



**EXPLORING INDUSTRY'S CONTRIBUTION TO THE LABOUR-
INTENSIVE CONSTRUCTION OF LOW ORDER RURAL COMMUNITY
ACCESS ROADS**

By

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Declaration

I hereby declare that the content of this dissertation, entitled exploring industry's contribution to the labour-intensive construction of low order rural community access roads, is a true reflection of my own work, and that this dissertation, in whole or part, has not been submitted for a degree to any other university or institution.

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Abstract

The Government of South Africa supports labour-intensive work methodologies as a means of alleviating unemployment in South Africa. In 2004 the Expanded Public Works Programme (EPWP) was formed to promote labour-intensive work methods due to the high unemployment situation.

The EPWP is a nationwide programme using public funds to encourage employment by using labour-intensive work methodologies with the intention of reducing national poverty. The programme covers four sectors. The four sectors are environment and culture, infrastructure, social and non-state. The largest component is infrastructure; roads being part of the infrastructure component provides the highest potential for employment creation.

Both international and local experience has revealed that by having trained supervisory staff and a proper employment framework, labour-intensive work methods can be successfully used for projects such as roads, sidewalks, storm water drains, trenches, buildings, sanitation and water. The national government, based on this experience and due to high levels of unemployment, has encouraged the use of these type of infrastructure projects as a way of contributing to the alleviation of unemployment.

“Only twelve per cent of the road sector budget is used for labour-intensive projects” (Public Works 2012b: 1). This implies that there have been no drastic changes in the extent to which labour-intensive work methodologies have been used in the road works programme.

This study focused on exploring parastatals’, consultants’ and contractors’ contribution to the labour-intensive construction of low order rural community access roads in the Outer West region of eThekwin’s Municipality, KwaZulu-Natal, in accordance with the EPWP Guidelines. The population consisted of 101 individuals from the contracting, consulting and parastatal fields of employment who had worked on EPWP related labour-intensive road projects in this region. All 101 individuals were chosen as the sample size.

A qualitative and quantitative approach was used in this research to gather data on the contribution made by the civil engineering industry to the promotion of labour-intensive road construction methods. This approach allowed for an understanding of the motivation and the experiences of consultants, contractors and parastatals regarding the design and construction management choices they have made.

Data was collected via a questionnaire containing open-ended questions and rating scales from 87 civil engineering staff that were employed by parastatals, contractors and consultants who were involved in designing, constructing and managing labour-intensive construction of low order rural community access roads in the Outer West region of eThekweni Municipality. In addition, interviews were conducted with same 87 civil engineering staff that were involved in designing, constructing and managing these labour-intensive road construction projects during the period from 2015 to 2019.

Data collected overwhelmingly suggested that very little practically is being done to promote labour-intensive construction of low order community access roads. The nature of engagement that does occur is largely through the filling in of basic reporting forms and providing basic small scale informal training and work to labour. No standard specification document is in place to enforce labour-intensive construction of rural community access roads. The documents that are in place merely serve as guidelines and administrative data collection tools rather than helping to promote labour-intensive road construction.

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List of Abbreviations

CEASA	-	Constructional Engineers Association of South Africa
CHE	-	Council of Higher Education
DORA	-	Division of Revenue Act
DPW	-	Department of Public Works
ECSA	-	Engineering Council of South Africa
EPWP	-	Expanded Public Works Programme
HEQC	-	Higher Education Quality Committee
IGP	-	Infrastructure Grants to Provinces
LEC	-	Labour Enhanced Contract
LGSETA	-	Local Government Sector Education and Training Authority
LI	-	Labour-Intensity
LIC	-	Labour-intensive Contract
MIG	-	Municipal Infrastructure Grant
NQF	-	National Qualifications Framework
PIG	-	Public Infrastructure Grants
SAFCEC	-	South African Forum of Civil Engineering Contractors
SALGA	-	South African Local Government Association
SETA	-	Sector Education Training Authority
SOE	-	State Owned Enterprise
WPSP	-	Work Place Skills Plan

Glossary of terms and definitions

Labour-intensive construction

Is optimising rather than maximising the labour content of a project. That is why the terms 'economically' and 'efficient' are very important in the definition. An appropriate mix of labour and equipment should undertake labour-intensive works. The methods used must be cost-effective and the product quality must comply fully with the specifications.

Labour extensive projects

"Are projects temporarily employing large amounts of workers for a short period in times of crisis". (Construction Education and Training Authority 2013b: 3).

Labour enhanced construction

"Uses more labour than conventional construction, typically 50% to 100% more, but not enough to put it into the labour-intensive category. Labour enhanced construction methods would have 15% to 25% of the construction costs going to labour" (Construction Education and Training Authority 2013b: 3).

Machine extensive projects

Are projects using a large number of machines for a short period of time.

CHAPTER 1: INTRODUCTION

1.1 Background to the study

The EPWP infrastructure sector caters for building works, electricity supply, road works, sanitation, storm water drains, water supply and waste management. The largest component being building works, making up nearly 61 percent of the total expenditure in 2010/11 year, but show the lowest labour-intensity at 2.6 percent. The very low labour input results in high costs to create jobs at a rate of R642000, which is more than twice the sector wage. (Public Works 2012b: 1)

The Public Works Final Report 2012: Study on Enhancing Labour-Intensity in the Expanded Public Works Programme Road Infrastructure Projects also highlighted that the “second largest element in the infrastructure sector is the road works programme, with 28 percent total expenditure, generating 57 percent of employment in this sector and 22 percent of all employment generation in the EPWP as a whole” (Public Works, 2012b:1). “The level of the roadworks component has been constant during the programme, changing from 8 percent to slightly above 11 percent.” (Public Works 2012b: 1). There seems to be no huge changes in the extent to which labour-intensive work methodologies are utilised in the road works programme during this period.

In contrast to the EPWP being a national programme, provinces and municipalities administer it. From a practical point of view, this implies that the EPWP is largely reliant on the capacity of local government institutions to project manage and administer the works and the support for the use of labour-intensive work technology in their works programmes.

The majority of the job production opportunities are formed within the framework of the infrastructure grants to provinces (IGPs) and the municipal infrastructure grants (MIGs).

Conditions are in place for the IGPs and MIGs through the 2004 Division of Revenue Act (DORA) which requires provinces and municipalities to implement public works such as low-volume roads, trenching works and storm water drains using labour-intensive work methodologies in accordance with the guidelines produced by the Department of Public Works (DPW), and accepted by the South African Local Government Association (SALGA) National treasury. A guiding frame for the management and administration of

labour-intensive projects was issued by the EPWP in 2004 and updated in 2005. They include specific regulations regarding contract clauses to be included for use of labour-intensive work methodologies. (Public Works 2015: 1)

Routine road maintenance, and designation of certain activities to be constructed using labour-intensive work methods in projects that use conventional machine-based work methods, are the two main areas of activity that generate employment in the roadworks programme in the EPWP.

Labour-intensive routine and maintenance work can provide a high level of employment, providing jobs to poor communities living in close proximity to the roads that are maintained. The use of labour-intensive work methods as the main form of work method only exists in a few road construction projects consisting of two to three pilot projects in some provinces. “Mostly, employment creation in road construction projects occurs by identifying a few work activities which are then constructed using manual labour in order to produce some additional jobs.” (Public Works 2012b:7)

“One of the requirements for roadworks projects is to generate additional employment by using labour-intensive work methods.” (Public Works 2012b:7). Road construction projects currently create some employment but way below their full potential. Jobs are created for very basic labourers who are employed to manage traffic during the construction process, cleaning of side drains or other small unchallenging activities. Some projects have marginally increased job creation in road construction by employing small-scale contractors to construct sidewalks using manual labour. The overall picture is that the labour-intensive works summate to a very small portion of the total expenditure of funds on road construction which has only a minor impact on the overall labour-intensity of the road projects.

At present, fully labour-intensive road construction projects only occur on a few pilot projects on community access roads. The construction of pedestrian sidewalks on new and existing roads is the only common activity for labour-intensive works at the present moment. This activity constitutes a small portion of overall project budgets and thus has very little impact on the labour-intensity of a project.

Despite the limited utilisation of labour-intensive work methods in road construction, there is a wealth of experience in the use of this technology from parts of South Africa, dating back to the early 1900s. The technology was successfully applied to urban roads in Soweto in the early

1900s, which relied on small-scale contractors. Community rural access roads have also been built in KwaZulu-Natal using labour-intensive work methods. The most notable is the Gundo Lashu programme which started in 2001 in Limpopo, initially as a gravel road construction programme graduating into a program which constructed bitumen surface roads using labour-intensive work methods. Key components of the EPWP implementation master plan are based on the improvement in the Gundo Lashu programme. This programme constructed roads to required quality standards at no extra cost compared to conventional machine-intensive road projects.

The construction and maintenance of rural roads are most suited for labour-intensive roadworks technology. South Africa has an extensive gravel road network meaning that there is no shortage of roads on which such work methods can be applied. Government recognises the need for improving access roads and this issue is also addressed in key policy documents such as the road infrastructure framework for South Africa. Within this context, the rewards from using labour-intensive work methods are recognised. It is further recognised that although some experience already exists in the country, the drive to use this technology has been on a little-by-little basis and has unfortunately not developed to its full potential. There is not much effort being made to use this technology. The current efforts being made to use this technology occurs by very small amounts in the form of developing guidelines, training programmes and small tasks in projects. The report on The State of the Expanded Public Works Programme in South African Cities 2017 to 2018 states that “none of the cities were able to meet their work opportunities target using labour intensive methods in the infrastructure sector. This is in keeping with the poor target rates for the past years” (Muzondo 2019: 38).

1.2 Problem statement

“It is perceived that levels of labour-intensity are low and further efforts should be made to increase the use of labour-intensive work methods. It is estimated that only 12 percent of the road sector expenditure is used for works classified as truly labour-intensive projects.” (Public Works 2012b: 1). The situation on the ground is rather bleak in terms of labour-intensive road construction works. Conventional equipment intensive work methods are still the predominant construction works method when upgrading roads and during rehabilitation and periodic maintenance of roadworks. Private contractors who use machine-intensive methods are involved in the majority of this work while some provinces still adopt an in-house capacity to do the work. The road works programme has shown very little improvement in supporting labour-

intensive methodologies.

Poor support for using labour-intensive methodologies in the rural areas severely impacts the cost of doing business in rural areas as pointed out by Nguvenjengua and Undji (2017: 54) “development of infrastructure in rural areas will reduce the cost of doing business in rural areas, which in turn will improve access to productive opportunities for individuals and households in these areas, thereby improving the income and welfare. Furthermore Derby (2017: 21) comments that “when it comes to uncorking and connecting disjointed communities in the developing world, a road network is a good place to begin. Suddenly, agricultural communities gain the market place for buying and trading, easy travel increases production and lowers rate costs, increased human interaction increases local employment, and profitability increases standards of living”.

1.3 Aims and objectives of this study

To explore the influence industry has on the labour-intensive construction of rural roads, and to provide insight into the depth of contribution of the civil engineering industry to the design, construction and project management of labour-intensive construction of rural roads.

The sub objectives will be:

- To find out the level of contribution from civil engineering consultants towards the design of labour-intensive rural roads.
- To ascertain the contribution made by civil engineering contractor's towards the construction of labour-intensive rural roads.
- To examine the contribution made by parastatal towards the project management of labour-intensive rural road construction.

1.4 Rationale for the study

The rationale for the study stems from a number of perspectives, the first being the researcher's personal experiences. As a lecturer, the researcher is currently engaged in lecturing road design, road construction project management and road construction to final year civil engineering students at the Durban University of Technology (DUT). This study will enable the researcher to be able to fill the gaps for our civil engineering graduates when they enter the road construction, road design and road construction project management workplace. This

study helps the researcher to get a better sense of industry's road construction needs and how these are served through the DUT road construction curriculum. This study will also enable the researcher to ascertain what industry's road construction needs are and how industry should be involved and how industry can better promote the labour-intensive road construction industry. This study will also provide insight to help reconceptualise and redesign the way the civil engineering industry interacts with the labour-intensive road construction industry.

The second motive relates to the fact that the labour-intensive road construction industry has been reviewed and new guidelines emerged (Public Works 2012a) that added certain requirements. From a civil engineering industry position, these guidelines relate to the routes of progression of the labour-intensive road construction industry. They provide a clearer definition of the direction possibilities within the labour-intensive road construction industry. Therefore, this study assists the researcher in making more informed decisions and choices in the process of aligning the road construction, design and project management curriculum with the requirements from industry. It also provides insight into how the researcher can help consultants, contractors and parastatal bodies promote rural road labour-intensive construction, which will, in turn, provide employment to unemployed rural communities and alleviate poverty.

On the other end of the spectrum the road construction industry has been urged to shed its decades-old working practices and embrace the forth industrial revolution, which has a wave of digitalisation sweeping the global economy, if it is to shake free of stagnation and flourish with trillions of dollars of cost savings. Now leaders in the built environment sector are being encouraged to adapt their strategies and capitalise on the opportunities offered by the new ways of working to improve productivity and sustainability. Coupled with issues such as climate change, depletion of natural resources and rapid urbanisation, road construction practices need to evolve and move away from reliance on manual labour and heavy metal machinery.

However, despite technological changes, industry of Civil Engineering has continued working as the last century, would depend significantly on manual labour, classical mechanics and, old operational and commercial models of the past century, resulting in a low productivity. Giraldo (2020: 1) "clearly states that for a civil engineer it is time to take advantage of new industrial revolution and begin to make a change in the traditional manual processes of production gradually, to move towards a digital and autonomous production in all its processes, from planning and design stages, until construction and maintenance stages. All these changes must

be aligned with clear government policies in technology, innovation and development, creating new educational incentives and attract new talent to further develop technological skills in future professionals required by the construction industry” (Giraldo 2020: 1).

The road construction engineering industry provides employment to millions of people who undoubtedly face an uncertain future with the rapid onset of the technological solution. However, if their leaders adapt quickly enough to these changes and view them as positive opportunities, the nature of the work might change but the jobs should remain in a healthier, more sustainable environment. The road construction industry has lagged behind other areas of the economy for far too long. It is time that it grasps the fourth industrial revolution with both hands and shows the watching world just how far it is prepared to go in terms of playing its part in the sustainable future of our planet.

1.5 Statement of key questions

The following are the key research questions that were examined in this study:

- What is the nature and extent of the civil engineering consultancy, contracting and parastatals industry’s influence on the promotion of labour-intensive construction of community access rural roads?
- The extent to which consultants are following the guidelines for the implementation of labour-intensive infrastructure projects under the Expanded Public Works Programme during the design and construction of labour-intensive rural access roads.
- The extent to which contractors are following the guidelines for the implementation of labour-intensive infrastructure projects under the Expanded Public Works Programme during the construction of labour-intensive rural access roads.
- The extent to which parastatal departments follow the guidelines for the implementation of labour-intensive infrastructure projects under the Expanded Public Works Programme during the project management of labour-intensive rural access road construction.

- The extent to which the civil engineering consultants, contractors and parastatal departments can improve labour-intensive design, construction and project management of rural community access roads.
- The extent to which consultants, contractors and parastatal departments can contribute to the knowledgebase on how improvements can be made to the labour-intensive design, construction and project management of rural community access roads.

1.6 Methodology employed in the study

A mixed method approach using a concurrent triangulation design using both quantitative and qualitative approaches was used to gain the necessary data to allow for the meaning and interpretation of the contribution that has been made in promoting labour-intensive road construction methods. As described by Creswell (2006: 62), “It generally involves the concurrent, but separate, collection and analysis of quantitative and qualitative data so that the researcher may best understand the research problem”. This approach allowed for an understanding of the motivation and the experiences that consultants, contractors and parastatal staff have had as a result of the design and construction management choices they have made. The sample constituted representatives of organizations from the contracting, consulting and parastatal fields of employment.

1.7 Theoretical perspective of the study

Data was collected from 87 questionnaires and 87 interviews that were designed containing both open-ended questions and rating scales that explored and probed parastatals’, contractors’ and consultants’ level of involvement in promoting labour-intensive construction of low order rural community access roads in the Outer West region of eThekweni Municipality. In addition, interviews were conducted with civil engineering staff that were involved in designing, constructing and managing labour-intensive road construction projects in the Outer West region of eThekweni Municipality during the period from 2015 to 2019.

Based on the results and findings of the research, recommendations have been made on how consultants, contractors and parastatals can improve the labour-intensive component during the construction of rural community access roads.

