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Challenges Faced by Stakeholders in the Road Construction Projects in the Gauteng Province of South Africa.

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Abstract

This study adopted a quantitative approach as the purpose was to investigate the challenges faced by stakeholders in the road construction projects in the Gauteng province of South Africa. This study adopted quantitative research and a well-structured questionnaire was distributed to different construction companies in Gauteng Province, which were registered with various approved councils construction professionals and contractors such as civil engineers, project managers, directors, quantity surveyors, construction managers and resident engineers. The questionnaires were sent via e-mails, some were delivered to the known construction companies by the researcher and some were distributed during site clarification meetings of contractors and consultant's bidders on Gauteng Department Roads and Transport tenders. 75 Questionnaires were distributed and 50 came completed and eligible to use. Random sampling method was used to select the respondents in various organizations. Research findings revealed that Community unrest and land proclamation were the highest ranked factors that pose a major challenge in the road construction, time, financial constraints, cash flow, lack of proper planning, resources, delivery of material, plant and equipment, shortage of skilled labourers, lack of equipment, lack of materials, performance guarantees, project duration/period, cost overruns were the major challenges facing the stakeholders in roads construction projects in South Africa. In conclusion, proper planning, communication is vital to overcome the challenges and government at the other hand needs to partner with private companies in terms of transferring skills and upgrading the upcoming contractors by emerging them with sustainable, independent contractors. Therefore, any challenges found in roads construction might be eliminated in the future projects by lesson learned, by planning for the upcoming project properly and also by identifying possibility risk at the early stage of the project.

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1. Introduction

The roads make our life easier in many ways as they link province to province even into other neighboring countries of South Africa [1]. In general roads boost the country economy and simplify people's life. Furthermore it, creates employment, income for people and construction entails a complex interplay of client, consultants, contractors, tool, equipment's and materials [2]. Moreover, roads boost the economy in terms of transporting goods, mineral resources in mining, farmers, and improve the access of different facilities such as schools, hospitals, shopping centers, work places and recreation centers [3]. If roads are in good conditions, they also reduce travel times and people save fuels on their vehicles, reduce production costs for the ever-growing number of goods shipments [4]. The construction

industry is the main distinct part that provides vital components as business, high recruitment of people and developing entrepreneurs for economy development [5].

However, the road construction has been facing some challenges. Road construction challenges are examined to be one of most repeatedly problem in the construction industry in South Africa. Most of the road construction challenges are continuous and there are recently new added challenges occurring in the industry due to new technology and other influences. There is a need to unlock or resolves these challenges within the industry [6]. “The challenges on roads construction are experienced on infrastructure which already incorporate, existing roads and the new infrastructure that is mushrooming which needs to take traffic into consideration [6]. Therefore it is vital to take roads challenges into consideration for better future modernizes quality roads in South Africa [7]. Many projects experience comprehensive challenges as results of exceeding initial scheduled time and cost estimates due to change of scope, procurement system. Stakeholders have positive and negative impact on road construction projects and hence, they contributes to the success or failure of the projects [8].

Department of Roads and Transport of Gauteng Provincial Government (GDRT) is obligated to road infrastructure network that interconnects the Gauteng provincial roads within the province and connects the Gauteng province with other provinces and countrywide. Hence the study will focus on the challenges faced by stakeholders in the road construction projects in the Gauteng Province of South Africa where most of the roads construction projects are taking place.

2. Overview of Gauteng Provincial road Network

In Gauteng there is a 5,846km provincial roads under the jurisdiction of the Gauteng Province Department of Roads and Transport (GPDRT), of which 4456km is pave and 1390km is unpaved. The Road Infrastructure Strategic Framework for South Africa (RISFSA) classification was used, for the development of the South African Road Classification and Access Management Manual (RCAM) classification system which deals with both rural and urban roads and also including the aspect of access management. Both RISFSA and RCAM are used in all Gauteng provincial roads. RCAM is a six-class rural and urban road classification system. Below, the table shows the road statistics of the paved and unpaved road [7].

