). The construction industry is the sector of the economy that is responsible for the planning, design, construction, maintenance and eventual demolition of buildings and works. It is essentially a service industry, obtaining its inputs and outputs from various sectors of the economy with which it is interrelated and interlinked, often in quite complex ways (Selleh, 2009: 10). Construction projects are complex, risky and time-consuming undertakings that are usually commissioned by governments and delivered by national and international participants with a variety of cultural differences, backgrounds, political systems, and languages (Shore and Cross, 2005; Othman, 2013:731). As a result, the South African construction industry

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is facing several problems and challenges such as poor performance of construction projects.

Construction projects attract high levels of public attention and political interest due to the substantial cost, direct and indirect impact on the community, environment, and budgets (Capka, 2004; Van Marrewijk et al., 2008; Othman, 2013: 731). On the one hand and due to their unique nature and characteristics, construction projects require high design knowledge and technical skills, competent human resources, professional managerial capabilities and large-scale investment (Flyvbjerg, et al., 2003; Frick, 2006; Sturup, 2009; Othman, 2013:731). However developing countries such as South Africa, suffer from having a shortage in providing these essential knowledge, skills, capabilities, and finances, which ultimately challenge the development of the construction industry (Othman, 2013:731). Compared with many other industries, the construction industry is subject to more risks due to the unique features of construction activities, such as long period, complicated processes, abominable environment, financial intensity and dynamic organization structures (Flanaganand Norman, 1993; Akintoye and MacLeod, 1997; Smith, 2003; Zou et al, 2012:2). Marx (2012:119) further states that the construction industry impacts directly on communities and the South African public at large, and its improved efficiency and effectiveness will enhance quality, productivity, health, safety, environmental outcomes and value for money.

CHALLENGES FACING THE SOUTH AFRICAN CONSTRUCTION INDUSTRY

Construction industries in all countries face many difficulties and challenges (Gale & Fellow, 1990; Ofori, 1990: Selleh, 2009: 11). However, the problems facing the construction industry in developing countries, such as South Africa, are significantly more fundamental, more serious and more complex. In developing countries, these difficulties and challenges sit alongside the general situation of socio-economic stress, chronic resource shortage and general inability to deal with key issues (Ofori, 1990; Salleh, 2009:11). The construction industry, in developing countries, faces conditions of uncertainties and risk; these risks include: Instability, scares resources, relatively unskilled labour, labour performance and productivity, low levels of productivity, overruns and excessive wastage, poor infrastructure, fraudulent practices and inability to adopt best practice (Selleh, 2009:12-14). The construction industry master plan (CIMP) further states that that challenges facing the industry today include enhancing quality and productivity besides high labour and material prices, inefficient and ineffective methods and practices, inability to attract and develop local workforce, inability to provide total integrated solutions and difficulty in securing timely and adequate funding (CIMP.2008:6).

The inefficient and deteriorated state of the South African construction industry with poor performance has detrimental effects to the development of the industry. Weaknesses, problems and constraints hampering the performance and development of the industry include (NCC, 2005; 8):

- Low capacity and capability of the local contractors and consultants due to weak resource base and inadequate experience;

- Inadequate and erratic work opportunities, inappropriate contract packaging of works which favour foreign firms in donor funded projects, low public investment in infrastructure projects and over dependence on donor funding;
- Inefficient and non - transparent procurement systems Corruption and financial mismanagement in public/private sectors;
- Lack of supportive institutional mechanisms in terms of financial credit facilities, equipment for hire and professional development;
- Unfavourable donor conditions which tend to marginalize local construction enterprises;
- Unfavourable tax regime;
- Poor working environment, including low standards of safety and occupational hazards on construction sites;
- Weak and non-facilitative policies and regulatory framework;
- Low productivity and quality; and
- Low technological base

The CIDB (2010:40) report indicated that the major contributors to poor quality of construction in South Africa are likely to be procurement related barriers. Such procurement related barriers include:

- fraud and corruption, or 'political interference' (including cronyism and nepotism);
- the procurement and delivery model (such as the 'design by employer' model);
- the use of procurement systems based on price and preference only, and not taking into account functionality (or quality); and/or
- Insufficient information to be able to select professional services and/or contractors based on quality criteria.

