

Investigation of Poor Service Delivery of Road Infrastructure

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Abstract

South Africa, as a developing country, has the responsibility to deliver developmental programmes such as reliable infrastructure, which could assist in the transportation of goods to other countries. Road infrastructure is a necessary condition to economic growth. This study adopted a quantitative approach in order to investigate on a stakeholder's perspective on the causes of poor service delivery of road infrastructure. Structured questionnaires was circulated to 75 stakeholders in construction industry 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. 50 came back 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 causes for poor service delivery. Followed by, 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 causes of poor service delivery of roads infrastructure according to stakeholders perspective. Therefore, mitigating the causes would be by having proper management planning, skills transfer through PPP's, proper communication channels and legality. It is recommended that road agencies (SANRAL, JRA), municipality engagement should play a vital role in the service delivery and maintaining roads. In addition, quality work is encouraged in order to avoid rework and save time and cost, hence more roads can be constructed. Good roads are an important aspect of society that could contribute to the African Renaissance. Moreover, roads contribute to poverty alleviation by promoting growth through provision of infrastructure in corridors that connects nations and access to land locked countries.

Keywords

Challenges, Construction industry, Road infrastructure, Stakeholder

1. Introduction

Good roads are an important aspect of society that could contribute to the African Renaissance. Moreover, roads contribute to poverty alleviation by promoting growth through provision of infrastructure in corridors that connects nations and access to land locked countries [1]. 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 generally 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] [3]. 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] [1]. 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 that cause poor service delivery. Road construction challenges causing poor service delivery 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 [1]. 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 [5][7].

Therefore, it is vital to carefully take into consideration the road challenges that cause poor service delivery for better future modernizes quality roads in South Africa [4]. 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] [9]. 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 causes of poor service delivery in the infrastructure projects in the Gauteng Province of South Africa where most of the roads construction projects are taking place.

2. Overview of Gauteng Provisional road network

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 1 reflects the roads in Gauteng, 5,846km provincial roads under the jurisdiction of the Gauteng Province Department of Roads and Transport (GPDRT), of which 4456km is paved and 1390km is unpaved [10]. 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. RCAM deals with both rural and urban roads and also including the aspect of access management. Both RISFSA and RCAM were used in all Gauteng provincial roads [11].

2.1 Condition of the Surfaced Roads in Gauteng

2.1.1 Visual condition index (VCI)

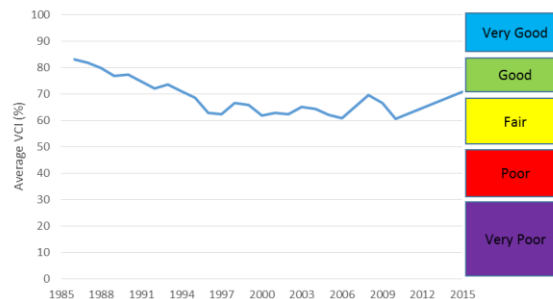


Figure no 1: Average VCI trend paved roads, 1985 to 2015

Figure 1 above represents the VCI (Visual Condition Index) distribution (by length) for the road network. The condition of the paved GPDRT roads is acceptable but borderline with 10% in the poor and very poor condition categories. According to a [11] recommendation, a maximum 10% of the road network shall be allowed to be in a ‘poor to very poor’ condition. The associated costs of roads in very poor’ condition is excessive [10]. Road users driving on these deteriorated roads pay extra for increased maintenance, time and fuel costs. Preventive maintenance, such as reseals, cannot improve the functionality and performance of these roads and large capital expenditure is required to rehabilitate “very poor” roads to a “good” and functional condition [10].

Only 1% (32 km) of the paved GPDRT roads is in “very poor” condition. These roads will require heavy rehabilitation [10]. 386 km (9%) of paved GPDRT roads are rated in a “poor” condition in 2015. Roads in a “poor” category will typically require rehabilitation within the next 5 years[10]. In some cases preventive, reseal treatments

with extensive pre-treatments such as pothole and structural failure repairs are still possible provided the intervention be done soon and the roads are not allowed to deteriorate much further. The window of opportunity to maintain these roads with cost-effective measures is unfortunately very brief [10] [11].