1.8 Limitations of the study

This study's limitations are that it only focuses on labour-intensive construction of low order rural community access roads in the Outer West region of eThekweni Municipality. Low order rural roads are class R5 rural local roads. TRH26, the South African Road Classification and Access Management Manual classifies "Class 5 as roads which provide direct access to smaller individual properties such as within rural settlements, as well as small to medium sized farms in rural areas. They serve no other purpose than to give such access. The length of these roads would mostly be shorter than 5 km. Traffic volumes should not be more than about 500 vehicles per day" (COTO 2012: 26).

The Outer West Region of eThekweni is spatially located in the western part of the eThekweni Municipality. It measures approximately 78 438ha in extent, representing 34% of the municipal region. The outer west region stretches 30km east to west from near the base of Fields Hill, to Cato Ridge and 40km from beyond Inanda Dam on the uMngeni River in the north to beyond uMlaas River in the south. Umkhambathini Local Municipality (under Umgungundlovu District Municipality) forms the western boundary of the region. Traditional authorities cover fifty percent of the Outer West Region. The region shares an urban and rural landscape with a wide range of settlement types extending from formal urban to rural settlements. Rural areas as well as the Western Suburbs have shown significant residential growth in the last few years. There are limited levels of economic development activities in the region in relation to the existing population who as a result travel out of the region to access economic opportunities.

This region was chosen because the region has a vast rural community urgently requiring community access roads. The community access roads will enable the community to be serviced with the basic necessities. The chosen location of the study provides a perfect niche because the community can be empowered and can be the new employed labour force to construct the access roads. This in turn will provide work for the unemployed, which will meet the needs of the EPWP program.

1.9 Overview of chapters

Chapter 1 provided an overview of the situational contextual framework that locates the study.

Chapter 2 reviews the literature pertaining to the three areas or forces that stimulate and influence the construction of labour-intensive rural community access roads, namely

parastatals, consultants and contractors. It delves into the motivations and contestations of labour-intensive rural road construction that provides the impetus for this study.

Chapter 3 presents the methodological processes that this study followed. The research design that guided the production of the data, which gives a detailed explanation of the research design decisions that has been taken, is presented.

Chapter 4 provides the data and the forms of the analytical methods used to decipher the results.

Chapter 5 completes the study with a summary of the findings and an attempt to explain what has been found.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Having presented the background to the study and the research focus in Chapter 1, this chapter presents a literature review of the components that are relevant to the study, which include labour-intensive design, construction and project management of rural roads by consultants, contractors and parastatals.

The main focus is the civil engineering industry's influence on labour-intensive construction of rural community access roads. The literature review presents a framework to understand labour-intensive construction issues, dynamics and the influences that affect consultants, contractors and parastatals within the labour-intensive road construction industry.

A review of the labour-intensive road construction industry is relevant, i.e., how it is conceptualised, why it is conceptualised in the way it is, and what factors influence the construction of labour-intensive low order rural community access roads. This literature review of the road construction industry, therefore, presents a contextual, site-based view on road construction. The civil engineering influence within the road construction industry is core to the unit of analysis of this study and therefore needs attention.

There are two major aspects to industry's contribution towards the construction of labour-intensive rural roads that were identified. The first aspect relates to the design phase and the second to the construction phase. Hence, what might be an appropriate inclusive relationship between industry and labour-intensive road construction and design, is an important consideration in future development of the labour-intensive road construction industry.

In addition to these components of the literature review, some process issues are pertinent. Hence, this literature review chapter includes a review of literature related to key process issues like design, construction and project management reforms. These process issues are presented with a view to developing an understanding of the key concepts of this study.

Solomon's (2019: 30) statement that "roads are public infrastructure, are vital to the economy and they have a direct impact on prosperity" informs the motivation for this study.

2.2 The technical feasibility of the use of labour

No project is based on 100% labour only or 100% equipment only. The technical feasibility of the use of labour depends upon the requirements of the specification and, to a large degree, upon the use of innovative methods to achieve these requirements labour-intensively. The Construction Education and Training Authority believes that

labour-intensive construction provides the skills transfer to workers, giving them a work ethic experience and allows the development of local entrepreneurs and trade, and also provides community empowerment through participation and acceptance of the ownership of the completed services and assets, saving on maintenance cost of the improved road. (Construction Education and Training Authority 2013b: 2)

This explains why some labour-intensive construction projects may be financially more expensive than conventional construction yet are approved due to their social economic net benefits.

The Construction Education and Training Authority (2013: 3) states that “the conception, design, documentation, and implementation of labour-intensive construction projects are orientated towards maximising the use of manual labour and promoting the use of local entrepreneurs in completing the work through technical and financial instruction and support”. In other words, it is the optimal substitution of labour for machines in the execution of the work.

According to the Construction Education and Training Authority (2013: 4) the main objectives of a labour-intensive construction project are to:

- Significantly increase the use of labour per unit of expenditure.
- Create a technically solid, good quality, economically feasible product equivalent to that achieved by machine-intensive construction.
- Generate large numbers of productive jobs quickly.
- Develop small previously disenfranchised black contractors.

Decision-makers tend to focus upon the word ‘labour’ and its common connotations of picks and shovels and slaves and ignore the extent to which the success of a labour-intensive project depends upon correct policy, suitability of the project, quality and efficiency, organizational and practical training at site and managerial levels, including contractor and subcontractor development.

“Conventional rural road construction is highly equipment intensive and labour saving to the point that only 10% of construction costs go to labour. In labour-intensive rural road construction about 65% of the construction costs go to labour, that is, 6 ½ times as much” (Construction Education and Training Authority 2013b: 3).

To summarise “labour-intensive, labour-based, labour-based/equipment-supported, employment-intensive construction methods are all considered to mean that the labour content is optimized and will in most projects compromise between 30% and 80% of the project costs” (Construction Education and Training Authority 2013b: 3).

2.3 Sustainable development

The Local Government Sector Education Training Authority (LGSETA) defines sustainable development as a “social and economic development that meets the needs of the present, within biophysical environmental constraints, and without compromising the potential of future generations to meet their own needs” (Local Government Sector Education Training Authority [LGSETA] 2012a: 36). The public sector has been a source of most of the funding for public infrastructure. Within such a context, the sustainability of an operation is primarily dependent upon the continuation of such funding. In the field of rural road construction, it is extremely difficult to operate an equipment-based maintenance system. It creates a net outflow of funds from the rural regions to the urban regions due to the high capital costs of procuring plant and intense technical supervision due to the speed of progress.

The capital-intensive system does not produce the results intended by the expenditure. Although local funds are available, the system is not sustainable from the social technical perspective because it needs spare parts, workshops, mechanics, fuel, oil and foreign exchange. The local social technical system, in particular the low level of individual skills, cannot sustain an equipment-based system. This is an example of difficulties experienced in technology transfer. By contrast, labour-intensive methods can be sustained because requirements are in accordance with the level of skills available. Extensive training is required and institutional capacity has to be established. The fact that funding is required for sustainability has not been ignored. That is equally the case for capital-intensive maintenance. In the latter case even though the funding has been made available, the system has not functioned (LGSETA 2012a: 36).

McCutcheon and Watermeyer (1995: 27) add that a “large programme using labour-intensive

methodologies will result in more employment opportunities per unit of expenditure, high quality, economically efficient assets, and the formation of individual skills and community, regional and institutional capacities”.

Loayza and Raddatz's (2010: 138) statement that “the geographic position of a sector’s production and the occurrence of poverty where it takes place would determine its potential for poverty alleviation” is evidence of labour-intensive rural road construction alleviating poverty in rural communities, but Karthik and Rao (2019: 1) point out that the growth of automation and mechanical advancements has negatively affected the demand for manual labour in developing countries in the modern-day construction industry.

2.4 Reasons for using labour-intensive construction methods

According to McCutcheon (1990: 483) “labour-intensive road construction has come of age”. It can be used for “maintenance of the rural roads that have been constructed over the past decade by labour-intensive methods and, secondly, the rehabilitation and up-grading of roads within the classified road network, i.e. the construction and maintenance of roads for which labour-intensive methods were previously considered inappropriate”.

Ampadu (1999: 43) further adds that “road construction comprises a series of linear operations, therefore it is theoretically possible to employ enough labour to achieve very high rates of progress comparable to those of conventional equipment-intensive methods”.

Studies by Sandbhor and Botre (2014: 20) reveal that the “construction sector has always been dependent on manpower with most of the activities being labour-intensive. Project productivity, thus, depends directly on productivity of labour. Enhancing labour productivity would contribute to overall success of the project”.

In addition James (2000: 757) reveals that “empirical evidence indicates that the use of labour-intensive techniques in African industry would create not only more employment but also more value-added, relative to competing capital-intensive alternatives”.

2.4.1 Alleviating unemployment in South Africa

According to Statistics South Africa (2021) “South Africa's unemployment rate rose to 32.6% in the first quarter of 2021 from 32.5% in the previous period. It was the highest jobless rate since comparable data began in 2008. The number of unemployed persons increased by 8 thousand

to 7.2 million, employment fell by 28 thousand to 15 million and the labour force went down by 20 thousand to 22.2 million. Total employment fell mostly in construction (-87 thousand). Also, the youth unemployment rate, measuring job-seekers between 15 and 24 years old, hit a new record high of 63.3%”.

Therefore, it is important to create job opportunities in the local communities to get the unemployed people into productive work, so that they gain skills when they work and increase their income capacity.

Aggarwal (2018: 375) reveals that “nearly a third of the world’s rural population does not live near a paved road, and it is widely believed that this limits their access to economic opportunities”.

Katouzian (1978: 423) believes that “when the strategy of economic development encourages the use of capital-intensive techniques, it is likely to result in a growing gap between rural and urban incomes”.

Parkins and McCutcheon (1999: 226) explain that “employment-intensive construction takes a special place in the field of Civil Engineering, as it is primarily aimed at generating employment, alleviating poverty, equalizing income inequalities and capacity building in historically, economically, politically or geographically disadvantaged communities”.

2.4.2 Participation in housing and public works

According to the Construction Education and Training Authority (2013a: 5) Government is faced with a major demand for housing in both urban and rural communities”. Building of houses is labour-intensive. The roads that supply services to housing can also be built labour-intensively.

2.4.3 Enhance individual and community capacities

The historical lack of technical capacity means that any proposals for public works should bear in mind the existing shortcomings and the need to create effective local capacity. The provision of housing and roads to service the houses is an excellent opportunity to create employment and to improve individual skills and community capacity in the whole process of the planning, provision, administration and maintenance of public works. (Construction Education and Training Authority 2013a: 5)

2.5 Labour-intensive road construction practices

According to Sugihara (2007: 121):

The global history of the diffusion of industrialization over the past two centuries suggests two distinct routes. The first is the 'Western path' associated with capital- and energy-intensive industry. The second path to creating a modern industrial economy is the 'East Asian path' based on labour-intensive industrialization that has built on quality labour resources cultivated in the traditional sector. This was the path followed by Japan from the nineteenth century and by many other countries in Asia during the twentieth century.

In view of the above comment, McCutcheon (1995: 332) suggests that in "South Africa unemployment (and thus poverty) could be alleviated (but not solved), public works constructed, and individual and community capacities created, through a well-planned national employment creation programme using labour-intensive methods for the construction and maintenance of public works".

Du Toit and Smith (1997: 5) believe that a "large-scale application of labour-intensive construction methods is not a foregone conclusion because, if the economic and developmental rationale underlying the construction process is not heeded, even a well-intended labour-intensive construction approach will not have the desired effect".

Maintenance labour-intensive road construction programmes must be encouraged by provisional road authorities. These programmes will encourage authorities to share information and experiences of the delivery of road construction technologies using labour-intensive methods, encourage good practice in using labour-intensive methodologies, enable authorities to jointly tackle problems that are experienced and also act as a coordinating engine for the road sector. This platform can be used for the coordination of the road construction industry's offering to key government programmes such as the EPWP.

The Department of Transport's intention to guide a process of integrating existing labour-intensive construction and maintenance programmes within the road construction industry has produced mixed results so far, as reflected in the quotations below:

The merits of labour-intensive work methods are recognised. The overall labour-intensity rate is lower for road construction works than for maintenance. The average labour-intensity for construction works is only 4.7% indicating that the road construction is essentially a conventionally equipment based works programme. With a few exceptions

very limited changes have been made to the work methods applied on the construction works, which continues to rely on heavy construction equipment with very limited labour inputs. Only a fifth of all employment is generated on construction works despite the fact nearly 75% of the funds is used for this purpose. (Public Works 2012b: 21)

Approximately 60% of the expenditure on road works activities takes place in rural areas while only 43% of the employment is generated on works in rural areas. As opposed to most labour-intensive roadworks in other countries a major portion of the employment-intensive road works in the EPWP programme apparently takes place in urban areas. (Public Works 2012b: 24)

Although good labour-intensive road construction experience exists in the country, the creativity in terms of using this technology has been on a bit-by-bit basis and has not developed to its full potential. There is not much effort being made to use this technology. The current efforts being made to use this technology occurs by very small amounts in the form of developing guidelines, training programmes and small tasks in projects. The report on The State of the Expanded Public Works Programme in South African Cities 2017 to 2018 states that “none of the cities were able to meet their work opportunities target using labour intensive methods in the infrastructure sector. This is in keeping with the poor target rates for the past years” (Muzondo 2019: 38).

The potential seems untapped at this stage. Further efforts in the form of extensive practical training programmes, writing up and enforcing the use of labour-intensive specifications and standards and stricter control by parastatal departments to enforce consultants and contractors to design and construct roads to suite labour-intensive construction methods must be made to increase employment in the road construction industry.

2.6 South Africa's experience in using labour-intensive road construction work methods

South Africa has had experience in using labour-intensive construction technologies to deliver infrastructure. There are examples of labour-intensive methods in road construction and maintenance across the country. The study on Enhancing Labour Intensity in the Expanded Public Works Programme Road Infrastructure Projects (2012: 6-8) states that In “1999 the Zibambele programme was piloted by the KwaZulu-Natal Department of Transport by awarding 2700 routine road maintenance contracts as part of the Road to Wealth and Job Creation initiative. The programme provided forty five thousand job opportunities recruiting local labour

to carry out routine road maintenance applying labour-intensive work methods. A similar programme in the Eastern Cape Province, the Sakha Sizwe employed twenty five thousand local people. Equally, Mpumalanga had the Siyatentela programme which employed two thousand local people. Limpopo also had a similar scheme, which employed fifteen thousand local people in 2012. Gundu Lashu was launched in 1991 by the Road agency in Limpopo. This was the first long-term labour-intensive road works programme in South Africa where emerging contractors were given extensive formal training. The programme improved more than 370 kilometers of rural roads”.

Parts of Africa and other countries across the world have also provided lessons. Lessons have been derived from Kenya’s length systems. Until now, what has been lacking nationally is integration of existing initiatives in order to maximise the economic and social potential of such programmes.

2.7 Resistance to the use of labour-intensive work methods

The Construction Industry Development Boards construction monitor, employment October 2020 (2020: 6) indicated that the construction informal sector showed a decline of -76 000 or -16% in the number of job opportunities shed on year-on-year basis from the second quarter of 2019 to the second quarter of 2020, and there was also a decline of -111 000 or -22% in the number of job opportunities shed on a quarter on-quarter basis. EPWP work opportunities in the infrastructure sector fell from 44% in the first quarter of 2018 to 9% in the third quarter of 2019.

Musekene states that “labour-intensive construction programmes, however, are not without criticism. Most of the programmes are stalled by various barriers related to ineffective management systems and structures as well as operational barriers associated with project planning and implementation” (Musekene 2013: 332).

Katouzian (1978: 38) argues that the “prevalent use of equipment intensive methods in low developed countries arises from their dependence on foreign technologies developed under conditions of relative factor endowments and prices inappropriate to the Third World”.

Resistance to the greater use of labour-intensive work methods is widespread in the EPWP. Decision-makers, project managers, design consultants, contractors and stakeholders have all

shown resistance to this type of technology. This phenomenon occurs across the world. The same has been reported by other countries where labour-intensive methods were introduced.

In general, there is sheer resistance to implement these work methods. This resistance can be seen ranging from the lack of practical guidelines, policy direction, vested interests, and the lack of knowledge of the technology in the EPWP.

Decisions to use this technology have been adopted by most senior policy makers in the country and they are supported by the resourced central agency which is dedicated to the implementation of public works using labour-intensive work methods. The programme has been recognised by most senior political bodies in government who have encouraged an additional increase of the application of this technology. Problems within implementation is therefore the major stumbling block in using this technology.