Furthermore, existing literature, found in Windapo & Cattell (2013:66-70) revealed the following twelve challenges that are said to influence the performance, growth and development of the South African construction industry:

- Public-sector capacity (Mbande, 2010; Milford, 2010; SA Construction Industry Status Report [Stats SA], 2004)

Mbande (2010), and Windapo & Cattell (2013:67), detect that there is a shortage of skills within the South African skills sector and in state-owned enterprises. According to the CIDB (2004), public-sector capacity is a key constraint on infrastructure delivery and sustainable growth in the South African construction industry. Milford (2010) observes that the lack of public-sector capacity has led to an inefficient and cumbersome process of funding construction projects by the government and in some cases, backlogs of more than six months in payments to contractors. The CIDB (2011) continue to suggest that specific issues of concern are the quality of tender documents and specifications and the management of change orders. The CIDB report notes that these factors are a reflection of the procurement capability of clients and their agents (Windapo & Cattell (2013:67)

- Mismatches between available skills and required skills (Mbande, 2010; CIDB, 2004; van Wyk, 2003)

The report by CIDB (2004) suggests that the skills supplied to the market through the Further Education and Training (FET) System were in many cases not appropriate to

the needs of the construction industry, resulting in a skills gap and a decline in the capacity of the professional sector within the construction industry. van Wyk (2003) submits that the high number of industry participants who have no education, let alone a degree, is a serious impediment to the development of the South African construction industry.

- Globalisation/critical global issues (Lewis, 2007; Raftery et al., 1998)

Lewis (2007) highlights the impact of globalisation on the construction industries in developing countries and the areas in which global trade perpetuates economic underdevelopment, thereby posing a challenge to the development of the construction industries in those countries. Furthermore, the current global economic recession and its effect on the world economy pose a challenge to the performance of the construction industry in South Africa.

- Procurement practices and the capacity for sustainable empowerment (Black Economic Empowerment [BEE] News, 2009; CIDB, 2004)

The CIDB (2004) further reports that, the existing preferential procurement environment is a challenge as it encourages historically disadvantaged professionals to establish their own firms rather than join established companies. This fragmentation, according to the report, has reduced the depth and breadth of expertise that can be consolidated within medium and large companies through access and experience on specialised and diverse projects.

- Access to affordable mortgage/credit and interest rates (Tomlinson, 2010; van Wyk, 2003; Luus, 2003)

Since the global economic crisis started in late 2007, banks have become very stringent in their lending criteria, compared to the access to easy credit that characterised the period from 2001 to 2003. This increased stringency has required developers and purchasers to put down equity of up to 50% and not less than 20% of the cost of a development or house, which very few people can afford. Funds available for lending have shrunk significantly, which directly influences the number of developments constructed (Luus, 2003). In addition, mortgage rates have fluctuated between 13% and 24%, causing substantial problems, with households finding it difficult to afford the higher interest payments and as a result, failing to pay their mortgage bonds (Tomlinson, 2010).

- Poverty (Mbande, 2010; van Wyk, 2004)

Poverty alleviation has been identified as one of the Millennium Development Goals (MDG) precisely because poverty has the ability to destabilise the world economy and lead to global unrest (van Wyk, 2004). According to Mbande (2010), given the MDGs intention to fight poverty, many donor nations are linking their funding of infrastructure to the achievement of socio-economic goals. Therefore, accessing infrastructure development funds can be a useful tool in construction industry development.

- Communication and Technology (CIDB, 2007)

South Africa has reasonable access to the latest technology; however, the prevailing levels of technology within the country and overseas tend to limit the scope of the projects that can be undertaken at any one time, with the material, equipment and personnel available. There is also a problem with end-users' perceptions about viable

alternative building methods and innovative building systems, especially in the low-cost housing market, as well as tension between technology and labour. Construction companies are encouraged by government policy to employ more labour to boost the economy and alleviate poverty (CIDB, 2007).

According to Emuze & James (2013:45), communication is one of the factors that affect the performance of construction project as it affects all aspects of construction work to some extent; therefore communication is crucial in the construction industry. Without effective communication among people, work progress would become an uphill task in construction. Tasks and projects are not only geographically dispersed, but the exchange of information is also slow and unreliable. It is notable that, despite the advantages of information and communication technology (ICT), the use of paper as a form of communication is still the main medium of information transfer and sharing within the industry (Emuze & Smallwood, 2012:6). This medium of communication exposes an organisation and the entire supply chain to errors, because it is extremely difficult for clients and contractors to obtain up-to-date information and virtually impossible to resolve processes such as requests for information (RFIs) within the required time (Sommerville & Craig, 2006: 89; Emuze & Smallwood, 2012:6). Therefore, it can be argued that communication breakdowns, which can either be minor or major, threaten negative consequences for construction project performance (Emuze & Smallwood, 2012:6).