Table 1: Network length by pavement type, 2015

| Road type | Length (km) | Length (%) |
|---------------|-------------|------------|
| Paved roads | 4,456 | 76% |
| Unpaved roads | 1,390 | 24% |
| Total | 5,846 | |

Table 2 shows the road classification, the definitions of “Mobility” and “Access/Activity roads” have been extracted from the Technical Recommendations for Highways (TRH) 26 and are:

- A road with a ‘Mobility’ function is a type of road designed to protect and promote vehicle movement. Most of the activities allowed on ‘Access/activity’ roads are not permitted on mobility roads.
- A road with an ‘Access/Activity’ function is any lower class collector and local roads / streets where the access functions are greater in number [7].

Table 2: Road Classification (Mobility/Access)

| CLASS | FUNCTION | DESCRIPTION |
|---------|-----------------|--------------------|
| Class 1 | Mobility | Principal arterial |
| Class 2 | | Major arterial |
| Class 3 | | Minor arterial |
| Class 4 | Access/activity | Collector street |
| Class 5 | | Local street |

| | | |
|---------|--|---------|
| Class 6 | | Walkway |
|---------|--|---------|

3. Construction industry

Construction is a billion dollar industry worldwide, much of which is linked to publicly financed projects [8]. However, cost and time escalation and poor quality are commonplace due to weak governance and endemic corruption [9]. Some causes of high rate of corruption in the construction industry are the fact that the construction industry has many close ties to the government and the industry involves complex, non-standard production processes that foster asymmetric information stocks between clients and providers [9]. Construction industry involves a large number of participants in a complex contractual structure that leads to a variety of psychological human behavior and attitude that promote corrupt activities [8]. Construction industry is always ranked as one of the most corrupt in the world due to large payments to gain or revise contracts and disobedience of regulations are common [10]. The impact of corruption not limited only to the payment of bribes however corruption extends to the construction of poor quality infrastructures with low economic returns and low funding for maintenance where great impact of corruption is felt [9]. Factors instrumental in corruption include the skills shortage within the construction industry, a perceived absence of deterrents and sanctions, and poor ethical standards [11].

4. Stakeholders in road construction projects

Stakeholders are Individuals and organizations that are actively involved in the project or whose interests may be affected as a result of project execution or project completion [12]. In construction Stakeholders can be a client, consultant, contractor, suppliers, community leaders, service providers [13]. Some researchers say stakeholders are internal and external, some say stakeholders are inside and outside and the others say stakeholders are primary and secondary [13]. Below is the figure identifying the potential stakeholders in construction industry adopted from [12]:

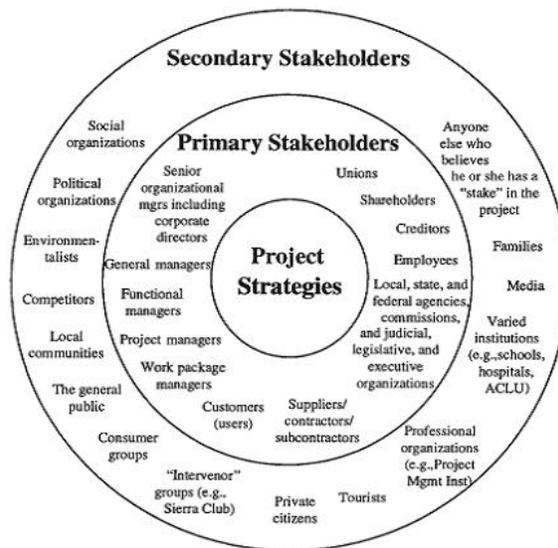


Figure 1: Potential Stakeholders for construction projects

In South Africa, community leaders and municipalities are very respective stakeholders in the project for political leaders to gain majority of votes in times of election however those leaders 80 % of them they are not technically qualified as they have occupied political posts; civil engineers at the national political level are rare however civil engineers can use political level to challenge the involvement in politics which can help them to gain more construction jobs and make good relationship with government in terms of tendering[14].

5. CHALLENGES FACING ROADS CONSTRUCTION PROJECTS

The South African roads construction faces challenges such as personnel on site, safety, time constraints and changing of scope of the work. Furthermore, there are indirect challenges that affect construction such as proclamation or landscaping issues which involves legal issues. Properties along the way where the road needs to be constructed, and the proclamation were not done properly therefore the legality process comes in if the owner of the property is not satisfied [15]. Sean Jones states that “The South African construction industry, is supposed to go through a high growth phase this year, owing to an increased number of construction projects, and a greater focus on housing projects and large-scale infrastructure projects, is facing severe problems regarding construction project delivery. These problems stem from a lack of capacity, skills shortage and quality standards”[16].