Lessons need to be drawn from the successful Zibambele and Gundu Lashu programmes. “These programmes had solid local political backing when they commenced. There was also strong support from both the local political leadership as well as from the management in their respective public works organizations. In other words, there is a need for local champions to drive these schemes”. (Public Works 2012b: 8)

However, local champions such as consultants in charge of road design have not had much training and experience in using labour-intensive technology and contractors have not been exposed to practical training. Finally, only theoretical knowledge exists among decision-makers in the technical departments.

2.8 Conceptualising the labour-intensive road construction industry

The CIDB Best Practice Guideline – Part 1 an overview of labour-based technologies and methods in employment-intensive works (2005: 2) states that “appropriate specifications and road labour-based technologies are required to optimise employment opportunities generated per unit of expenditure. The absence of adequate design information on road labour-based technologies frequently limits the choices available in project design. As a result road labour-based technologies are often approached circumspectly and conservatively”.

“Employment-intensive works have been highly visible in the civil engineering sector. The civil engineering road sector is plant-intensive when compared to the building sector. The building sector, in general, generates more employment opportunities per unit of expenditure than does

the civil engineering road sector. If, however, labour is substituted for machines, this position can be reversed. Alternatively, if a blend of labour and light equipment is used on civil engineering road projects, the difference in labour-intensiveness between the two sectors reduces” (The CIDB Best Practice Guideline – Part 1 an overview of labour-based technologies and methods in employment-intensive works 2005: 2).

The Gundo Lashu programme was the only programme of a significant size that utilised a significant amount of labour in upgrading roads. “Currently there are a few ongoing road construction projects, which rely entirely on labour-intensive methods. However, as they are few in number, they have the features of being a pilot project only” (Public works 2012b: 41). In light of the above medley of negative conditions, there is an urgent need to provide detailed education to managers, consultants and contracting staff on how to design, construct and project manage road works using labour-intensive work methods.

2.9 The Expanded Public Works Programme

The EPWP is a long-term programme aimed to alleviate poverty and reduce unemployment. The aim is to provide opportunities, together with project-based training. The EPWP is a nationwide program covering all realms of government and state owned enterprises (SOEs). This program spans all quarters encompassing social, infrastructure, environment and culture.

The expectation is that all public bodies in all infrastructure provision they are responsible for will contribute to the programme, as indicated in the following extracts.

As part of this initiative, the national government has through the Division of Revenue Act (DORA) placed additional conditionality’s on infrastructure grants. The grants call for increased focus on the cost efficient use of labour absorptive methodologies in the provision of infrastructure. These additional conditionality’s require provinces and municipalities to use the Guidelines for the Implementation of Labour-Intensive Infrastructure Projects under the EPWP for identification, design, construction and maintenance assets. (Public Works 2015: 3)

International and local experience has shown that with well-trained supervisory staff and the appropriate employment framework, labour-intensive methods can be used successfully for infrastructure projects such as those involving roads, sidewalks, storm water drain trenches, buildings, water and sanitation. On the basis of this experience and in the context of high levels of unemployment the national government as directed that

these infrastructure projects must contribute to the employment creation. (Public Works 2015: 3)

The EPWP programme promotes the employment of the unemployed to obtain work, so that labourers can obtain the necessary skills during work which will increase their capacity to earn an income. The poor people and those with no income at all are targeted for participation in these projects.

2.9.1 The EPWP Guidelines

The large projects directorate of the EPWP unit developed guidelines for assisting various client bodies with regard to the conceptualization, planning, design, implementation and management of large infrastructure projects, which are to be implemented in accordance with the EPWP principles. The purpose of developing the guidelines was to provide government and its partners, implementing infrastructure sector programmes projects, with the necessary tools to successfully implement labour intensive projects. "The guidelines were designed with the aim of minimizing the additional work required from provincial and municipal officials" (Public Works 2015: 3). Sections in the guidelines must be adapted into the relevant sections of the contract documentation for both consulting engineers and contractors based on the specific need. There are requirements that certain construction and maintenance activities must be carried out by hand. "Furthermore, client public bodies must ensure that both consultants and contractors comply with the EPWP reporting frameworks" (Public Works 2015: 3).

A code of good practice must be used, when employing labour, is included in the guidelines. This code has been formulated by the Department of Labour and provides for special conditions of employment in EPWP projects.

An eligibility requirement for the appointment of contractors and consulting engineers is included in the guidelines to improve the capacity of the construction industry to project manage labour-intensive projects. All principal staff employed in the project must undertake special National Qualifications Framework accredited training programmes in labour-intensive construction at all levels. Hence, a well-trained labour force is of critical importance. This is emphasised by McCutcheon (2018b: 45) who states that "specific training was initially given to over 1200 engineers and officials in NQF7 (orientation of policy and senior engineering level) and in NQF5 (engineering site level). The challenges were that the trainees' frequently reported during the training sessions of the difficulties of actual implementation which overcame any knowledge gained during their training. Furthermore, insufficient numbers of senior decision-makers actually took part in either the orientation or the training sessions".

An EPWP project refers to a project that incorporates the elements of employment creation, labour-intensive methods, local resource optimization (only use equipment for activities that cannot be effectively done by the use of labour), quality is not compromised, skills development and transfer, community ownership, optimization of quality, cost and time, decent working conditions (fair wages, appropriate provision for safety and health and freedom of association) and lays the foundation for sustainability (Public Works 2015: 1)

According to the EPWP, the objective of implementing the labour-intensive infrastructure projects under the EPWP are, to provide employment opportunities and distribution of income, by injecting some project funds in the form of wages to local poor and unemployed people, providing training or skills development to locally employed workers, building cost-effective and quality assets, and the development of labour-intensive capacity in the construction industry. (Public Works 2015: 1)

The EPWP guideline document is a guiding structure for the execution of labour-intensive projects under the EPWP. It gives guiding instructions on how labour-intensive works must be executed by the designer. “It assumes that the public bodies will appoint accredited consultants to design the works and to administer the contract” (Public Works 2015: 2). Some customisation of some sections of these guidelines will be necessary to provide the delivery models. The staff of the public body will perform the activities when no consultants are appointed.

The document also provides guidance on the identification of projects suitable for labour-intensive construction design, specifications for labour-intensive works and the formulation of contract documentation for labour-intensive projects. Direction is also given towards the use of contract clauses, which must be included in the standard documentation, in order to promote labour-intensive projects. (Public Works 2015: 2).

“The employment of locally recruited temporary workers on all EPWP labour-intensive infrastructure projects must be in accordance with the current Code of Good Practice for Employment and Conditions of Work for the expanded Public Works programme” (Public Works 2015: 1). “In terms of the code of practice, workers in these projects are entitled formal training, which will be provided by training providers appointed and funded by the Department of Labour” (Public Works 2015: 2).

2.10 Training

Ho (2010: 1299) states that “construction is a labour-intensive industry that is heavily reliant on the availability of local workers”, implying that a skilled work force resource is thus crucial to this industry.

According to Putlitz (2019: 38) “every project is unique. The project team must include people with the skills required for this particular project, and must be appointed as early as possible to avoid the identification of key requirements at a late stage”.

All successful large-scale programmes have been linked to long-term, in-house training programmes. All levels of management require training. It was found that a direct relationship of training and success of construction existed. That means that a good training programme delivered competent workers and resulted in good quality and productivity. EPWP training is regarded as an important component of the EPWP. Each project should have a clear training programme for its workers to improve their work performance. Training will focus on the needs and will be implemented based on a programme by programme basis. (Public Works 2015: 11).

Muzondo and McCutcheon (2018: 25) stated, when evaluating the qualification level of contractors it was found that contractors with higher technical qualifications performed better than those without. It is therefore vital that all contractors who are involved in labour-intensive road construction receive the relevant training.

It must be emphasised that the provision of accredited practical training has greater importance than the quantity of construction or the number of workers that will be employed. The construction phase of the programme can only progress at the rate at which competent engineers and supervisors have been practically trained. Progress can only occur at the rate at which trained workers are produced.

Hanna *et al.* (2008: 197) state that “labour costs compared to other project cost components such as material and equipment, have more opportunity to be improved by good management. Labour costs are reduced when productivity increases. It can either amplify or eliminate a project’s profit, making it of vital interest to contractors”.

In view of the above statement, trained hands-on supervisors are crucial for modern labour-intensive work. Enormous time and effort are required to produce a supervisor who can marshal

and productively manage the technical activities of teams of workers. The crucial importance of the hands-on site supervisor for effective modern labour-intensive construction cannot be underestimated. Unfortunately, very little practical training of on-site supervisors has actually taken place.

Ahmad *et al.* (2017: 117) state that it is the “perspective and culture of labour that influence the effective use of any resources such as material, machinery, energy or transportation. Resources, which are used effectively and sustainably by labour in construction, presents contractors with a higher probability to improve productivity and reduce costs, thus reducing the overall construction cost”.

Hence, a well-trained labour force is of critical importance. This is emphasised by McCutcheon (2018b: 45) who states that “specific training was given to over 1200 engineers and officials in NQF7 (orientation of policy and senior engineering level) and in NQF5 (engineering site level). The training material had been officially approved. While one might claim that the training was adequate in relation to senior-level orientation it is clear that it was ineffective given the lack of improvement in labour-intensity. Also, while many attended the course, far fewer completed the portfolio required for the actual qualification. The trainees’ frequently reported during the training sessions of the difficulties of actual implementation which overcame any knowledge gained during their training. Furthermore, insufficient numbers of senior decision-makers actually took part in either the orientation or the training sessions”.

Other pertinent quotations from McCutcheon are as follows:

Specific training is required for all concerned at all levels national, provincial and local authorities, engineers (site and design), and a range of skills site personnel, and of critical importance are hands-on single and multi-site supervisors. Nowhere in the EPWP in South Africa was there a formal programme that linked the essential formal training required with a planned construction programme. Formal linkages were not established between construction projects and the necessary technical, supervisory and contractual training. (McCutcheon 2018b: 45)

In the original 2004 consolidated programme overview and logical framework it was stated that a national training centre would be established. This had still not happen by the end of phase 2, 10 years after the commencement of the EPWP. (McCutcheon 2018c: 63)

Initially the municipality had envisaged appointing training providers to render training to all subcontractors and the workers. The lack of a training budget and the delays from the Department of Labour and the Construction Education and Training Authority made it almost impossible for this dream to be realized. The bulk of training was rendered on-site for subcontractors by the appointed consultants. The subcontractors were awarded the certificates of attendance, not the certificates of competence. The main weakness of the program was the lack of a coherent training program for the subcontractors. (McCutcheon 2018b: 54).

Training must be extensive and good at what it sets out to do; particular attention must be paid to site supervisors (road builders) and multi-site supervisors (site supervisors or managers). (McCutcheon 2001: 276)

It therefore cannot be more emphasized that the hands-on site supervisor is critical because this is the person who ensures that the work is being performed properly in technical and organizational terms all day, every day. The senior management can rest assured that something sensible is taking place in the field immediately and, usually, only weekly supervision by higher level of management will be necessary. (McCutcheon 2018b: 54)

The above views are echoed by El-Gohary and Aziz (2014: 6) who state that

poorly trained and unskilled operatives are commonly characterized by low and faulty outputs coupled with unjustifiably high inputs. In addition, their outputs are almost always rejected by the inspection engineer, either in whole or in part, resulting in extensive and expensive rework, rectifications, or repairs. On the contrary, experienced operatives possess sound intellectual abilities, practical solutions to obstacles, and high technical and motor skills. All of these lead to higher productivity, lower cost of labour, and better quality of finished outputs.

Alvanchi, Lee, and Abourizk's (2012: 1005) statement, that "every year, construction companies spend considerable resources on their human resource activities, determining how many new workers are required and evaluating potential hires. Further, the money spent on hiring and training new workers can be lost as they leave a project". This reinforces the point that well-trained site managers in a labour-intensive road project are vitally important because they can manage the labour force in a way that can prevent the labour from leaving the project (to seek better opportunities) while the project is in the construction phase.

2.11 Subcontracting practices in the construction industry

Subcontracting is a well-established practice within the construction industry, since it is an effective means of improving small, medium and micro enterprises in the construction works contracts. “In the labour-intensive road construction industry subcontracting portions of the work are done to increase the contracting capacity of the contractors and to satisfy client requirements relating to the engagement of small and micro enterprises or local enterprises in a contract, in accordance with a targeted procurement strategy of a public body” (Public Works 2012a: 17). Subcontracting is also used as a means of addressing racial and gender imbalances in the ownership of contracting entities, through the different types of subcontracting arrangements, namely domestic, nominated and selected small contractors.

The mandatory subcontracting policy operates within the traditional procurement realm where the main contractors normally engage subcontractors to carry out part of their contractual work based on the skill and capacity set which the subcontractors supposedly possess. The role of main and subcontractors would be to deliver the project according to the specifications to the client. The subcontractors will have a duty to learn and develop their technical and financial management skills from the main contractors and consultants

However, Milner (2019: 2) states that “construction disputes between main contractors and subcontractors are a widespread occurrence. The cost of disputes is significant; they reduce profits, affect productivity, are often time consuming, and damage relationships, sometimes irrevocably”.

The main reasons pointed out by Mambwe *et al* (2020: 62), in order of importance, attributed to the policy’s failure to meeting the interests of the main and subcontractors included:

- Lack of interest by Main foreign contractors to build capacity of local contractors.
- Main contractors view subcontractors as potential competitors.
- Main contractors not willing to subcontract 20% of the contract sum.
- Main contractors allocate low value works to subcontractors so that they maximise profits.
- Lack of experience, personnel, equipment and poor financial resources among local subcontractors.

- Insufficient capacity in project management among subcontractors inhibits the possibility of subcontracting 20% of huge or high value projects.

Mambwe *et al* (2020: 64) also state that empowering and developing capacities of small scale contractors involves strategic planning on the part of government.

According to Ng and Tang (2010: 732) “it is impossible to replace the sub-contracting practice, measures should be introduced to improve the chance of sub-contractor success. One way to achieve that is by ensuring all aspects vital to a sub-contractor go well”.

Some of the vital aspects that will help a sub-contractor are pointed out by Mambwe *et al* (2020: 67) “The scope of works for subcontractors must be well defined in the contract documents. The contracts must also provide the criteria on how performance and quality required for the works will be measured, the methods for performance measurement and the acceptance. The terms and conditions for subcontracting must be included in the contract documents, especially payment terms, retention, advance payment bond, defect liability period and liquidated damages”. This will help mitigate much of the problems that are experienced between the main contractor and sub-contractor.

In the labour-intensive rural road construction projects, the Gundo Lashu project Musekene (2013:36) states “that two broad labour-intensive models were used in order to capacitate local communities to become independent emerging contractors. Within the first model a total of 32 emerging contractors were trained in labour-intensive methods. These contractors were then provided with small trial contracts for execution. Those who demonstrated their ability by the successful completion of these small contracts were then allowed to tender for larger contracts”.

Muzondo and McCutcheon (2018: 31) concur that the “technical capacity and competence of emerging contractors along with their experience should be evaluated during the selection process and as such, contractors should be appointed based on their technical ability to do the job. There is a definite need to develop contractor development programmes that will focus on improving emerging contractors’ who are mostly employed as subcontractors that will focus on improving emerging contractors’ project performance. Such programmes should focus on developing the technical qualifications and skills of contractors and provide construction experience”.

2.12 Community involvement

“Community participation generally is more successful when the community takes on much of the responsibility, as compared to situations in which higher-level public agencies attempt to assess consumer preferences through surveys or meetings. In order for community participation to work, projects must include special components that address it directly. Villagers can be recruited to help during all phases of designing, implementing, maintaining, supervising, and evaluating a new rural road construction, but only if the time, effort, and money are spent to do it right” Thwala (2009: 39). Communities can help identify the most appropriate access roads to be constructed, find the local workers with the necessary expertise and keep the community informed about the progress with the project. “Special attention must be paid to the development of local committees and governance structures to adequately oversee local participation. These local committees and governing structures direct and execute development projects, rather than merely receive a share of project benefits. The objectives of community participation as an active process are empowering the residents, building beneficiary capacity, increasing project effectiveness, improving project efficiency, and sharing of project costs” Thwala (2009: 40).

According to Noah (2012: 70), “projects related to community development require the involvement of the community from the onset. The approach of the South African National Roads Agency Limited is to establish a Project Liaison Committee that has a Project Liaison Officer as its secretariat. This approach ensures structured engagement, regular consultation, and the dissemination of information and the sharing of ideas, which all support the successful implementation of the project. This is achieved by establishing Project Liaison Committees who have to provide structured engagement with affected communities, as well as with the Project Management Team, thus facilitating transparency in delivering services”.