1,399 km (32%) of paved GPDRT roads were rated to be in a “fair” condition in 2015. The large percentage of roads in a “fair” condition remains a concern because they have the short-term potential to deteriorate into the “poor” category if appropriate preventive treatments are not applied timeously [10]. A substantial portion of the road network thus currently operates within the fair condition category, placing a huge demand on reseal needs to prevent further deterioration and delay subsequent expensive future rehabilitation costs[10][11].

3. Construction Industry

The civil engineering construction industry focuses on the development of infrastructural works. [4] Identified four primary areas distinctive of the contracting sector. The first area being the construction of roads, railway, bridges, and tunnels, the second area being the erection of harbors, docks, waterways, dams, reservoirs and sea defense and land reclamation works, just to name a few [12]. The construction industry creates and maintains the built environment that underpin all modern human endeavor[4]

The built environment is the reflection of the developmental progress as well as the physical foundation for economic and social advance into the future. The construction industry creates and maintains this foundation in a process that must deliver value to clients and society. The construction industry, as part of the business sector, is one of the main instruments in the task of working for a better life; It is an engine of reconstruction and development. Without the participation of, and the expertise and capacity of the construction industry and its related professions, backlogs obstacles will be difficult to overcome [1] [2] [10].

4.0 Challenges Behind the Causes of Poor Road Construction Projects

[4] 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 standard [14] [15]. Furthermore, there are indirect challenges that affect construction and cause poor service delivery such as proclamation or landscaping issues that 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]. 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 [7] [10]. Below are the causes of poor service delivery 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:

4.1 Poor Causes of Poor Service Delivery- Design Related Problem as per [1] [7] [15] [16] [17]

- Lack of detail specifications;
- Poor design reflection;
- unrealistic specification;
- Cost overruns;
- Barriers to the uptake of new knowledge;
- 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.

4.2 Challenges Faced by Contractors as per [16] [17] [18] [19][20] [21] [22]

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

- Lack of proper planning;
- Inadequate Construction programme of works;
- Resources
- Improper equipment selection & faulty equipment;
- Poor performance by the contractors;
- Performance guarantee;
- Cash flow;
- Delivery of materials, plant and equipment;
- Time and Financial constraints;
- Absenteeism;
- Tiredness;
- Legal provisions;
- Procurement method chosen;
- Lack of Risk management;
- Existing services and land/properties proclamation;
- Traffic volume.

5. Mitigation the causes of poor service delivery of road infrastructure

5.1 Communication

Good communication among teamwork should be monitored, clear, honest, open and frequent but not excessive [1] [23] [26]. Communication in project management is one of the ten-knowledge area that employs the processes required to ensure timely and appropriate generation, collection, distribution, storage, retrieval and ultimate disposition of project information [1].

5.2 Education and Training in Construction Industry

All three parties (client, consultant and contractor) should perform continuous training courses to improve capability of personnel and professionals carrying out designs, supervision and construction of all levels [19]. Civil Engineering Body of Knowledge advise that civil engineers must always seek broad knowledge base on empowering themselves in thinking out of the box on how civil engineers do business, including how to manage projects, risk management routine incorporation, handling of contracts, procurement and legal issues [1] [7]. Most of the contractors have related qualifications towards their field of work however, they did training at short period of time of which more internal training are needed [23].

5.3 Skills Transfer

It is necessary for skills transfer to the youth as number of youth receive qualification without skills on the ground to use those qualifications on site. According to [21] [24], nearly half a million skilled workers in construction will go for pension in the next five years therefore, to overcome skills gap, it is good that companies and government sectors employ talented workforce to assist in skills transfer to benefit the organization [18] [23].

5.4 Proper Planning Management

Community affected by the construction as their properties are along road reserve needs to be proclaimed and noticed in time during planning stage of the project [19] [24] [25]. Stakeholders organizations such as Telkom, Eskom, rand water, city power should be involved during the initial or planning stage of the project to coordinate and corporate with relocation and relocate of services [19] [24]. By involving those stakeholders' organizations, it will help the recent contractor or organization to find the existing underground existing services by producing accurate and clear as-built drawings other than mapping underground services which were unknown [24]. A well-planned project, which is cautious monitored have a direct positive impact on good performance, profitability of the contract and the company [19] [25].