- Availability of suitable land for construction (Boshoff, 2010; van der Merwe, 1997)

Boshoff (2010) highlights that while there is an extensive supply of public land; private land is not readily available in South Africa. The total area of land within each cluster that can be developed is further limited by such factors as topography and soil conditions (van der Merwe, 1997). Furthermore, there are many land claim issues in the courts, zoning issues and heritage sites, all of which combine to make the price of available land inhibitive, thereby delaying development processes.

- Availability of Infrastructure (CIDB, 2007)

Human settlements require infrastructure to sustain them. An area cannot be developed without infrastructure such as electricity, pipe-borne water, roads, streetlights and sewage disposal systems (Ofori, 1990). According to the CIDB (2007), the government of South Africa spends considerable amount money on improving its old and depreciated urban and rural infrastructure. There is also a huge challenge with respect to limitations on electrical capacity (Eberhard, 2008). The electricity-generating company in South Africa, Eskom, has a nominal generating capacity of 39,154 megawatts (Mbendi.com, n.d). According to reports, water scarcity is also said to become an increasing problem.

- High rate of failure of enterprises (CIDB, 2004; van Wyk, 2003; 2004)

The CIDB (2004) report notes that the failure rate of South African construction companies is unacceptably high. The report shows that there were 532 liquidations of construction companies in 2004, 371 in 2002, 554 in 2001 and overall, 1,400 companies that could not remain viable in the 2002–2004 period. According to this report, there has been a long-term decline in profitability in the industry, and many companies confirm profit levels as low as 1%.

- Increases in the costs of building materials (BER, 2011; Stats SA, 2010b; CIDB, 2004; van Wyk, 2003)

Materials account for as much as 60% of total project costs (Bourne, 1981; Haskell, 2004). South Africa produces its own strategic materials and relies on imported equipment. Therefore, increases in material costs within the industry are a cause for concern. The CIDB (2007) report on the Building and Construction Sector in South Africa notes that the prices of volatile building materials such as steel, cement, sand, copper, timber, polyvinyl chloride (PVC) pipes, bitumen and masonry increased by up to 100% between October 2000 and 2006. Stats SA (2010) and BER (2011) reported price increases ranging from 70%–241% between 2000 and 2010. In addition, BER (2011) determined that the prices of building materials increased linearly at an average rate of 70% between 2002 and 2010 and that all building material prices increase overall up to 2008, when the material prices reached their peak.

According to van Wyk (2003), significant growth in the construction industry is dependent upon price stability in material costs, which have increased at rates higher than the inflation rate. The effects that increases in building material prices have on the construction industry, including the inability of developers to deliver affordable housing, high tender valuations and poor construction industry performance (CIDB, 2007; Cockayne, 2011).

- Statutes and regulations (SA Construction Industry Status Report [Stats SA], 2004).

The CIDB (2004) report states that since 1994, the South African Government has passed more than 1,000 pieces of legislation, which have in turn spawned numerous regulations, giving the impression of over-regulation. These laws have affected tender and procurement procedures, employment and labour practices, BEE, planning permissions and controls, skills development and training and business practices. As a result, the development approvals and zoning processes of local authorities are slow and lead to unnecessary holding costs for developers (CIDB, 2004).
Lastly van Huyssteen et al. (2008) and Vertenten (2008:6) highlight that the industry has a low and unreliable rate of profitability, margins are characteristically very low, its invests very little in research and development and in capital, there is a crisis in training, and too many clients are undiscriminating and still equate price with cost, selecting designers and contractors almost exclusively on the base of lowest price. It is universally recognised that the industry must improve its performance. There is the need for the industry to simultaneously deliver better value for money and become more profitable (Fairclough, 2002; Vertenten, 2008:6).