Studies by Musekene (2015: 747) revealed that the targeting process of various projects within the Gundo Lashu programme was not fully regulated. The study found that the decisions on the communities from which people should be recruited was left for the contractors to decide. Hence, the participant selection process was open to abuse. The abuse led to,

- Some of the participants being recruited into different projects more than once.
- Recruitment of participants who did not meet the programme requirements.

- Recruitment of people outside the targeted population.

Due to the community not been given an opportunity to be involved in recruiting people to work on the project the opportunity to give all poor community inhabitants a job was lost. The recruitment process was open to abuse by the contractors because the contractors themselves were not familiar with the inhabitants of the area.

2.13 Problems within the Expanded Public Works Programme

The researcher McCutcheon states that

during the first two phases of the EPWP the infrastructure sector failed to achieve the levels of labour-intensity anticipated in its formulation. Labour-intensity remains stubbornly around 10% which is barely more than that could be achieved using conventional methods. It did not set up formally linked training programs to produce large numbers of hands-on single and multi-site supervisors. (McCutcheon 2018a: 53)

Furthermore McCutcheon (2018a: 53), revealed that the EPWP

did not establish an in-house implementation capacity at local, provincial, or national level. Consequently, the public sector did not develop an in-house capacity to evaluate implementation. Particular attention will be called to the EPWP's decision to rely upon independent small contractors and therefore the reliance upon the contract, while largely ignoring the lack of experience or training among the target group.

In addition, Ralushai (2019: 55) reveals that "in order to assess staff turnover effectively in municipalities and to mitigate the impact thereof, proper reporting is needed". Muzondo and McCutcheon (2018: 52) concur: "Municipalities must have an exit management strategy or policy where exit interviews are conducted in order to understand why people are leaving the organization. This information together with information from staff satisfaction surveys, must then be used to develop a staff retention policy".

McCutcheon (2018a: 53) states that the "existing construction industry is based on the use of fuel powered heavy equipment. Extensive re-engineering is needed to produce a technically sound labour-intensive construction system. During the first ten years of South Africa's independence, the Infrastructure Sector of the EPWP failed to achieve the levels of labour-intensity anticipated in its formulation".

According to the Department of National Treasury, low infrastructure spending has resulted in

challenges regarding the delivery of new infrastructure and the maintenance of existing assets, and government is struggling to attract and retain crucial skills in the built environment (National Treasury 2016: 4).

McCutcheon (2018a: 53) further states that the “inability of the public sector to spend the funds allocated to them has a very negative impact upon the employment and wages. The inability to spend allocated public funds has important implications beyond the question of labour-intensity. There is a severe need to improve in-house capacity of the public sector”.

Re-engineering the provision of high standard labour-intensive road construction projects to improve skills and employment is a role that consultants in South Africa need to immediately take up. If the project is designed to be constructed labour-intensively, the contract documentation must be written accordingly. The decision to employ more workers to do the job must be strictly incorporated into the contractual documentation. This must include modifications to the contract specifications, bill of quantities and the tender and adjudication process. Construction must occur in strict accordance with the clauses set out in the contract documentation. Municipalities must ensure that the agreement between consultants and the municipality are written with specifications that enforce consultants to re-engineer the design and contract documentation to suit labour-intensive road construction. Engineers in consulting firms will then make the effort to do so because they have been trained as engineers, which simply means to design accordingly. An attempt to start the process is better than not doing anything at all. A signed contract with the Municipality and the consultants will enforce the consultants to at least start the process of trying.

Jitsing *et al.* (2019b: 39) explain that

millions of South Africans depend on local government to provide them with basic services every day. Over and above this local government has a constitutional responsibility to promote economic and social development within its boundaries. These two complementary goals require capable and efficient local governments that have sufficient capacity to deliver on the mandate and can respond to the needs of the communities.

According to Ralushai (2019: 58),

Drawing on the following research commissioned by the Local Government Sector Education and Training Authority that many municipalities in South Africa have

encountered difficulties in sustained service delivery, and face increasing debt, governance problems and community protest, in 2018 the Minister of Corporate Governance and Traditional affairs, Dr Zweli Mkhize, identified 55 municipalities as dysfunctional. A previous minister in the same portfolio, Pravin Gordhan, had identified in 2014 that a third of the country's municipalities were doing well, a third had the potential to do well and a third were dysfunctional.

“Municipalities are the key drivers in project managing the construction of labour-intensive road construction in rural communities. With many municipalities, encountering difficulties in sustained service delivery and being dysfunctional, the management of rural road construction in those municipalities will definitely be a failure” Ralushai (2019: 59).

Aghimien *et al* (2019: 513) state that the “construction industry lacks adequate skilled workers despite the fact that the industry is labour-intensive in nature. In a bid to increase the availability of skilled workers in the industry, public work programmes such as the EPWP is seen as a viable option due to its ability to provide skills development and training to its participants. However, since the advent of the EPWP in 2004, nothing has changed with regards to the increase of skilled workers in the South African construction industry. Major challenges of EPWP are low wages, lack of discipline among participants, limited duration of the training, and delay in payment of stipends to participants. There is the need to make time to adequately train these beneficiaries in order to achieve this feat. The present period allocated for training on the programme is deemed insufficient. In order to improve the programme, there is a need for improved coordination, management and administration among programme officials, improve communication, adequate funding, and improve training”.

According to McCord (2017: 151) the initial phases of the EPWP combined skills development training with short-term employment. The expectation was that the participants would exit with a higher level of skills and find jobs in the market. However, the training component of EPWP is not adequate to lead to the acquisition of *higher skills*. As a result, many participants return to unemployed status upon exiting the programme.

Sindelo (2019: 79) further adds that the EPWP job creation projects, with its current implementation, are not sustainable. It is, rather, a temporary job creation opportunity that rarely provides an exit strategy or ensures that the beneficiaries on the EPWP projects are employable towards the end of their EPWP employment contracts. Poor control, reporting and the use of inaccurate instruments have destroyed the most important characteristics of the programme.

As a result, gaps such as those that relate to the monitoring and evaluation of the projects grouped under the EPWP in the department occur.

In a nutshell McCutcheon (2018b: 41) “explains that the labour-intensity in the infrastructure sector reflects business as usual through the use of conventional construction capital-intensive, heavy equipment intensive construction. The above numbers were achieved at the low levels of labour-intensity. Use of proper labour-intensive methods would have ratcheted numbers up significantly. The actual results amount to opportunities forgone. The serious inability of the current authorities to spend the funds allocated to them within the financial year results in negative implications for skills development participants, employment and wages. The EPWP is a program in name only. Thus, despite its title the EPWP is no actual programme in the sense of overall planning, training, construction and maintenance”.

The South African Institution of Civil Engineering commented that “There still seems to be a strong resistance amongst the road design and construction fraternity against labour-intensive road construction, mainly due to the misconception that it is too time-consuming and costly, and that it results in an inferior project” (South African Institution of Civil Engineering 2018: 36).

McCutcheon (2018b: 45) picks up on this point as follows “the mind-set of all engaged in the construction industry is orientated towards the use of heavy equipment from concept through design, contract documentation tendering to implementation. Most engineers reject the concept of labour-intensive construction. Rejection stems in part from the lack of understanding of the principles and practice of modern labour-intensive construction. Most engineers do not know that the effective use of these methods which is based on new information, techniques, training, and organization. The lack of understanding is aided and abetted by the vigorous contention that there is nothing worth understanding”.

In light of the above medley of conditions, only a few consultants have the practical experience, time and knowledge required to perform a thorough revamp of the standard designs, documents and procedures.

The South African Institution of Civil Engineering (2018: 37) suggest that the new strategy going forward must include three components:

1. Provide an in-house capacity;
2. Formally establish a long-term programme; and
3. Provide practical training, which must be linked to construction and maintenance.

2.14 The credibility of local governments labour-intensive construction skills development plan

Human resource development has been one of government's top priorities for many years now. Hence, municipalities know that investment in skills development is one of the main keys to improve productivity and, for the public sector, to optimize service delivery. Investing in skills development requires clarity of objective and careful planning to get the best return on investment and avoid the unrealistic expectations of human resource development that most municipalities experience. Skills development must be considered as an investment in human capital in order to increase the future productivity of employees, which in turn improves the performance of local government, which results in improved service delivery. Large amounts of money are spent on human resource development undertakings, but very few get an adequate return on investment.

Jitsing *et al.* (2019a: 53) states that the workplace skills plan (WSP) becomes inconsequential if there is a lack of executive broader management buy-in and support, as some senior municipal officials do not prioritize the training and development of their workforce. The training process is sometimes given to training providers who can offer only what they have, and not what the municipality needs. At the end of the day, this renders the WSP futile. In some cases, managers choose their favourite workers to go for training instead of selecting those who really need it, thereby jeopardizing the whole process of skills, audits, which feeds into the WSP".

Limited resources versus a need for training is also a stumbling block for adequate skills development, as many municipalities put skills development as the last priority of their budget. Misappropriation of funds also affects skills development, as some managers mismanage the funds for their personal aggrandisement and not for training. "Some municipalities believe that the process of submitting the WSP is ritualistic and that they are submitting the WSP for the sake of compliance" (Jitsing *et al.* 2019a: 54). As a result, skills development is neglected.

Municipalities have a huge challenge processing discretionary grants. Municipalities wait for as long as three to four years to receive funds from this grant and in some cases the grant will be too small to cater for the training needs that municipalities require. One can therefore understand why training is not being given first priority. Human resource development professionals need to stop being reactive and become more proactive and start skills development with student institutions of learning, sponsoring them as a way of nurturing

innovative skills and later absorbing them into their municipalities. Managers must use appropriate criteria to select carefully whom they send for training in order to realise the potential of the WSP and address the skills gap rather than just sending close allies for training.

Jitsing *et al.* (2019a: 55) states that “to ensure that local government retains a skilled workforce it is essential that skills development must be informed by a quality skills audit process. This leads to tailor-made skills development and training. The main reason for conducting a skills audit is to ensure that municipalities implement training and development that are relevant to the needs and demands of the municipalities. It is also imperative to mention that skills development requires many resources, such as time, money and critical expertise”.

Despite the fact that skills development is a critical component in modern-day workplaces, it is unfortunate that some municipalities do not embrace and implement this process thoroughly.

“There is a lack of executive and broader management support, as some managers do not prioritize the training and development of their workforce. Therefore, there is a need for a comprehensive appreciation of skills development by managers for an effective skills development process”. (Jitsing et al, 2019a: 55)

Kraak et al (2013: 35) states “large numbers of unemployed people have been trained, only to remain unemployed. Many have accessed training programmes mainly to obtain the learner allowance. Moreover, a rigid and heavily bureaucratised quality assurance regime adopted by the ETQA units within SETAs has stifled the responsiveness and innovation of providers with regards to meeting real skills needs, particularly skills needs on the ground within communities”.

This section concludes with a salutary comment from McCutcheon (2018b: 41): “in the original June 2004 consolidated program overview and logical framework it was stated that the national training center would be established. This had still not happened by the end of phase 2, 10 years after the commencement of the EPWP”.

2.15 Labour-intensive design, construction and project management in the civil engineering curriculum at tertiary institutes

According to Greber and Mammen (2019: 39), “in 2006 the Council of Higher Education and the higher education quality committee entered into a memorandum of understanding with the

Engineering Council of South Africa, whereby ECSA was dedicated to undertake the quality assurance functions of the HEQC with regard to the graduate engineering programmes”.

ECSA therefore has the statutory responsibility of accrediting the engineering programmes offered at undergraduate level and conducts regular accreditation evaluation visits to institutions that offer engineering programmes. One of the reasons for this, as cited in the ECSA policy on accreditation inspections is to establish whether the diplomats and graduates from the respective programmes are ready for employment. Accreditation criteria consider the structure, learning outcomes, educational processes, resourcing and sustainability of the programme to determine if the quality of the programme is adequate. This means that both the programme and the work performed by students must meet the specified ECSA exit level outcomes applicable for that programme. ECSA has developed quality assurance documents that contain standards, criteria, policies and procedures that the education provider must comply with in order to secure accreditation. These quality assurance documents include a higher education qualifications sub-framework. It is therefore clear that the HEQC and ECSA, in fulfilling their functions as accredited bodies, must align the curriculum and outcomes of engineering undergraduate programmes with the competency requirements and expectations of employers.

The importance of accreditation is an independent quality assurance process, which cannot be underestimated. It is after all there to show the public the quality of these programmes. In some instances, programme deficiencies are only resolved once the professional body notifies the institution of its intention to withdraw its program accreditation.

Unfortunately, labour-intensive design, construction and project management are not given substantial emphasis in our civil engineering programmes at tertiary institutions. It is unfortunate that ECSA has never found this lacking and never used this as a deficiency when accrediting our tertiary intuitions. As a result, many of our graduates who enter the workplace are not ready to design, construct or project manage a labour-intensive project.

2.16 Chapter summary

It is imperative to understand the context described above in order to locate the discussion on industry's contribution to the labour-intensive construction of rural roads. Furthermore, this discussion provides the background to the data analysis in the forthcoming chapters. These

inputs frame the discussion of the contributory environment in the development of the labour-intensive road construction industry that this study reposes on. Chapter 3 presents the research methodology employed for this study.

CHAPTER 3: METHODOLOGY

3.1 Introduction

In this chapter, the research design developed to produce the empirical evidence for this study is presented. The focus is on the civil engineering industry's contribution to the labour-intensive construction of rural roads in South Africa. The civil engineering staff that were employed by parastatals, contractors and consultants who were involved in designing, constructing and managing labour-intensive construction of low order rural community access roads made up the participants for this study. This study aims to explore the contribution of the civil engineering industry towards the design, construction and project management of low order rural labour-intensive construction of community access roads in the Outer West region of eThekweni Municipality. The Outer West Region of eThekweni is spatially located in the western part of the eThekweni Municipality. It measures approximately 78 438ha in extent, representing 34% of the municipal region. The outer west region stretches 30km east to west from near the base of Fields Hill, to Cato Ridge and 40km from beyond Inanda Dam on the uMngeni River in the north to beyond uMlaas River in the south. Umkhambathini Local Municipality (under Umgungundlovu District Municipality) forms the western boundary of the region. Traditional authorities cover fifty percent of the Outer West Region. The region shares an urban and rural landscape with a wide range of settlements types extending from formal urban to rural settlements. Rural areas as well as the Western Suburbs have shown significant residential growth in the last few years. There are limited levels of economic development activities in the region in relation to the existing population who as a result travel out of the region to access economic opportunities

This chapter, therefore, presents arguments for the research design choices that have been made in producing the empirical data for the study.

3.2 Adopted research approach

A concurrent mixed method design was used in this study. "Mixed method research involves both quantitative and qualitative methods used in the same research study." (Wiersma and Jurs 2009: 11). In addition, "when a qualitative design, e.g. a case study, can be enhanced by quantitative data, a mixed method design is the preferred design" (Creswell and Plano Clark

2007: 33). “The single-phase timing of this design is the reason it has also been referred to as the “concurrent triangulation design”. It generally involves the concurrent, but separate, collection and analysis of quantitative and qualitative data so that the researcher may best understand the research problem” (Creswell, Plano Clark, et al., 2003: 65). Furthermore, such a study “focuses on collecting, analyzing and mixing both quantitative and qualitative data in a single study to provide a better understanding of research problems than either approach alone” (Creswell and Plano Clark 2007: 5).

Creswell and Plano Clark (2007: 34) assert that “when quantitative results are inadequate to provide explanations of outcomes, and the problem can best be understood by using qualitative data to enrich and explain the quantitative results in the words of the participants, a mixed methods design is thus the preferred design”.

According to Henning, Van Rensburg and Smit (2004:3), the quest in qualitative research “lies in understanding and for in-depth inquiry”, compared to quantitative research which requires counting and controlling variables. Qualitative research involves the “freedom and natural development of action and representation” (Henning, Van Rensburg and Smit 2004: 3), but quantitative data can be used to “enhance the description of results or the identification of salient themes” (Creswell and Plano Clark 2007: 33).

The researcher explored the contributions and actions of the civil engineering industry consultants, contractors and parastatals regarding labour-intensive road construction and their influence on design, construction and project management within one region (Outer West), with a view to interpreting and understanding what, how and why the civil engineering industry contributes towards, or not, the labour-intensive road construction industry.

3.3 Case study and the methodology used

“Case study research is an increasingly popular approach among qualitative researchers, which provides methodological flexibility through the incorporation of different paradigmatic positions, study designs, and methods” Nerida et al (2014: 10).

The field of labour-intensive road construction is highly contested and happens differently in different contexts and different instances. The most appropriate way, therefore, is to investigate this phenomenon through a bounded case study methodology which “investigates a contemporary phenomenon within its real-life context; when the boundaries between

phenomenon and context are not clearly evident; and in which multiple sources of evidence are used” (Yin 2014: 16).