Other challenges are government regulations and policies which differ from one department to another. For instance, the roads construction can be done by department of roads and transport, and other government departments that need their protocol to be followed like department of labour, and the Contractor must obtain construction work permit approval to commence with construction work or activities [17]. Moreover, the department of water affairs requires the Contractor to obtain water license, the environment issues affects construction in a big way, such that the construction on wetlands or parklands, the Contractor must apply to the GDARD(Gauteng Department of Agricultural and Rural Development) which takes time for approval, some environmental issues are erosion, sedimentation and inclement weather. Failure to adhere with environmental regulations will results in a project being delayed or termination and contractor prevented to participate on future work opportunities or fines[17]. Failure to deliver road projects on time by the contractor displeases both clients and road users who expect to benefit from the completion of project on time. Moreover, projects delayed are very costly for contractor and different stakeholders of the projects [18]. Below are the challenges or constraints from contractor, consultant, client/general that may adversely affect the progress or failure to any road construction project in the Gauteng Province, South Africa [19]:

5.1. Challenges faced by stakeholders on roads construction projects

5.1.1. Design related problem

- Lack of detail specifications;
- Poor design reflection;
- unrealistic specification and even continuous changes of design by the client

Unprofessional design stops or delay the execution of project as the design needs to be reviewed amended and accepted or be approved for construction works. Once the errors are identified, works are temporary suspended until such errors are rectify. The errors normally occur in companies where selection process of vendors is compromised [20]. Issues arise from design which does not incorporate with the expertise of construction processes, rendering the design “difficult to construct” on site. Time, budget and quality are affected by design problems which impact risk on project. Normally in a project, design decision made by the consultant in the absence of the contractor and those decisions have constructability implications during the execution of the project [21].

5.1.2. Cost overruns

- These cost overruns have been attributed to design changes [22]. Design changes found to be most important source of construction wastage.
- In South Africa, most of overruns are caused by additional cost due to variation works, inflation or increase in the cost of construction materials, delay of drawings, contractor’s bankruptcy or liquidation and others overruns [22].

5.1.3. Barriers to the uptake of new knowledge

Most road development projects in Africa are let on the basis of design specifications rather than performance specifications. Road pavement designs are prepared by consultants who must take responsibility for the performance of the road for a 15- or 20-year period [22 &23]. Consultants are not in a position to take any risk on the design and therefore tend to resort to ‘tried and tested’ solutions, even if these result in high construction costs. Practitioners in the road sector in most parts of Africa tend to lack access to new knowledge and awareness of new innovations [22 &23]. Some of the challenges that faces roads construction industry are little or no capacity at all level of government especially in municipalities and include the following [21; 22 &23]:

- Lack of essential skills necessary for the management of projects,
- Undermining of engineering skills in municipalities;
- Poor project scoping and specification;
- Lack of knowledge relative to skills and resources required to implement projects;
- Contract awards based mostly on poorly defined tender processes,
- Lack of experienced employees capable of managing projects;
- Unnecessary time lags between tender submission and award.

5.2. Challenges faced by Contractors

Following are some of the challenges faced by the contractor in the roads projects

- Lack of proper planning

Any poor project planning to any project contract leads to project failure as a results of poor project management. It is also harm the nation as a whole in its infrastructural growth process. Lack of proper project control system, poor planning and poor work definition of scope lead to project failure or delayed [24].

- Inadequate Construction programme of works

Most of the contractors seem to fail to submit or produce construction programme of works to the engineer and client at early stage of the project. Submission of programme of works is one of the mandate or documentation required before commencement in order to meet the due completion date. Other contractors deliver or submit unrealistic programme of works to the engineer which delay the approval by the engineer as the programme needs to be adjusted [20].

- Resources

The contract/project managers failed to plan their resources in time, fail to scrutinize the work tasks or activities and their interactions on the project with the expected duration of the project [21]. Improper equipment selection & faulty equipment leads to delay of the project cause by time spent on repair [20].

- Poor performance by the contractors

Poor contractor's performance result in poor quality and low productivity [24].