METHODOLOGY

Data for this paper were obtained from both primary and secondary sources, for obtaining the primary data; a well-structured questionnaire was distributed to construction professionals such as Architects, Quantity surveyors, Structural engineers, Electrical engineers, Mechanical engineers, Civil engineers, Project Managers, Construction managers and construction project managers, from contracting companies, consultant offices & public owners sectors. The questionnaire was designed based on information emanating from reviewed literature. Data

collection was through self-administered questionnaires, which were distributed by hand and by Email in the research environment, the Gauteng province. Out of the 160 distributed questionnaires, 131 were received back which represents 82% of the return rate, these formed the basis of this study. The secondary data was obtained from a thorough review of literature relating to the subject of the paper. From the literature reviewed it was evident that project delivery in South Africa was poor, the study therefore identified measures that can be implemented to improve the performance of construction projects in South Africa. Using a five point Likert scale, the respondents were asked to rate the levels of agreement on each of the possible measure that can be taken to improve the performance of construction projects in Gauteng, South Africa. The studied factors were ranked based on the mean item score. A higher mean item score represents a higher ranking.

Mean item score

The five-point scale was transformed to mean item score (MIS) for each of the factors of causes and effects as assessed by the respondents. The indices were then used to determine the rank of each item. The ranking made it possible to cross compare the relative importance of the items as perceived by the respondents. This is the method used to analyse the collected data from the issued questionnaires in this study. Likert scaling is a bipolar scaling method, measuring either positive or negative response to a statement (Sukamolson, nd: 20). After the questionnaire is completed, each item may be analysed separately or item responses may be summed to create a score for a group of items. Hence, Likert scales are often called summative scales.

The computation of the relative mean item score (MIS) was calculated from the total of all weighted responses and then relating it to the total responses on a particular aspect. This was based on the principle that respondents' scores on all the selected criteria, considered together, are the empirically determined indices of relative importance. The index of MIS of a particular factor is the sum of the respondents' actual scores (on the 5-point scale) given by all the respondents' as a proportion of the sum of all maximum possible scores on the 5-point scale that all the respondents could give to that criterion (Pilot & Hungler, 1995:33). Weighting were assigned to each responses ranging from one to five for the responses of 'strongly disagree' to 'strongly agree' and 'Extremely unlikely' to 'Extremely likely'. This is expressed mathematically below. The mean item score (MIS) was calculated for each item as follows;

$$MIS = \frac{1n1 + 2n2 + 3n3 + 4n4 + 5n5}{\Sigma N} \quad \text{.....Equation 1.0}$$

Where;

n1 = Number of respondents for extremely unlikely or strongly disagree;
n2 = Number of respondents for unlikely of disagree;
n3 = Number of respondents for neutral;
n4 = Number of respondents for likely or agree;
n5 = Number of respondents for extremely likely or strongly agree;
N = Total number of respondents

After mathematical computations, the criteria are then ranked in descending order of their mean item score (from the highest to the lowest).

FINDINGS AND DISCUSSIONS

From the 131 usable questionnaires, the following information was gathered; of all the respondents 61% were male and 39% were female. Relating to their qualifications, findings revealed that 1.5% of the respondents had no qualification, 6.1 % had only completed matric (grade 12), 40.5 % had diplomas, while 7.6% of the respondents had B-Degrees, 7.6% had an M-Degree and lastly, only 0.8% of the respondents had a Doctorate qualification. Findings also revealed that 34.6% of the respondents were Quantity surveyors, 21.5% were project managers, 11.5% were civil engineers, 7.7 % were construction project managers, 6.9% were construction managers, 5.4 % were electrical engineers, 1.5% of the respondents were both structural engineers and architects and finally 4.6% were mechanical engineers and the other 4.6% had job a titles that were not identified in the study and therefore their titles fell under the heading "other". When asked about their work experience, findings showed that 54.4% of the respondents had between 2 and 5 years of work experience, 28.3 % had 6-10 years' experience, 7.2 % had 11-15 years' experience, 7.1 % had 16-20 years' experience and 0,8 % of the respondents had 26-30 and 31-35 working experience in the construction industry.

Respondents were asked to rank a list of measures that can be taken to improve the performance of construction projects in Gauteng, South Africa. Using standard deviation (SD) and mean scores ($\bar{x}$), the results were ranked as follows; Proper planning and scheduling (SD=0.652; $\bar{x}$=4.52; R=1), Making use of effective project management techniques (SD=0.641; $\bar{x}$=4.52; R=1), Clear information and communication channels (SD=0.602; $\bar{x}$=4.49; R=2); Adherence to construction drawings and specifications (SD=0.638; $\bar{x}$=4.45; R=3) Ensuring proper material planning (SD=0.612; $\bar{x}$=4.44; R=4), adequate planning (SD=0.636; $\bar{x}$=4.43; R=5), Effective strategic planning (SD=0.645; $\bar{x}$=4.41; R=6), Proper project implementation and management (SD=0.682; $\bar{x}$=4.41; R=6), Frequent coordination between the construction team (SD=0.679; $\bar{x}$=4.39; R=7), Use of appropriate construction methods (SD=0.703; $\bar{x}$=4.38; R=8), Site management and supervision (SD=0.677; $\bar{x}$=4.38; R=8).