A case study allows one to understand the event within the realities of that system and what exists within, and as such allows the researcher to explore the depths of the phenomena within its context. As Thomas (2010: 309) states, “a case study approach is especially useful in situations where contextual conditions of the event being studied are critical and where the researcher has no control of the events as they unfold”.

As such, this is an explorative, observational case study and will be restricted to the Outer West region of eThekweni Municipality.

3.3.1 Site for the case study

With the core principles of the case study methodology being articulated above, this section articulates how and why the Outer West as a case study region and more specifically, the eThekweni Municipality was chosen. The Outer West region has an extensive improvised rural population who all require basic services, one of them being rural roads. This region was therefore the most appropriate choice. The case study focuses on the construction of the rural community access roads that were built in the region. It involved a multitude of role players that had both a direct and indirect impact on the result and as such were able to provide insight into the nature of civil engineering’s contribution to the labour-intensive construction of rural access roads and reveal the driving forces that ultimately limited it.

Employment of the unemployed rural population to carry out labour- intensive tasks during road building in the region will provide jobs and help alleviate poverty in the region. The eThekweni Municipality has a skills shortage of qualified and experienced in house staff who can design and project manage labour-intensive projects. Training needs to be urgently provided to the unqualified and inexperienced in house staff to mitigate the skills shortage.

The views, perceptions and opinions of the civil engineering industrial fraternity were explored within the background of the Outer West region to gauge their level of contribution to the labour-intensive road construction industry.

This study will help provide knowledge to the municipality on how they can improve labour-intensive rural road construction, design and project management.

3.3.2 Naturalistic or qualitative aspect of the case study

Naturalistic or qualitative evaluation approaches require the use of predominately qualitative research methods to describe and access the accomplishment of programmes in their natural settings, focusing on the process of implementation rather than quantifiable results. Research that is usually qualitative in nature aims to provide a thorough description of a group of people or community. Such descriptions are entrenched in the life-worlds of the actors who are studied and produce inside-perspectives of the actors and their practices.

3.3.3 Quantitative aspect of the case study

Kumar (2019: 17) states that “the structured approach to inquiry is usually classified as quantitative research. In the structured approach, everything that forms the research process-objectives, design, sample and questions that you plan to ask of respondents is predetermined. The structured approach is more appropriate to determine the extent of a problem, issue or phenomenon”. Wiersma and Jurs (2009: 13) explain that quantitative research usually takes place in situations that are controlled and manipulated. For this reason, the “research design in quantitative research tends to be structured and prescriptive”, the outcomes of which “are to a large extent expressed as numbers”. The quantitative data derived in this study were used to poll opinions of participants, to gauge preferences and inclinations in order to answer the research questions of this study.

3.3.4 Implementation evaluation aspect of the case study

Implementation evaluation research focuses on answering the question of whether an intervention (programme, therapy, policy or strategy) has been accurately implemented (process evaluation studies), whether the target group has been sufficiently covered, and whether the programme was implemented as designed. In this study, the ‘programme’ was the EPWP and the ‘intervention’ was the Guidelines for the Implementation of Labour-Intensive Infrastructure Projects under the Expanded Public Works Programme. This study researched how the civil engineering industry contributed to the EPWP programme by promoting labour-intensive road construction. It also examined how the consultants, contractors and parastatals used the EPWP Guidelines when designing, constructing and project-managing labour-intensive construction of rural roads.

3.4 Participants in the study

The civil engineering staff that were employed by parastatals, contractors and consultants who were involved in designing, constructing and managing labour-intensive construction of low order rural community access roads made up the participants for this study. Design Engineers, engineer's on-site representatives, contracts managers, on-site agents, head engineer, and site representatives were the participants. These participants are associated with companies that have for a period of five years from 2015 to 2019 been involved in labour-intensive road construction projects in the Outer West region of eThekweni Municipality. These participants have interacted with products of labour-intensive road construction and can therefore provide an unbiased and insightful opinion on the labour-intensive road construction industry, and how, if any, attempts have been made to contribute to its improvement.

This study effectively relies on a single case study because, as Creswell (2006: 76) advises, "the study of more than one case dilutes the overall analysis; the more cases an individual studies, the greater that lack of depth in any single case".

3.4.1 Sampling

The sample of respondents was carefully chosen, using analytical induction, to represent the target group that this study is based on, from among those that are or have been associated with labour-intensive road construction in the Outer West region of eThekweni Municipality and whose experience locates them as being able to provide valid and reliable data. The population were chosen from the Outer West Municipalities data base of all the consulting and contracting companies and parastatal personnel who worked on all the labour-intensive rural road projects from 2015 to 2019. One hundred and one individuals was the population size. The consulting and contracting individuals who made up the population size all work for companies who during the five year period from 2015 to 2019 won tenders competing with a series of other companies to undertake design, construction and project management of rural labour-intensive road construction in the Outer West region. In order to qualify for the above tenders the companies must show that they have the necessary qualified staff, according to the municipality's needs, to undertake labour-intensive road construction. Staff must have attended the necessary NQF training for labour-intensive construction and design. Thus, the data generated from the study positions the researcher to be able to surmise and deduct conclusions relating to relationships, latent requirements, and underlying motivations behind the actions of the key role players from

the civil engineering industry in the phenomenon as it unfolds in the Outer West region of eThekweni Municipality.

The population was from all the rural road construction projects on their books during the five-year period. Consultants, contractors, parastatals, engineers and technicians that have worked on labour-intensive road projects in the region were asked to answer the survey questionnaire and were asked to be interviewed. One hundred and one individuals made up the population size from which all were chosen as the sample size. Of the 40 participants in consulting practices targeted 32 responded to the questionnaire and the same 32 took part in the interview. Of the 40 participants in contracting practices targeted 34 responded to the questionnaire and the same 34 took part in the interview. Of the 21 participants targeted in parastatal departments 21 responded to the questionnaire and the same 21 took part in the interview. In total, there were 87 responses to the questionnaire and 87 responses to the interview. A grand total of 174 responses were received. Eighty-seven individuals of the targeted 101 individuals responded to the survey giving a response rate of 86%. During participant selection, should the same or different individuals be selected for the quantitative and qualitative samples? Creswell (2006: P119) states that a “clear consensus does not exist on this question, but a common practice among mixed methods researchers is to select the same individuals for both the quantitative and qualitative data collection, so the data can be more easily converged or compared. Selecting different individuals will introduce personal characteristics that might confound the comparison”. Design engineers, resident engineers and technicians from consultants, engineers, technicians, foreman, and supervisory staff from contractors, project managers, engineers and technicians from parastatal made up the respondents. The respondents all worked on labour-intensive road construction projects in the study region in the course of the five-year period from 2015 to 2019.

One hundred and one localised staff were chosen to serve as the sample population. All the consultants, contractors and parastatal staff involved in the design, construction and project management of all 20 rural labour-intensive construction roads projects in the Outer West Municipality during the period from 2015 to 2019 made up the sample. All key personnel for this case study made up the sample. As companies have more than one senior employee that worked on the above projects, it was inevitable that companies provided multiple respondents.

The choice of using all the consulting and contracting companies and parastatal personnel who were involved in all the above projects as respondent companies was deliberately planned to

meet the criterion of “fitness for purpose” as recommended by Cohen, Manion and Morrison, (2005: 91) who state that “the research plan must suit the purposes of the research”. The sampling strategy was premeditated and mindful of the research enquiry to attempt to provide a holistic opinion of the civil engineering industry limited to the microcosm of the Outer West region of eThekweni Municipality so that validity was maintained.

3.4.2 Data sources and collection

The primary research instrument employed for data collection of this study takes the form of a questionnaire which asked the relevant questions extracted from the Guidelines for the Implementation of Labour-Intensive Infrastructure Projects under the EPWP and from the Basic Conditions of Employment Act Ministerial Determination Four EPWP. The Basic Conditions of Employment Act Ministerial Determination Four EPWP document is included in the Guidelines document mentioned above. Guided by the research questions, the questionnaire was constructed to explore the depth and level of contribution of the civil engineering industry in labour-intensive road construction. The researcher made appointments with consenting respondents, so that the respondents could answer the interview research questions.

3.4.3 Interviews

Due to the mixed methods approach of this study, structured interviews were also used. According to Levent *et al* (2016: 141) the “detailed and standard interview guides of structured interviews will allow the researcher to have more control over the process. The interview guide in this case will help the researcher to prioritize questions and keep the conversation focused, especially when only a short amount of time is granted to the researcher by the informant”.

The interviewees for this study were the staff from the consultants, contractors and parastatal departments who were involved in labour-intensive road construction in the Outer West Municipality during the period from 2015 to 2019 as they were charged with among other tasks, ensuring “that informed decisions are made through the active involvement of all relevant stakeholders” (Sattar and Cooke 2012: 377). During participant selection, should the same or different individuals be selected for the quantitative (questionnaire) and qualitative (interview) samples? Creswell (2006: P119) states that a “clear consensus does not exist on this question, but a common practice among mixed methods researchers is to select the same individuals for both the quantitative and qualitative data collection, so the data can be more easily converged or compared. Selecting different individuals will introduce personal characteristics that might

confound the comparison". It is for this reason this study interviewed the same individuals who took part in the questionnaire survey. After the participants completed and submitted the questionnaire at their own convenience and time without the researcher being present the interview survey appointments were made with the same participants to take part in the interview. The interview was conducted a few days after the participant submitted the questionnaire survey. The same 87 participants who took part in the questionnaire survey were the participants for the interview survey.

Levent *et al* (2016: 141) further states that "structured interviews also help to boost the response rate and maximize the reliability and validity of data". "Using a structured interview is a way of trying to ensure comparability across the sample. Individual interviews are valuable to provide detailed information about the meaning of an event, situation or social context to each participant in a setting". (Mathers *et al* 2000: 2)

Individual structured interviews were conducted in a natural private setting (offices and boardrooms) using an electronic voice-recording device that would provide the least amount of disturbances or intrude on the course of the interview.

Nor *et al* (2014: 30) states that structured interviews enable the interviewer to ask each respondent the same questions in the same way. As the questions are specific, hence the potential for interviewer's variability is reduced.

3.5 The questionnaire

As this case study involves measuring civil engineering's contribution to the labour-intensive roads construction industry in accordance with the Guidelines for the Implementation of Labour-Intensive Infrastructure Projects under the EPWP, a structured questionnaire was appropriate.

In keeping with the above recommendations, the questionnaire took the form of a structured design, composed of questions, which sought to ascertain if the guidelines in the Guidelines for the Implementation of Labour-Intensive Infrastructure Projects under the EPWP were adhered to. The researcher examined the minutes of meetings, correspondence, payment certificates, project documents, bill of quantities, project specifications, design drawings, construction drawings for each project. This enabled the researcher to get a better understanding of the projects and aided the researcher in formulating the respective open ended questions in the

questionnaire.

Telephonic contact was made with the respective staff from consultants, contractors and parastatal. Meetings were arranged with staff who consented to a meeting where they were given the survey guide, consent form and the questionnaire. Participants answered the questionnaire at their own convenience and time without the researcher being present. This *modus operandi* ensured a level of personalisation instead of being sent via mail. It allowed the respondent to “put a face to the researcher” as the stigma attached to understanding and filling in of the consent forms is one of tediousness and boredom. The face-to-face interview portion of the survey was done a few days after the participant completed the questionnaire.

The researcher’s supervisor helped streamline the questions for the questionnaire to make them structured and coherent so that data analysis would not be jeopardised by ambiguity and lack of lucidity.

As the research instrument explored various contributory sectors of the civil engineering industry, a certain degree of statistical methods were required for probing into the nature of characterisations and analysis thereof. Therefore, to further streamline the research instrument, the researcher engaged the assistance of a statistician.

A pilot test was conducted to establish the validity and reliability of the questionnaire. Connelly (2008: 411) explains that a pilot study, is “designed to guide the future study”. Connelly further states that “the lessons learned in the pilot study can prevent major problems that could not be anticipated”. Furthermore, a pilot test assesses “whether a questionnaire has been designed in a manner that will elicit the required information from respondents” (Sharma 2009: 53). Lanphear (2001: 33) adds that the advantages of pilot test are that it allows for “changes that arise from unforeseen events or ideas not originally considered”. Lanphear (2001:33) further states that other advantages include the “opportunity to validate statistical approaches and instruments to strengthen their impact when full implementation is tested and also the potential for considerable cost savings as another reason to undertake pilots prior to investing resources”.

Considerable literary debate has taken place on the size of pilot studies. Hertzog (2008: 180) points out that there is limited “guidance with respect to sample size for pilot studies” with the final size dependent on various issues specific to the study in question not to mention time and budget restraints. The sample size for this pilot test was limited to approximately 10% of the

final study size (10 respondents for the questionnaire and interview) as recommended by Brink and Wood (1998: 380).

Questions in the survey questionnaire with multiple items used Likert scales for scoring in order to “capture the extent of agreement or disagreement with an idea, and not measure some sort of quantity” (Johns 2010: 4). Likert scales enabled the researcher to synthesise measurement with opinion. However, Likert scales can be limited in their exposure of opinions, in that their answers can be too abrupt and inflexible. Therefore, the questionnaire incorporated open-ended questions that allowed respondents to respond in their own words and “invite an honest, personal comment from the respondents in addition to ticking numbers and boxes” (Cohen, Manion and Morrison 2005: 255). Wiersma and Jurs (2009: 204) furthermore explain that “open ended items allow the individual more freedom of response because certain feelings or information may be revealed that would not be forthcoming with selected response items”. The respondents were therefore allowed to voice their opinions which “puts the responsibility for and ownership of the data much more firmly into the respondent’s hands” (Cohen, Manion and Morrison 2005: 255). In addition, open-ended questions provide “a genuine response, rich in value and honesty that are the hallmarks of qualitative data” (Cohen, Manion and Morrison 2005: 255).

3.6 Research validity and reliability

Cohen, Manion and Morrison (2005: 105) state that “validity is a requirement of both qualitative and quantitative research”, and Wiersma and Jurs (2009:5) state that it “deals with the accurate interpretability of the results (internal validity) and the generalizability of the results (external validity)”. This therefore creates the grounds for this study to be externally validated.

Thomas (2010: 319) explains that “trustworthiness is the term used in qualitative research as a measure of the quality of research. Credibility, transferability, dependability and conformability of the data results in trusted information”. These four components were incorporated into the study, which reinforced and enhanced the qualitative research design of the study.

Credibility in qualitative research is defined by Thomas (2010: 319) as “the extent to which the data and data analysis are considered to be believable and trustworthy”, while Lichtman (2006:194) writes that “credibility suggests that the results should be evaluated from the point of view of the participants”. This study used triangulation methods to establish credibility by developing a questionnaire and interviewing qualified civil engineering staff as well as

examining all the data sources mentioned above from all the projects from 2015 to 2019. Feedback on the data gathered from the data sources mentioned above and from the persons interviewed was scrutinized. The concurrent triangulated mixed method design was used. Quantitative and qualitative data were first collected. After the collection process was completed both sets of data was analysed and the findings compared. Results from both sets of data complimented each other in the findings. The quantitative data which was in the form of a questionnaire was conducted in the absence of the researcher being present occurred a few days before the interview. The interview was conducted individually face to face with the researcher and respondent being present. The respondents who answered the questionnaire in poor hand writing, which could not be clearly understood by the researcher, was contacted again to clarify as to what was actually written so as to not omit any answers from the data analysis.

“Transferability is the extent to which the results can be transferred to other settings”, according to Lichtman (2006: 194), while Thomas (2010: 320) regards “research findings as transferable or generalisable only if they fit into contexts outside the actual study context”. Transferability is analogous to external validity and is therefore in line with the validity of this study as indicated above. Thomas (2010: 320) goes on to say “that transferability is a major challenge to qualitative studies due to the subjectivity of the researcher”.

To circumvent any bias or prejudice, transferability was enhanced by a thorough, rich and detailed description of the setting to be studied to provide adequate background information so that an informed picture could be derived from the situation under study.

Lichtman (2006: 195) states that “dependability emphasizes the need for the researcher to account for the ever-changing context within which research occurs. The researcher is responsible for describing the changes that occur in the setting and how these changes affected the way the researcher approached the study”. “A reliable questionnaire should yield the same answer if the same question is posed to the respondent repeatedly in a short span of time. This can be achieved by performing a “test-retest”, i.e. administer the same questionnaire to the respondent a second time and check for consistency of the answer. Any discrepancy in the answers could be due to lack of clarity of the questions and this should be reviewed and rephrased” (Ng 2006: 32).