- Performance guarantee
- Cash flow
- Delivery of materials, plant and equipment

Delivery of materials, supplies and equipment takes time than normal. Most of the Contractors do not have equipment and plant for their own; they depend on hiring of which sometimes they fail to get that equipment on time [25]. The delays on delivery of materials, plant and equipment cause by non-payment by the contractor.

- Time and Financial constraints.
- Absenteeism
- Tiredness

When contractors are under pressure, they engage workers to work overtime that leads to tiredness and no reasonable output can be achieved when body is tired and exhausted and it also cause poor quality of work done and accidents. Hiring of unskilled personnel hinder the execution of work on site as per specification and leads to mistakes during construction. More time spent on alterations and rework [26 &27].

- Legal provisions

Most of the contractors fail to comply with all applicable laws, regulations, statutory provisions and agreements. The engineer shall be provided with proof of compliance to the issues like water license if the contractor has obtained permission and permits for execution of works by the contractor from any Act of Parliament, Ordinance, Regulation or By-laws of local or other statutory authority [27 &28].

- Procurement method chosen
- Lack of Risk management

M1 Grayston Bridge in Gauteng, South Africa collapsed due to improper planning of risk. Risk information needs to be transmitted intra-organizationally hence the communication becomes an important aspect of risk management and risk identification [25,29&30]

- Existing services and land/properties proclamation

Another challenge related to design, the existing services and land proclamation seems to be forgotten always when the designs of projects are underway. The existing services and land proclamation become issue and delay the project during construction phase therefore these issues needs to be considered during planning stage [18;32&31].

- Traffic volume

According to Roads Asset Management System (RAMS), 12,468 million (approximately 12.5 billion) vehicle-kilometers are travelled each year on the GDRT (Gauteng Department of Roads and Transport) road network. Majority of traffic occurs on paved roads, where 76 % of the total network length carries 99% of the total traffic volumes on the Gauteng Province roads therefore the life cycle needs to be analyzed as it will place a high emphasis on the reservation of the paved road network [7&33].

6. Methodology

6.1. Research approach and design

This study adopted a quantitative approach as the purpose was to investigate the challenges faced by stakeholders in the road construction projects. Quantitative research is based on the measurement of quantity or amount. It is applicable to phenomena that can be expressed in terms of quantity. A well-structured questionnaire was distributed to different construction companies in Gauteng Province, amongst construction professionals such as civil engineers, project managers, directors, quantity surveyors, construction managers and resident engineers. The questionnaire were sent via e-mails, some were delivered to the known construction companies by the researcher and some were distributed during site clarification meetings of contractors and consultants bidders on Gauteng Department Roads and Transport roads tenders. 75 Questionnaires were distributed and 50 came completed and eligible to use and reflects 67 % response rate. It was difficult to gather questionnaires as the professionals are always busy, some of them returned questionnaire after scheduled time, and others apologized of not sending the completed questionnaire back. The study was conducted from reliable scholarly sources such as articles, journals, books, publications, websites and site experience on the field.

6.2. 5- Point linkert scale

5- point linkert scale was adopted for the study which gave a wider range of possible scores and increase statistical analyses that are available to the researcher [24]. The first linkert scale read is on agreement form as follows:

- 1- Strongly Disagree (SD)
- 2- Disagree (D)
- 3- Neutral (N)
- 4- Agree (A)
- 5- Strongly Agree (SA)

The second linkert scale read is on likelihood as follows:

- 1- Extremely Unlikely (EU)
- 2- Unlikely (U)
- 3- Neutral (N)
- 4- Likely (L)
- 5- Extremely Likely (EL)

The 5 point scales were transformed to mean item score abbreviated as (MIS) for each of the challenges faced in the road construction projects, the mitigations taken and the impact of stakeholders in the roads construction projects evaluated by the different respondents within the roads construction industries[24].