Table 1 Scoped Literatures and Ifa Sages Categories Synthesis

Recommendations to improve performance of construction projects	$\bar{x}$	σX	R
Proper project planning and scheduling.	4.52	0.652	1
Make use of effective project management techniques	4.52	0.641	1
Clear information and communication channels.	4.49	0.602	2
Adherence to construction drawings and specifications.	4.45	0.638	3
Ensure Proper material procurement.	4.44	0.612	4
Adequate planning	4.43	0.636	5
Effective strategic planning.	4.41	0.645	6
Proper project implementation and management	4.41	0.682	6
Frequent coordination between the construction team.	4.39	0.679	7
Use of appropriate construction methods	4.38	0.703	8
Site management and supervision.	4.38	0.677	8

Timely supply of material	4.36	0.673	9
Have complete and suitable design at the right time.	4.35	0.751	10
Minimize dispute between all parties	4.35	0.749	10
Allocation of adequate project duration	4.34	0.726	11
Allow for material price escalation in original tender document	4.32	0.878	12
Good workmanship	4.32	0.722	12
Appointment of highly experienced design team	4.31	0.750	13
Practise sufficient risk management	4.31	0.782	13
Appointment of highly experienced technical team	4.30	0.703	14
Use suitable construction methods to suit specific project.	4.26	0.715	15
Conduct Frequent progress meeting.	4.25	0.851	16
Ensure collaborative working in construction.	4.23	0.776	17
Appointment of experienced contractors	4.22	0.878	18
Use proper and modern construction equipment.	4.21	0.857	19
Proper implementation of local regulations	4.17	0.746	20
Speedy decision making process	4.14	0.923	21
Decrease number of variation orders	4.08	0.993	22
Ensure Up-to-date technology utilization.	3.95	0.904	23

σX = Standard deviation; $\bar{x}$ = Mean item score; R = Rank

These findings were in agreement with findings obtained by Emuze (2011:230), Olomolaiye (1990), Ailabouni & Gidado (2012:134), Kazaz and Ulubeyli (2006) as well as Ayodele & Alabi (2011:142) in these studies on measures that can be taken to improve the performance of construction projects; adequate documentation and transfer of knowledge; total quality management of all processes; good organisational culture among project partners; robust open information sharing among project team , good supervision and site management , material management, work planning, supervision, site layout and technical education and training, keeping costs within budget and keeping to the schedule are the most effective ways of improving project performance. Mohammed & Isah (2012:785) indicated that, adequate planning; coordination; and proper monitoring of the construction projects by an experience and qualify professionals should be encourage to improve the performance of construction projects. Ayodele & Alabi (2011:142) informs that to reduce project abandonment and consequently improve project performance, the following must occur; adequate project planning, adequate funding for the projects, proper cost control during project implementation, timely payment by client. In a study conducted in the Nigerian construction industry, Waziri (2012:1383) discovered that effective project planning, controlling and monitoring were the most prominent methods to improve the performance of construction projects. All these findings were in support the findings of this paper on measures that can be taken to improve the performance of construction projects in South Africa

CONCLUSIONS

The objective of this paper was to establish measures that can be taken to improve the performance of construction projects in South Africa. Reviewed literature revealed the following as recommendations to improve the performance of construction projects: adequate documentation and transfer of knowledge; total quality management of all processes; good organisational culture among project partners; robust open information sharing among project team, good supervision and site management, material management, work planning, supervision, site layout, technical education and training, adequate project planning, adequate funding for the projects, proper cost control during project implementation, timely payment by client.

Findings from the well-structured questionnaire, recommendations for the improvement of the performance of construction projects in Gauteng, South Africa, include: Proper project planning and scheduling, make use of effective project management techniques, clear information and communication channels, adherence to construction drawings and specifications, ensure Proper material procurement, adequate planning, effective strategic planning, proper project implementation and management, frequent coordination between the construction team., use of appropriate construction methods, site management and supervision, timely supply of material, have complete and suitable design at the right time, minimize dispute between all parties.

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