A pilot test was conducted to establish the validity and reliability of the questionnaire. Therefore,

to enhance the dependability and reliability of my research, the respondents and interviewees of the pilot study after completing the questionnaire and interview were asked by the researcher to provide feedback on their understanding of the individual items of the survey, which allowed the researcher to review and rephrase questions in the survey in preparation for the main study. The pilot study results and participants were not included in the main study. This was done to protect the main study results from being contaminated.

Confirmability examines “the degree to which results could be confirmed or corroborated by others” (Lichtman 2006: 195). This is analogous to objectivity, that is, “the extent to which a researcher is aware of or accounts for individual subjectivity or bias” (Thomas 2010: 322). As indicated earlier, the participants were from the civil engineering industry and comprised consultants, contractors and local government civil engineering officials. The participants were specifically chosen as they were considered to be well versed and knowledgeable within the field of civil engineering road construction.

The measured data gathering occurred in a trustworthy manner because the research made use of first-hand information from sources directly involved with the labour-intensive construction of rural access roads in the Outer West Region. The gathering of information and doing research each time raises the concerns of reliability and validity. In this study, the questionnaire and interview were used as a tool to correctly measure what has been planned to be measured in order to accomplish the goals of the research.

To ensure this study was valid, a supervisor was assigned to supervise the researcher. The supervisor assessed the content and the objectives of the study and verified whether the research questions and the data collection instrument were derived from the subject of the literature. In addition, the research committee members checked to ensure the study is in keeping with what it planned to measure.

This study effectively relies on a single case study because, as Creswell (2006: 76) advises, “the study of more than one case dilutes the overall analysis; the more cases an individual studies, the greater that lack of depth in any single case”.

The sample of respondents was carefully chosen to represent the target group that this study is based on, from among those that are or have been associated with labour-intensive road construction in the Outer West region. Sample was chosen from all twenty road construction

projects. The respondents all worked on labour-intensive road construction projects in the study region in the course of the five-year period from 2015 to 2019. The choice of using all the consulting and contracting companies and parastatal personnel who were involved in all the above projects as respondent companies was deliberately planned to meet the criterion of “fitness for purpose” as recommended by Cohen, Manion and Morrison, (2005: 91) who state that “the research plan must suit the purposes of the research”.

During participant selection, should the same or different individuals be selected for the quantitative and qualitative samples? Creswell (2006: P119) states that a “clear consensus does not exist on this question, but a common practice among mixed methods researchers is to select the same individuals for both the quantitative and qualitative data collection, so the data can be more easily converged or compared. Selecting different individuals will introduce personal characteristics that might confound the comparison”. This study selected the same individuals for both the quantitative and qualitative data collection.

Individual structured interviews were conducted in a natural private setting (offices and boardrooms) using an electronic voice-recording device that would provide the least amount of disturbances or intrude on the course of the interview. Levent *et al* (2016: 141) states that “structured interviews also help to boost the response rate and maximize the reliability and validity of data. Using a structured interview is a way of trying to ensure comparability across the sample”. Nor *et al* (2014: 30) states that “structured interviews enable the interviewer to ask each respondent the same questions in the same way. As the questions are specific, hence the potential for interviewer’s variability is reduced”.

For consistency to occur with interviews, each question was asked in exactly the same way, including tone of voice and body language.

The data collected measuring the performance of the civil engineering industry in promoting labour-intensive rural access road construction in the Outer west region of EThekwinini reflected to be in keeping with what they were planned to measure because the data collection tools correctly measured what it planned to measure in order to accomplish the goals of the research.

3.7 Considering ethical Issues

During the process of data acquisition, assimilation and analysis, Miles and Huberman (1994) list numerous considerations that a researcher needs to bear in mind. The researcher is advised to take cognizance of informed consent, benefits, cost, reciprocity, risk, privacy, confidentiality, anonymity and research integrity throughout the research process. Ng (2006: 32) also adds that “anyone involved in collecting data from participants has an ethical duty to respect each individual participant’s autonomy. Any survey should be conducted in an ethical manner and one that accords with best research practice”. Part of the requirement for undertaking research at the Durban University of Technology is to enroll and pass an online ethics course. The researcher completed and passed this course in 2016. Evidence of which is found in Appendix M. The Web-based training course helped the researcher to understand ethics in research before conducting research.

The Institutional Research Ethics Committee gave full ethics clearance and approval for conducting this research in 2017 as evidenced in Appendix N. A letter of approval from the EThekweni Municipality to conduct research in the Outer West Region was also given in 2017 as evidenced in Appendix O.

Ng (2006: 32) further states that “two important ethical issues to adhere to when conducting a survey are confidentiality and informed consent. The respondent’s right to confidentiality should always be respected and any legal requirements on data protection adhered to. In the majority of surveys, the participant should be fully informed about the aims of the survey, and the participants consent to participate in the survey must be obtained and recorded”.

“All participants should be given a covering letter including information such as the organization behind the study, including the contact name and address of the researcher, details of how and why the respondent was selected, the aims of the study, any potential benefits or harm resulting from the study, and what will happen to the information provided. The covering letter should both encourage the respondent to participate in the study and also meet the requirements of informed consent” Ng (2006: 33).

Ng (2006: 33) also highlights “the importance of maintaining the confidentiality of individual responses and reporting survey results only in the aggregate. Another ethical consideration is recognizing that survey participation is a voluntary event that requires the researcher to encourage participation without undue pressure or coercion of the participants”.

The participants of this study were all informed of the nature of the study, purpose, data collection, depth of the study and their rights to participation and withdrawal as evidenced in the letter of information in Appendix P and survey and interview guide as evidenced in Appendix A. Furthermore, informed consent in writing was obtained from each of the participants as evidenced in Appendix A.

The benefits of the study to the researcher were revealed in the cover page of the questionnaire (Appendix A) which subsequently may lead to academic recognition and career advancement of the researcher. The expected benefits to the participants would be assisting with promoting labour-intensive road construction and all the benefits that come with it. The potential hazards of the study are minimal if not nonexistent. As part of this study was a qualitative study, participants in the interview were voicing an opinion or perception, which is within their constitutional rights to do.

The researcher's background is in the civil engineering field and has worked for over 25 years in the road construction industry, therefore he has an interest in the civil engineering industry's contribution towards the labour-intensive road construction. He has presented a paper entitled "Industry's Contribution to the Labour-intensive Construction of Rural Roads" at the South African Transportation Conference in 2018. The participants were all from the civil engineering field and therefore a certain degree of trust was expected as both parties were driven by the upliftment of the labour-intensive road construction industry.

As the participants were located in the civil engineering arena but from different spectrums of the field (consultants, contractors and parastatal), a certain degree of disagreement and difference of opinion was envisaged. To this end, privacy, confidentiality and anonymity prevailed at all times.

This study followed the route taken by numerous other concurrent mixed method investigation studies using both quantitative and qualitative data, thus the researcher maintained the research standards as set by previous researchers in the field while exhibiting the same degree of integrity.

3.8 Biases

As the researcher is currently employed in the civil engineering industry, and involved in the labour-intensive road construction industry, the researcher was aware that he might influence

the research process or manipulate and prejudice the data in favour of the civil engineering industry. In order to mitigate against the biases that may arise from the researcher's engagement, the researcher relied specifically on the data, provided a deep description of the process and the data as a way of informing the conclusion.

3.9 Limitations of the study

The enquiry used the case study approach with a "thick" in-depth account of the unfolding events which required participants to consider the entire period of the five years covered by the study, so devoting enough time to thoroughly complete the questionnaire may not have been possible.

Due to the nature of civil engineering work being located both in an office and on remote sites, some may not have the time to take part in the questionnaire and interview survey. Furthermore, some may just not wish to participate in the study and therefore this indicates a probable limitation of the study.

Therefore, not all 101 chosen participants who represented the sample may have been in a position to complete the survey. Of all the 101 participants chosen as the sample 87 participants completed and responded to the questionnaire survey and the same 87 participants completed the interview survey.

The study explored the industry's contribution via the Outer West regions database, which is a limitation to the study. Road construction activities are occurring within all municipalities throughout the country; however, the research was restricted to the Outer West region of eThekweni Municipality due to its extensive rural road database. Therefore, the inferences, outcomes and generalisations found in this study are related to the Outer West region only.

To best serve the research problem, a concurrent mixed method approach was considered to be the most appropriate research design approach. The choice of sampling strategy was governed by fitness for purpose, cautious of the nature of the research enquiry. The primary method of data collection was via a survey questionnaire and structured face to face interviews taking due cognizance of validity and trustworthiness. A pilot study was conducted in order to establish trustworthiness.

3.10 Pilot study results

“A research tool should be tested on a pilot sample of members of the target population. This process will allow the researcher to identify whether respondents understand the questions and instructions, and whether the meaning of questions is the same for all respondents. Where closed questions are used, piloting will highlight whether sufficient response categories are available, and whether any questions are systematically missed by respondents. For those questions which you feel may be confusing or sensitive, it is important to ask the respondents to comment specifically during the pilot test” (Ng 2006: 33).

Ng 2006: 34 further adds that “pilot tests also allows a trial data analysis to make sure the data received can actually be used. Any missing or unnecessary information can be detected and questions can be either added or removed as a result”.

Some of the questions needed further streamlining after carrying out the pilot study. Some questions were repetitive and strikingly similar to others and some were of an ambiguous nature. Some respondents felt as if they had already answered certain questions previously. With guidance from the researcher’s supervisor and statistician, the concerns raised by the pilot study were evaluated and re-worked. Problematic questions were subsequently interrogated to finally arrive at more precise and explicit questions that went to the heart of the research questions underlying the nature of the study.

The pilot study further provided some information on the quality and depth of the data collected from respondents. Some answers to open-ended questions were abrupt to the extent that some responses required further probing. Through the pilot study, the researcher realised that some of the open-ended questions would require going back and forth to respondents to gain a clearer, deeper understanding of their opinion. The questions were edited to prevent the above from occurring in the main study.

3.11 Chapter summary

Due to the criterion of fitness for purpose, all elements of research should be carefully considered and planned. In adopting a strategy for this research, the researcher was mindful of the research purposes, wary of the data collection methods and the dominant choice of methodology. The selection of sampling strategy was not random but governed by its suitability for the study so as to best serve the research purposes.

The information collected from the data generation is presented in the following chapter. The researcher further describes the forms of analytical methods chosen as most appropriate to decipher the results that are characteristic of this mixed method approach study.

CHAPTER 4: STATEMENT OF FINDINGS, INTERPRETATION AND DISCUSSION OF PRIMARY DATA

4.1 Introduction

This chapter focuses on the presentation of the data through which emerging and key findings are identified after having presented the research design for the production of the data in Chapter 3. An analytical framework will be presented to direct the development of the chapter. Details of the analytical framework is presented below.

The questionnaire was the primary tool used to collect data from civil engineers in three particular organisation types, namely consulting, contracting and parastatal engineering organisations. The questionnaire was designed using key questions that were formulated from the Guidelines for the Implementation of Labour-Intensive Infrastructure Projects under the Expanded Public Works Programme. The respondents' answers, data collected from minutes of meetings, reports, contract documentation, bill of quantities, contract specifications, design drawings, construction drawings and other sources were measured using the above guidelines to judge the level of contribution the civil engineering industry has made towards labour-intensive construction of rural roads in the Outer West region of eThekweni Municipality. The data collected were analysed using SPSS version 26.0. The results are presented in the form of graphs, cross tabulations and other figures.

4.2 Management and analysis of the data

There are two major aspects to industry's contribution towards the construction of labour-intensive rural roads that were identified. The first aspect relates to the design phase and the second to the construction phase. Hence, what might be an appropriate inclusive relationship between industry and labour-intensive road construction and design, is an important consideration in future development of the labour-intensive road construction industry. Hence, an analytical model was conceptualised to guide the data analysis section so as to bring coherence and resonance with the research focus, aims and outcomes of this study.

The framework organises the themes of the data presentation. The first theme is the design phase of the projects and the second theme is the construction phase of the projects.

4.3 Biography of participants from industry

In this section background to the participation rates and the nature of industries that participated in the data production process is presented. This is presented in order to illuminate two issues: firstly, the breadth of specialisation areas within the civil engineering industry to show inclusivity of specialisation in this research process, and secondly to allude to some of the limitations that could have an influence on interpretation of the data.

The participants were from the civil engineering industry organisations that had been involved in the design, construction and project management of all the rural roads projects in the Outer West region of eThekweni Municipality for a five-year period from 2015 to 2019. In total, there were 20 projects to the value of 80 million rand. All professionals who worked on all 20 projects were chosen as the sample for this study.

Table 4.1 describes the status of the respondents and the organisations to which they belonged.

Table 4.1: Classification of participants who responded

Respondent Status	Organisation	Targeted Interviewees	Responded to the Interview	Targeted Respondents for data for the Questionnaire	Responded to data gathering for the Questionnaire
Design Engineers	Consultant	20	16	20	16
Engineers on-site Representative	Consultant	20	16	20	16
Contractors Manager	Contractor	20	17	20	17
On-site agent	Contractor	20	17	20	17
Head Engineer	Parastatal	1	1	1	1
Site Representative	Parastatal	20	20	20	20
Total		101	87	101	87
Grand Total of (87 + 87) = 174 responses					

One hundred and one localised staff were chosen to serve as respondents. All the consultants, contractors and parastatal staff involved in the design, construction and project management of all 20 rural labour-intensive construction roads projects in the Outer West Municipality during the period from 2015 to 2019 made up the sample. All key personnel for this case study made up the sample. As companies have more than one senior employee that worked on the above

projects, it was inevitable that companies provided multiple respondents.

The choice of using all the consulting and contracting companies and parastatal personnel who were involved in all the above projects as respondent companies was deliberately planned to meet the criterion of “fitness for purpose” as recommended by Cohen, Manion and Morrison, (2005: 91) who state that “the research plan must suit the purposes of the research”. The sampling strategy was premeditated and mindful of the research enquiry to attempt to provide a holistic opinion of the civil engineering industry limited to the microcosm of the Outer West region of eThekweni Municipality so that validity was maintained.

Of the 101 interviews targeted, 87 interviews were accomplished, producing a response rate of 86%. Of the 101 professionals targeted for data for the questionnaire, 87 also responded producing a response rate of 86%. Twenty rural road projects to the value of 80 million rand were completed during this period resulting in the completion of 87 questionnaires and 87 interviews. While gathering data from 87 professionals for the questionnaires the researcher also conducted interviews to gain an in-depth perspective of their contribution towards labour-intensive rural road construction. Altogether, data was gathered from 87 professionals for the questionnaire and 87 interviews were conducted summing to 174 responses of the planned 202 responses giving a response rate of 86%. “Quantitative methods, such as surveys answer the question “How much?” However, these methods can leave the question “Why?” unanswered. This is where qualitative data collection methods come into play. When we ask closed-ended questions in a questionnaire, we often find out later on that the response options we gave do not help describe real language use.” (Canals 2017: 398). The research study design used was a concurrent mixed method design where both quantitative in the form of a questionnaire and qualitative in the form of a face to face interview was used to answer both questions “How much?” and “Why?”. Zohrabi (2013: 260) is of the view that “questionnaires and interviews instruments are selected because of their extensive utilisation and their application in mixed method approaches to research. By using these instruments, the researcher can obtain both quantitative and qualitative data. In addition, it was argued that any researcher needs to enhance the validity and reliability of the data”. According to Canals (2017: 398), “interviews are more personal, as compared to questionnaires, allowing us to have higher response rates. It allows more control over the order and flow of questions. Interactions between respondents and research staff can provide valuable information about the results. Face -to -face interviews have a distinct advantage of enabling the researcher to establish rapport with

potential participants and therefore gain their cooperation. These interviews yield highest response rates in survey research. They also allow the researcher to clarify ambiguous answers”.

Cronbach alpha test were conducted on questions having several question items to establish the internal reliability of the variables. The closer the Cronbach alpha is to 1, the higher the internal consistency reliability. Question 1 had 7 variable items and scored 0.947, question 12 had 3 variable items and scored 0.965. This test revealed that a reliability score of 0.947 and 0.965 deemed the internal reliability of the variables in the two questions as highly reliable. Reliability is computed by taking several measurements on the same subjects. A reliability coefficient of 0.70 or higher is considered as ‘acceptable’.

4.3.1 Demographic data

This section summarises the demographic characteristics of the respondents.

Figure 4.1 describes the organisations to which the respondents belonged.