5.5 Timeframe to Respond

The timeframe to respond in different aspect of the project is required. The sensitive aspects such as payment response, delivery of materials, site instruction by resident engineer to the contractor, decision making by the project

stakeholders and client response in every enquiry [26]. The Public Finance Management Act of 1999 (PFMA) determines that all contractual obligations (and accounts) must be settled within 30 days from its receipt [section 38(1) (f) read with Part 4, Regulation 8.2.3 of the Regulations in South Africa therefore the client needs to be take into consideration the payment response within 30 days[26].

6. Factors that can aid the effective delivery of roads projects

6.1 Road Agencies

Road agencies mandate is to help on the different aspects of roads all over the country. The road agencies like SANRAL, JRA and others can be the solution on most of the causes of poor service delivery found on roads construction in the Gauteng province, South Africa. Furthermore, the South African Roads Agency Limited and National Roads Act (Act No 7 of 1998) is a statutory company which can aid the effect delivery of roads project as its responsibility are planning, design, construction ,operation, management, control, maintenance and rehabilitation of national roads in South Africa. SANRAL also finance roads construction in accordance with government policy [4] [11] [12].

The other road agency that can aid is Johannesburg Road Agency(JRA) of which its core competencies are planning, design, construction, operation, control, rehabilitation and maintenance of the roads and storm water infrastructure in the City of Johannesburg(JRA website).The JRA main responsibilities are construction and maintenance of bridges/culverts, traffic signals/traffic signal systems, footways for non-motorists, road signage and road markings therefore JRA can be very helpful on the delivery of roads construction projects. This competencies and the mandate can aid the delivery of roads projects if the JRA become more involved in roads construction [10] [11].

Roads agencies can aid in success delivery of roads infrastructure by having a service delivery agreement between the local municipalities in Gauteng. This service agreement could in turn create more job to the local communities, reduce costs by not hiring private companies to do the job. The municipalities will get more skills, technical personnel to carry out the civil works

6.2 Engaging municipalities' services.

The Gauteng municipalities have the duty to carry out the routine maintenance and some of the municipalities can handle light construction activities such as rehabilitation of the road and resurfacing of the road. However, what is happening right now, the government outsourced to private sectors of civil engineering firms to carry out the large rehabilitation of the road construction works; new infrastructure projects and other structures like bridges and big culverts [1] [4] [5]. This increases the budget expenditure unnecessary whereas if it was done within the municipality a lot of saving could be done and more roads could be maintained and constructed. Hence, different municipalities need to increase their investment to roads infrastructure; provide long-term vision to maintain roads infrastructure [5] [11].

6.3 PPP- Public-private partnerships

In early nineties, public-private partnerships (PPPs) became visible as cutting –edge of long-term contractual arrangement between a private contractor and the government [4] [19]. It was guaranteed to be greater value for money compared to traditional public contracting because all transfers of design, operation and maintenance responsibilities and risks toward the private consortium [4] [19] PPP could result in the transferring of skills to local communities and they tend to carry all the risk. PPP could assist government to improve service delivery, since this option involves setting up of public enterprises at arm length from the public service to deliver specific services.

6.4 Key Performance indicators

Key Performance indicators (KPI) are used to measure performance of the process that is critical to its success. It is vital to identify performance indicators for benchmarking projects at the project selection phase in order to achieve good project performance [14].