6.3. Computation of the mean item score (mis)

The computation of the 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. The formula is used to rank the challenges facing roads construction projects based on frequency of occurrences as identified by participants. [12]

$$MIS = \frac{1n1 + 2n2 + 3n3 + 4n4 + 5n5}{\sum N}$$

Where;

- n1 = number of respondents for strongly disagree
- n2 = number of respondents for disagree
- n3 = number of respondents for neutral
- n4 = number of respondents for agree
- n5 = number of respondents for strongly agree
- N = Total number of respondents

7. Findings and Discussions

7.1. Challenges faced by contractors on roads construction industries

Table 3 reveals that community unrest/disruption was ranked the highest with (MIS=4.10; STD=1.093); Existing services and land / property proclamation was ranked second with (MIS=3.80; STD=1.050); time and financial constraints was ranked number third with (MIS =3.72; STD=1.05) followed by cash flow ranked fourth with the (MIS= 3.70, STD=0.91); Lack of proper planning ranked fifth with the (MIS = 3.64; 0.851); Cost overruns was ranked sixth with (MIS=3.52; STD=1.035); Resources in terms of staff/personnel was ranked seventh with (MIS=3.44;STD=1.072); Delivery of materials, plant were ranked eight with (MIS=3.44; STD=0.972);Lack of detail specification ranked ninth with (MIS=3.34; STD=1.272); Shortage of skilled workers was ranked tenth with (MIS=3.32; STD=1.291); Lack of equipment and materials was ranked eleventh with (MIS=3.28; STD=1.246); Performance guarantees was ranked twelve with (MIS=3.26; STD=1.291); Project duration corrupt officials was ranked thirteen and second last unrealistic construction programme was the second last factor with (MIS=3.02; STD=1.152) and poor performance by the contractor was ranked the last factor contributing to challenges faced by stakeholders with (MIS=2.90; STD=0.544).

Table 3. Respondents 'response on challenges faced by the stakeholder in roads projects

| CHALLENGES FACED BY THE CONTRACTOR IN ROADS CONSTRUCTION | MIS | STD. DEV | RANK |
|--|------|----------|------|
| Community unrest/ disruption | 4.10 | 1.093 | 1 |
| Existing services and land/ properties proclamation | 3.80 | 1.050 | 2 |
| Time and financial constraints | 3.72 | 1.051 | 3 |
| Cash flow | 3.70 | 0.909 | 4 |
| Lack of proper planning | 3.64 | 0.851 | 5 |
| Cost overruns | 3.52 | 1.035 | 6 |
| Resources | 3.44 | 1.072 | 7 |
| Delivery of materials, plant & equipment | 3.44 | 0.972 | 8 |
| Lack of details specifications | 3.34 | 1.272 | 9 |
| Shortage of skills labourers | 3.32 | 1.203 | 10 |
| Lack of equipment and materials | 3.28 | 1.246 | 11 |
| Performance guarantees | 3.26 | 1.291 | 12 |
| Project duration/period | 3.24 | 1.061 | 13 |
| Corruption by officials | 3.24 | 1.287 | 13 |
| Unrealistic construction programme | 3.02 | 1.152 | 14 |
| Poor performance by the contractor | 2.90 | 0.544 | 15 |

8. CONCLUSION

Community unrest was the highest ranked factor which is a major concern to all stakeholder (client, consultants and contractors). Community unrest such as strikes, stoppage of project by business forums, councilors interruptions disrupt the project spending more time negotiations of the community grievances delay project and sometimes total abandonment of project sites is the biggest threat to road construction projects. Moreover, the existing services and land proclamation also pose a huge challenge to delivering a project on time, it needs to be taken into consideration during early stage of the project. However, the problems identified are somehow different from other countries, since most countries were complaining about poor performance of contractors, lack of equipment corruption which were ranked the highest. But in this study we saw community unrest being the highest followed by existing services and time of the project. Therefore, proper planning and good communication with the various communities and different department must take place especial during the preliminary stage, and transparency, honesty must be key to every individual who is involved in the project. Therefore, any challenges found in roads construction might be eliminated to the future projects by lesson learned, by planning for the upcoming project properly and also by identifying possibility risk at the early stage of the project.

9. Recommendations

The service providers hired (contractor and consultants) should be rated in term of their key performance indicators, every service providers and client should “know how” in every aspect of the project. Any contractors employed should be properly managed in terms of resources, skills, cash flow, availability of equipment and other related aspects. It is also important for both private companies and government to work together in terms of transferring the skills not only to the upcoming professionals but to the government officials whom most of them are political appointed without relevant skills.

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