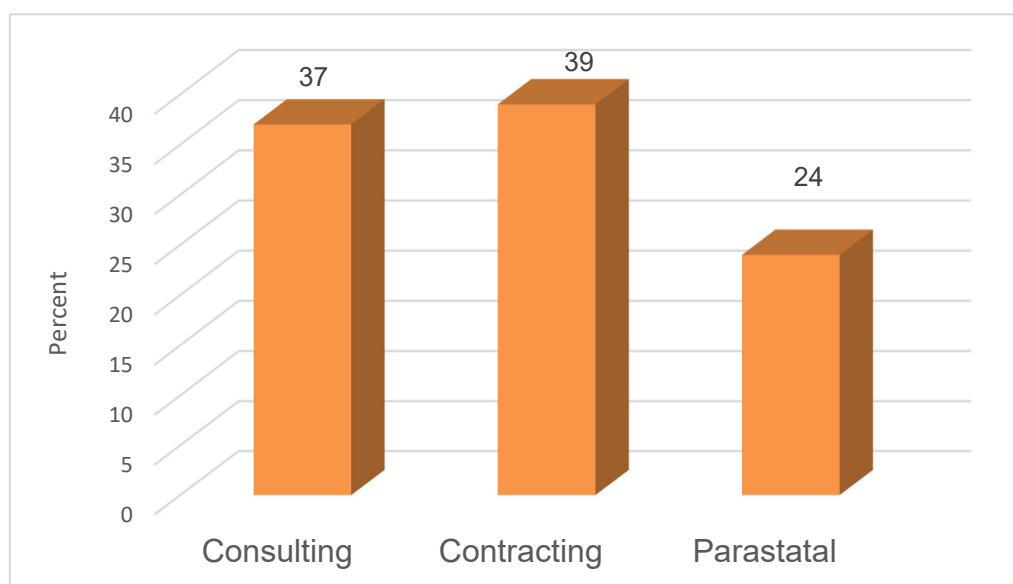


Figure 4.1: Participants in terms of civil engineering company types

A little more than two thirds of respondents ($37 + 39 = 76\%$) were consultants and contractors while a little under a quarter of the respondents (24%) worked in the parastatal (Outer West Municipality). This demographic profile of respondents reflects a bias of participation by the parastatal company and is a factor that needs to be kept in mind as a possible limitation. It would have been useful to have equal representation from each type of company for statistical

generalisation. This demographic profile may compromise the generalisability of the findings. One possible reason for this bias is that parastatal companies, in this case the Outer West Municipality, do not have sufficient in-house capacity to design and construct labour-intensive road construction works and therefore rely heavily on the use of outside consultants and contractors to carry out this type of work for them.

4.4 Level of design compliance towards labour-intensive road construction

This section aims to display compliancy of the construction drawings, bill of quantities and project specification with the Guidelines for the Implementation of Labour-Intensive Infrastructure Projects under the Expanded Public Works Programme. It analyses the working drawings, instructions given to contractors in the documentation, and the design of the bill of quantities. The aim of this was to establish if the designs by industry met the requirements of the Guidelines for the Implementation of Labour-Intensive Infrastructure Projects under the Expanded Public Works Programme.

This was accomplished by analysing the data collected from the questionnaire and the respondents' answers to the relevant questions in the interview and the information retrieved from the construction drawings, bill of quantities and project specifications for every project.

4.4.1 Levels of support from the design drawings

This was accomplished by noting the answering patterns from the respondents per variable section. Levels of disagreement (negative statements) were collapsed to show a single category of "No". The same procedure was used for the levels of agreement (positive statements) and a "neutral answer" was included when the respondent had no clue about the design requirements from the EPWP Guidelines or had no knowledge about labour-intensive road construction design. This was allowed due to the allowable levels of reliability.

The results are further presented using summarised percentages for the variables that make up each section (Figure 4.2). Results are then further examined according to the significance of the statements.

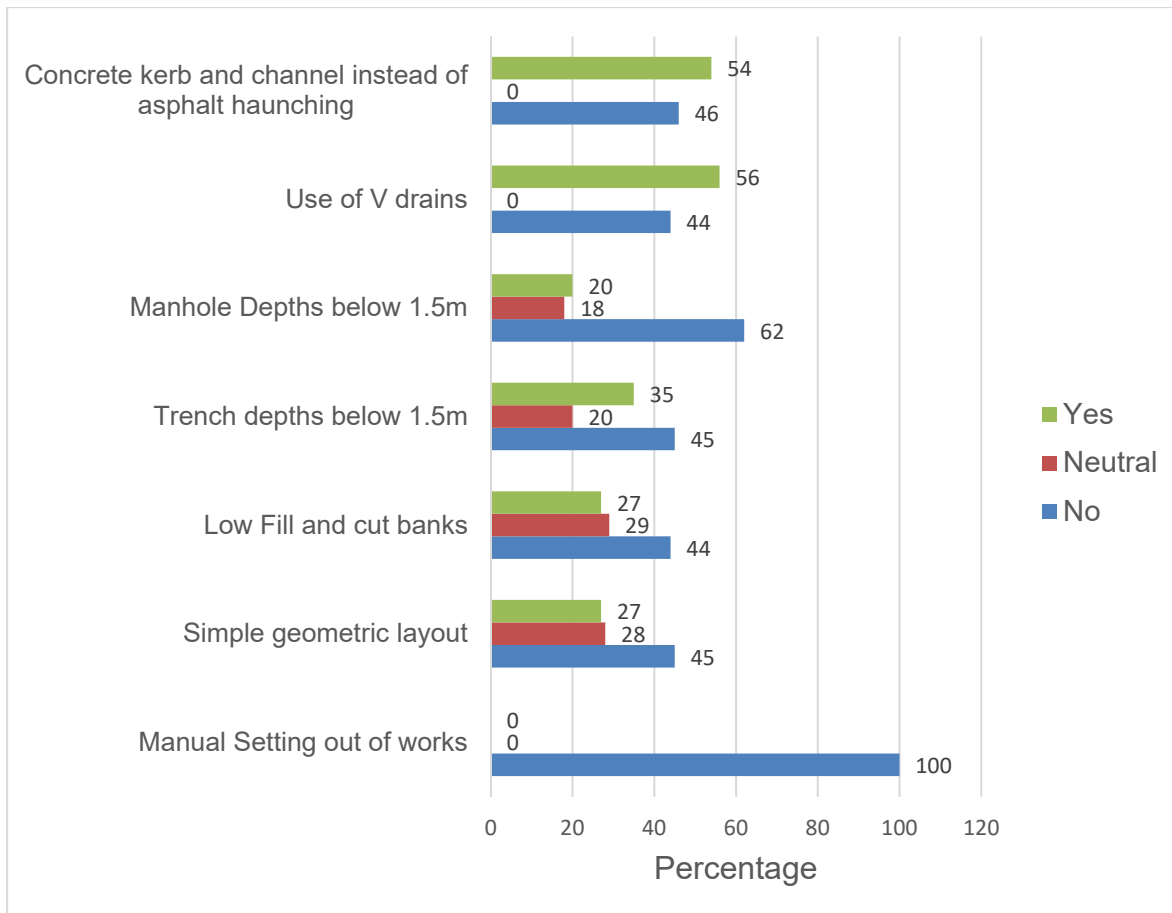


Figure 4.2: Level of support from design drawings

The general trend is that the level of disagreement is higher than agreement in five out of seven instances. In most instances, the level of neutrality is as high as the levels of agreement. For example, there were almost as many respondents who agreed that the geometric layout was simple as there was who were neutral. This implies that some contributions were heeded whilst others were not. The interview revealed that many of the respondents who answered in the neutral in the questionnaire could not differentiate between a simple geometric layout suited for labour-intensive construction and a more complex geometric layout, which is suited for heavy machine-based construction.

Of interest is that 100% of the respondents answered in the negative that manual setting-out data was provided. When the contractors were questioned, they stated that they had to rely on expensive equipment used by surveyors to set out the works because the design engineer did not provide manual setting-out information. This increased the cost of the project. Ninety percent of the roads constructed were existing gravel paths upgraded to rural roads. It would have been very easy for the design engineer to provide manual setting-out data information to

the contractor. The Guidelines for the Implementation of Labour-Intensive Infrastructure Projects under the Expanded Public Works Programme clearly states that designers must provide manual setting-out information on all construction drawings.

Over 60% of the respondents answered in the negative that manhole depths were below 1.5 metres. This again is an EPWP design guideline requirement for labour-intensive projects. As a result, the contractors had to rely on the use of heavy excavation equipment to excavate deep trenches. Low fill and cut banks, trench depths below 1.5 metres and the use of concrete kerb and channels instead of asphalt haunching are items that can be constructed using labour-intensive methods. Results from item one and two of question one from the questionnaire revealed that a small majority of the respondents, between 54% and 56%, reported that the use of V drains and concrete kerbs and channels were constructed. During the interview when the question two was asked as to what contributions do participants think that contractors can make to the labour-intensive construction of rural roads all participants stated that minor drainage works like V drain and kerb and channel construction can be constructed fully labour-intensively. However, when probed during the interview, if concrete was mixed by hand labour-intensively or was ready mix concrete imported for the construction of V drains and kerb and channel construction, all the respondents answered the latter. All participants also reported that concrete for minor drainage construction could have been mixed by hand labour-intensively rather than ready mixed concrete being used when asked question fifteen of the interview for their opinion as to which areas of the contract was not complaint in promoting labour-intensive road construction. As a result of their answers one can conclude that these two items were not constructed using fully labour-intensive methods. Only 27% of the respondents reported that the consultants designed the projects to accommodate for low fill and cut banks and 44% reported in the negative. During the interview, when question one was asked as to what contributions can consultants make to the labour-intensive construction of rural roads respondents reported that the earthwork design needs to be in accordance with labour-intensive road construction methods rather than being reliant on machine-intensive construction methods.

4.4.2 Levels of support from the scope of works in the contract document.

Table 4.2: Scope of works (Bill of quantities and project specifications) level of support

Question from the Questionnaire	Findings	Percentage of Respondents who reported the same Findings
Question 32. Areas or Components requiring urgent attention for roads to be constructed labour-intensively	Respondents stated that Items which can be constructed labour-intensively in the Bill of Quantities need to be flagged so as to prevent these items from be constructed using machine intensive methods.	100%
Question 32. Areas or Components requiring urgent attention for roads to be constructed labour-intensively	Specifications in the contract document need to state that items flagged as LI items would not be paid for if they were constructed using machine-intensive methods.	100%
Question 15. Was payment made for items constructed using machine-intensive methods that could have been constructed using labour-intensive methods	All respondents answered YES	100%
Question 14. Were labour-intensive items identified in the scope of work	All respondents answered YES but stated it was very vaguely identified to the point where it was open to abuse. Respondents stated that Specifications should have been written stating no payment would be made for these items if they were constructed using machine intensive methods.	100%
Question 14.3. Were there items listed in the scope of work built exclusively using labour-intensive methodologies	NO	90%

The EPWP Guidelines for the implementation of labour-intensive infrastructure projects are very specific in stating that items in the project bill of quantities that can be constructed using labour-intensive methods should have an “LI” abbreviation listed next to the item. It is interesting to note from Table 4.2 that the all the respondents reported that the bill of quantities in all 20 projects did not have any LI abbreviated items listed. The same respondents stated that this gave the contractors an opportunity to use machine-intensive methods when they needed to speed up the construction works which was to the disadvantage to the local labour who could have been employed to carry out the labour-intensive tasks. The respondents also stated that the contractors took further advantage when they realised that they were being paid for these items. The respondents reported that similar to conventional contracting the construction of V drains, kerbs and channels, head walls and wing walls, dry stack retaining walls and installation of signposts were constructed using labour enhanced methods. This was misunderstood for

labour-intensive methods. Meaning that when constructing a concrete v drain labour-intensively for example, the concrete must be mixed on site and loaded onto a wheelbarrow, hauled and then placed in the excavation. When the respondents were asked if this was the process followed 90% answered in the negative by stating that ready mix concrete was ordered. The respondents also reported that many contractors opted for the machine-intensive construction of asphalt haunching for kerbs and asphalt channels rather than using the labour-intensive methods needed to lay 'figure 6' type kerbs and concrete channels. The data for the findings in Table 4.2 was gathered by the researcher from the answers received from the respondents during the interview, the questionnaire survey and the photographs taken of the various projects as shown below.

Contractors usually prefer to finish the work quickly, receive payment and move off site. This quick process ensures higher profits. Machine-intensive work ensures quick production to the detriment of local labour who could be employed and earn a living. It is for this reason that the EPWP Guidelines for the Implementation of Labour-Intensive Infrastructure Projects states that the project specification for labour-intensive contracts must include a clause that states that items listed with an LI abbreviation would not be paid for if this item was constructed using machine-intensive methods. It is however discouraging to note that this clause was omitted in the entire project specifications of all 20 projects. The interview revealed that the professionals responsible for designing the contract documentation stated that they were unaware that this was a requirement. One senior technician who put the contract documentation together stated that his supervisor who was a professional engineer checked the document and stated it was ok. It was further discouraging to note that the contractors were paid for these items which were constructed using machine-intensive methods which could have easily been constructed using labour-intensive methods. A typical example of how construction companies work can be seen in the photographs below (Figures 4.3 to 4.7), with contractors starting the contracts using labour-intensive methodologies but later resorting to machine-intensive methods when they are pushed for time to complete the project. This problem would have easily been resolved if the labour-intensive items in the bill of quantities was flagged using an LI abbreviation and the project specification and contract documentation stated that LI items will not be paid for if they were constructed using machine intensive methods. Parastatal staff also need to award longer construction time periods to complete the projects so as to not rush contractors to complete the projects quickly.



Figure 4.3: Labour-intensive loading and hauling of asphalt



Figure 4.4: Labour-intensive spreading of asphalt



Figure 4.5: Machine-intensive compaction of asphalt



Figure 4.6: Machine-intensive hauling, spreading and compaction of asphalt



Figure 4.7: Machine aided hauling and labour-intensive spreading of asphalt

Figures 4.3 to 4.7 show photographs taken by the researcher of the road construction projects. Figures 4.3 and 4.4 show labour-intensive construction where the labourers are loading, hauling and spreading asphalt. Figure 4.5 shows machine-intensive compaction of asphalt. Asphalt cannot be compacted manually to provide the same finish as produced by machine compaction. Unfortunately, Figure 4.6 shows the same tasks of loading, hauling and spreading carried out using expensive machinery. This is quicker than labour-intensive methods but much more expensive.

The contractor in this project, in order to move on to his next contract quickly, which was much more financially lucrative, decided to abandon the use of labour-intensive methods and adopt a machine-intensive method to speed up the construction process. If the project specification document had the necessary clause stating that the on-site loading, hauling and spreading of asphalt must be carried out using labour-intensive methods then this machine-intensive construction would have been prevented. Labourers would have not been dismissed. The contractor would also not have been paid for his machine-intensive activity that could have been done using labour-intensive methods. Many contractor respondents in the interview stated they were allowed to proceed using machine-intensive activities without being cautioned or stopped by the appointed consultant and the parastatal professional responsible for project-managing the project. During the interviews the contractors also stated that they were put under pressure

by parastatal officials to complete the project quickly so that funds could be spent during the current financial year and not carried over to the next financial year. If the funds were not spent timeously this could be perceived as neglect on the part of the municipality not spending the funds earmarked for the respective wards during the financial year.

Figure 4.7 shows machine aided hauling of asphalt. This machine-intensive task replaced ten labourers who could have done the loading and hauling of asphalt. Here again labour-intensive activity would have been promoted if a clause in the bill and specification stated that the on-site loading and hauling of asphalt must be carried out using labour-intensive methods.



Figure 4.8: Labour-intensive hauling of hand mixed concrete



Figure 4.9: Labour-intensive construction of kerbs and channels



Figure 4.10: Machine-intensive constructed asphalt kerbing

Figures 4.8 to 4.10 show photographs taken by the researcher of a project which used both labour-intensive methods and machine-intensive methods to construct side drain kerbs and channels. Figures 4.8 and 4.9 show labour-intensive construction where the labourers are hauling hand mixed concrete to construct side drain kerb and channels. Figure 4.10 shows asphalt side kerbing that was constructed using machine-intensive methods. Here again the contractor, when pushed to complete the work quickly, resorted to machine-intensive methods rather than employing more labourers to construct the same item using labour-intensive

methods. Poor specifications in clauses and non-annotated LI items in the bill of quantities allowed the contractor to be paid for the work. They were not penalised for using machine-intensive work methods.