6.5 Quality

In construction projects, quality of work is associated with adherence to conditions of the contract and specifications stipulated in the contract documents in their entirety during the execution of the project. There are two distinct areas in which quality of work achieved is measured for success [27]. The second aspect of quality of work concerns what beneficiaries see and feel when making use of the construction product. This is a product of workmanship, workmanship has been defined in the Concise Oxford English Dictionary as the degree of skill with which a product is made or job is done. Some aspects of workmanship are fulfilled automatically when project specifications are adhered to. For example, when the surfacing stone sizes are within tolerance, the road will be nice and smooth to drive on. Similarly, when the final layer of a road base is within the stipulated level tolerance, the road will be comfortable to ride on. However, the degree of riding comfort of a road, all other things being equal, will depend on how the level tolerance has been controlled within the lower and upper limit [27]. The road will be more comfortable to ride on where the upper and lower tolerance limits have been maintained to the minimum than where they have been allowed to fluctuate from the uppermost to the lowermost limits. Consequently, Griffin when describing the organization and management combined the phrases “quality of work” and “workmanship.” He described quality of work as workmanship that involves the assign work. Quality is all about meeting the customer requirements [27].

7. Methodology

7.1. Research Approach and Design

This study adopted a quantitative approach as the purpose was to investigate the causes of poor service delivery in the road infrastructure projects. 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.

7.2 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 [21]. 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[21].

7.3 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 causes of poor service delivery of road construction projects based on frequency of occurrences as identified by participants. [21]

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

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

8. Findings and Discussions

8.1 Causes of Poor Service Delivery

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 2. Challenges faced by the stakeholder in roads projects

Challenges	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

8.2 Mitigation to the Challenges Facing Roads Construction Industry

Table 4 below reveals that proper planning management was ranked first with (MIS:4.46; STD= 0.676), second was Skills transfer with (MIS: 4.36; STD=0.851), Timeframe to respond by consultant and contractor ranked third on the table with (MIS :4.32; STD= 0.683). Fourth was education and training with (MIS=4.30;STD=1.020). Second last was good communication with (MIS: 4.24; STD= 1.061). Legality of contract ranked last on the table below with MIS (4.00; STD=0.948).

Table 3- Respondents response on mitigations to the challenges

Mitigations	MIS	STD DEV	RANK
Proper planning management	4.46	0.676	1
Skills transfer	4.36	0.851	2
Timeframe to respond by Client, Consultant and Contractor	4.32	0.683	3
Education and training	4.30	1.020	4
Good communication	4.24	1.061	5
Legality of contract	4.00	0.948	6

8.3 Factors that can aid the effective delivery of roads construction projects.

Table 5 below shows the respondents response regarding the factors that can aid the effective delivery of roads construction projects. The quality of work ranked first from top with MIS=(4.28; STD=0.834), Roads agencies ranked second with the (MIS = 3.94; 0.818). Key performance indicators ranked third in the table below whereas engaging municipalities ranked fourth with (MIS of 3.86; STI=0.931) and fifth were Private partnership- PPP which is last from the table below with (MIS of 3.70; STD=1.093)

Table 4 –Respondents response on factors that can aid effective delivery of roads construction projects.

Factors	MIS	STD. DEV	RANK
Quality of works	4.28	.834	1
Roads agencies	3.94	.818	2
Key performance indicators	3.90	.931	3
Engaging municipalities	3.86	.857	4
Private partnership- PPP	3.70	1.093	5

9. 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 and causes poor service delivery. 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. Therefore, proper planning, skills transfer and timeframe to respond would aid in the poor service delivery. Good communication with the various communities and different department must take place especial during the preliminary stage, and transparence, honesty must be key to every individual who is involved in the project. The Gauteng municipalities have the duty to carry out the routine maintenance and some of the municipalities can handle light construction activities such as rehabilitation of the road and resurfacing of the road. Therefore, the municipality must stop outsourcing rehabilitation of the road so as to decrease the budget expenditure unnecessary. Moreover, different municipalities need to increase their investment to roads infrastructure; provide long-term vision to maintain roads infrastructure.

10. Recommendations

It is recommend that all three parties (client, consultant and contractor) should perform continuous training courses to improve capability of personnel and professionalism its encouraged to think out of the box. It is necessary for skills transfer to the youth as number of youth receive qualification without skills on the ground to use those qualifications on site. It's recommended that companies and government sectors employ talented workforce to assist in skills transfer to benefit the organization. PPP's would assist the government in the transfer of skills

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