Figure 4.11: Machine-intensive landscaping of verges



Figure 4.12: Machine-intensive finishing and tidying up

Another activity that can be carried out using labour-intensive methods is minor landscaping of verges alongside a newly constructed road edge and finishing and tidying up alongside the road edge. Here again, Figure 4.11 and 4.12 show that these tasks were carried out using machine-

intensive processes. The inadequate clauses and annotations in the bill of quantities and the project specification resulted in the contractor being allowed to carry out these tasks using machine-intensive methods. It was discouraging to note that 90% of the respondents stated that none of the items in the bill of quantities was exclusively built using only labour-intensive methods.

4.4.3 Concluding comments on the level of design compliance towards labour-intensive rural road construction

This section of the study considered inputs from participants who were designers in the consulting companies, foreman and site supervisory staff of the contractors, and parastatal project managers. Data was also gathered by the researcher reading through all 20 project documents including design drawings and specifications, visiting construction sites and attending some monthly on-site meetings.

The majority of the responses, on-site photographs and the researcher's observations when going through the contract documentation and design drawings suggest that the contract documentation, design drawings, specifications and bill of quantities did not contain the relevant information needed to enforce the contractor to construct rural roads using labour-intensive methodologies. The Guidelines for the Implementation of Labour-Intensive Infrastructure Projects under the Expanded Public Works Programme was available for perusal by all consultants, contractors and parastatal departments from 2015. It was discouraging to note that none of them made the effort to read the document.

Unfortunately, the design guidance in the EWPW Guidelines was neglected. In addition, comments from respondents in the interviews confirmed that civil engineering rural road project documentation, specifications, bills of quantities and design drawings are laden with information promoting machine-intensive construction. Designers, project managers and contractors will have to learn more about labour-intensive construction to be able to make changes to the above documentation. Unfortunately, this neglect has resulted in fewer labourers being employed to carry out the works.

It is concluded from these observations that industry made little attempt in designing documentation and producing working drawings to suite labour-intensive rural road construction.

4.5 Level of community involvement in the projects

This section attempts to highlight the nature of the involvement of the community, who would have benefited from these projects.

4.5.1 Establishment of a community project steering committee

It is vital that the community become involved in a construction project from the onset of the project. This will enable the community to help find the labourers with the required skills, find community liaison officers who have the necessary knowledge about the demographics of the area, and find the best location for site establishment for the contractor's office, and locating areas where materials and equipment can be safely stored and monitored. This also provides a platform for the community to establish a steering committee where they can address any queries concerning the project. This helps the contractor when they have to establish themselves in the area to carry out the works, source labourers, and provide for water and electricity connections. The steering committee can help to identify the poor individuals in the community who require the necessary informal and formal training to carry out the construction works and in turn earn a wage. These requirements are clearly spelt out in the EPWP Guidelines requirements (Public Works 2015: 16)

During the interviews contractor respondents stated that if the necessary labour was available timeously at the beginning of each task they would have employed them to carry out the task instead of using machine-intensive methods.

When the respondents were asked if a project steering committee was established at the onset of projects they were involved with, over 85% answered in the negative. Table 4.3 shows the results.

Table 4.3: Community project steering committee

Question	Percentage Response	
	No	Yes
Was a community project steering committee formed at the onset of the project.	85%	15%

The 85% response rate reveals that the contractors would have had problems trying to establish the site, source labourers, and obtain water and electricity connections. The reasons from the respondents as to why they did not instruct the community to establish a steering committee from the onset of the project was that they simply did not know that this was an EPWP

Guidelines requirement. The contractors also explained that they had several problems trying to source the necessary on-site skills from the local community. This resulted in the contractors resorting to machinery to complete the tasks that could have been done by labour.

4.5.2 Employment of local labour

The requirements of the EPWP Guidelines for the implementation of labour-intensive works is that workers must be employed according to the Code of Good Practice for Employment and Conditions of Work for the Expanded Public Works Programme.

4.5.2.1 Level of adherence to the Code of Good Practice for Employment and Conditions of Work for the Expanded Public Works Programme

Strict guidance is given from the above two documents on how labour needs to be employed on labour-intensive projects. Ninety percent of the contractors did not follow the above two codes of good practice. Figure 4.13 shows these results.

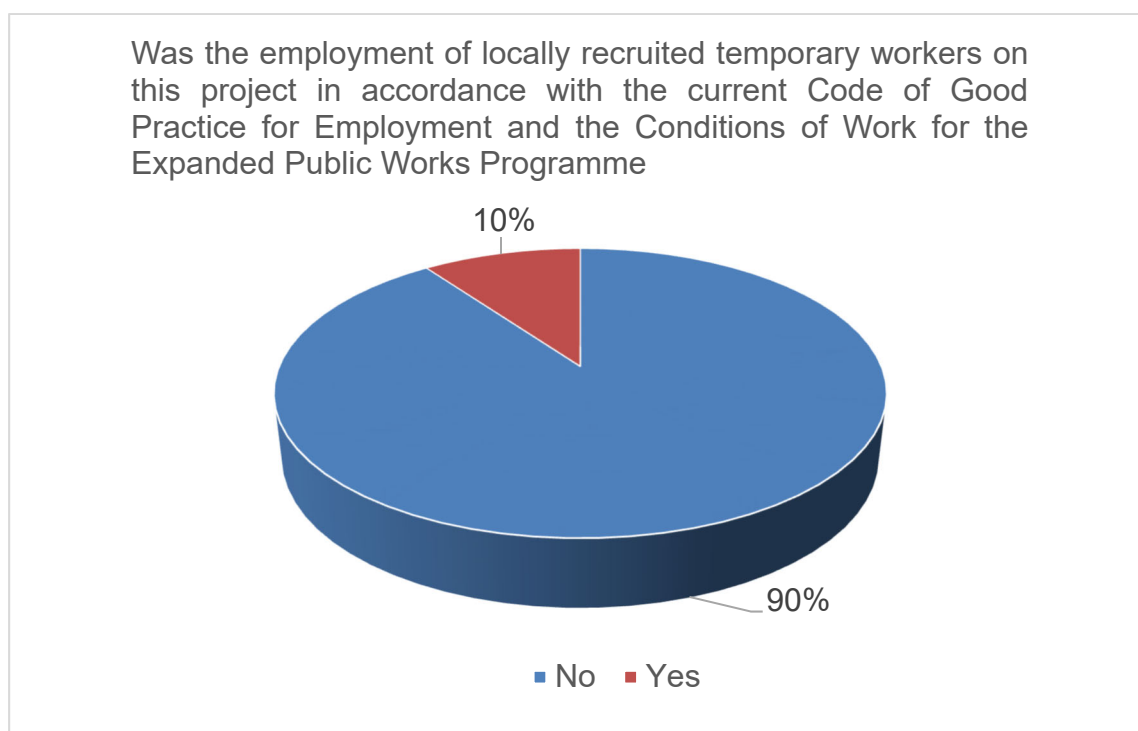


Figure 4.13: Use of Code of Good Practice to employ labour

Many reasons emerged as to why the Code of Good Practice was not used. The main reason was that a project steering committee was not formed at the onset of the project. There was therefore no committee to establish a pool of labourers for the contractor to employ from.

According to the EPWP Guidelines, the project steering committee with the established project committee liaison officer are tasked with providing a pool of labourers who meet the requirements of the project and the Code of Good Practice. Due to this neglect, the contractors, when faced with time constraints, resort to employing any labourer who arrives at the site office without checking if he or she meets the requirements of employment as set out by the Code of Good Practice. The interview revealed that some contractors were unaware that there is a Code of Good Practice that needs to be complied with when recruiting labourers for labour-intensive projects. Others stated that the local Induna and councillor forced the contractors to employ their relatives and friends of their choice for which the Induna received a “kick back” (the labourers paid the Induna a portion of their wage). The respondents from the interview recognised that the corrupt sourcing of labourers was due to a lack of the formation of a project steering committee who could police the activity of finding labourers to perform labour-intensive tasks.

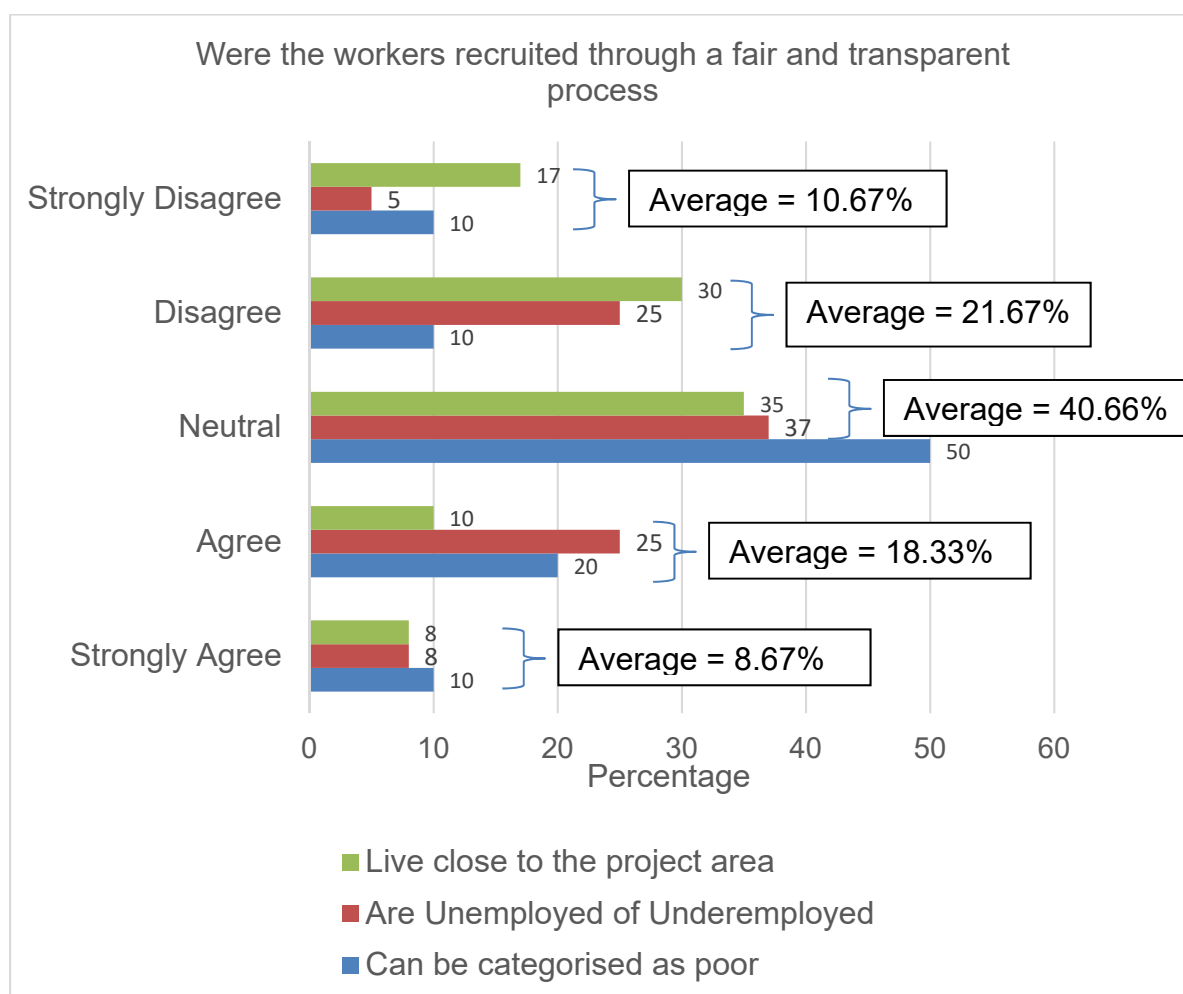


Figure 4.14: Level of fairness and transparency in employing workers

Figure 4.14 represents the results of the level of fairness and transparency used to recruit workers in all 20 projects. The figure shows that a large relative percentage (40.66%) of the respondent answered neutral on this question. The survey revealed that the respondents who answered neutral were unaware that a Code of Good Practice even existed. They therefore did not want to answer yes or no in fear of not following the EPWP Guidelines recommendations. A very small percentage of the respondents (8.67%) strongly agreed that they used fairness and transparency when recruiting labourers, and 18.33% agreed. This left approximately 32.34% of the respondents not in agreement. There were many reasons why many of the projects did not follow the correct protocols when recruiting labourers. Reasons included not having a database from which to select labourers. This was due to the community steering committee not being formed at the onset of the project. As a result, the contractors followed the old principles of contracting by hiring any labourer who arrived at the site office without doing background checks regarding whether the labourer fitted the profile required by the EPWP Guidelines for labour-intensive projects. The professional staff also stated that they were still uneducated regarding the recruitment procedures to be followed during labour-intensive projects.

The EPWP Guidelines were specifically written to promote labour-intensive construction by ensuring that the correct demographics of labour is employed, poverty alleviation methods are adopted, households where no one is employed are prioritised during recruitment, and opportunities are given to the needy by providing them with the necessary training to seek future employment. It also outlines the correct percentages of youth, females and people with disabilities that need to be employed. The professional team revealed in the interviews that they were unaware that employment guidelines for labour-intensive projects existed. It was disheartening to learn that the needy were not given first preference for employment.

4.5.2.2 Demographics of the labour employed

The EPWP Guidelines outline strict protocols for contractors on the correct demographic percentages to be used when employing labourers. This is to encourage employment of a greater percentage of youth, females and those with disabilities. The EPWP target is that 55% of the labour force should be made up of youth or women and 2% should be labourers with disabilities. The results from the survey revealed that all 20 projects did not meet this target. At the most only 20% of employees on a project were women and youth. Women were given non-challenging tasks. These unchallenging tasks included being flag people during traffic control,

where their job was to regulate stop-go signs while guiding traffic during the construction process and being gatekeepers at construction sites. These minor unchallenging tasks did not provide them with the necessary skills to seek future employment. Figures 4.15 to 4.19 reveal that adult males were mostly employed to carry out the skilled tasks.



Figure 4.15: Adult males surfacing the rural roads



Figure 4.16: Adult males preparing for work



Figure 4.17: Adult males asphaltting the road patchwork

4.5.3 Concluding comments on the concern about the employment of local labour during the construction process

From the data generated, the evidence suggests that contractors were not supportive of recruiting labour according to the EPWP Guidelines. Data also suggested that industry was not fully educated and simply did not know that the EPWP Guidelines and the conditions of work for the EPWP existed. Contractors thought that local labour could still be recruited by following the old ad hoc ways contractors followed in the past. They simply made statements along the lines of “this is the way we always employed local labour”. To add to the problem, consultants and parastatal site engineers who were tasked to project manage and monitor the construction process did not rectify the problem from the onset of the project, which resulted in the same mentality being used when new labourers were employed throughout the construction period. The results from question 4 of the interview survey, which asked what aspects of the EPWP guidelines needs improvement, revealed that there were very few contractors (27%) who were aware of the EPWP Guidelines when recruiting labour and who tried to adopt some of the recommendations made in the guidelines and who provided answers as to how to improve the guidelines. The remaining 73% of contracting professionals did not have the necessary experience in the labour-intensive construction field to properly monitor how labour was employed in the projects that the main, emerging and sub-contractors were involved in. They were selected on these projects on the basis that they employ a NQF 5 qualified staff to monitor

the projects. Further probing revealed that the budgets allocated to pay for the NQF 5 qualified staff was not sufficient and only allowed a site visit from this qualified staff twice a month, which left the site mostly in the hands of inexperienced labour-intensive contractors.

4.6 Training local labour

4.6.1 Training recommendations from the EPWP Guidelines

The Guidelines for the Implementation of Labour-Intensive Infrastructure Projects under the Expanded Public Works Programme clearly state that public bodies should make sure that participants working on the EPWP projects gain labour-intensive accredited training as soon as possible. Training applications need to be submitted to the relevant regional office of the Department of Higher Education and Training timeously. Staff from the National Department of Public Works, or Provincial Coordinating Department EPWP units can help the public body to put together and forward the training applications to the relevant provincial office of the Department of Higher Education and Training or to any other financial backing institutions like the Sector Education and Training Authority (SETA).

Training can be arranged by the contractor for the targeted labour to enable workers to equip themselves with the basic work knowledge required to perform the work in line with the requirements of the contract in a manner that does not affect workers' health and safety. Practical training should ideally be provided before the start or during the implementation of a project. The money spent on practical training of targeted workers can be funded from various funding agencies such as the National Skills Fund, the Department of Higher Education and Training, the implementing public bodies, and from SETAs.

Training must occur on the project site or in as close proximity as possible. The public body managing the project must make sure that the project supervisor aided by relevant training staff from the National Department of Public Works forwards all training applications for workers. The public body must make sure workers receive practical on-the-job construction skills rather than life skills. The public body must also ensure that training is provided before the implementation of the project. Workers who receive training must be employed in the project to carry out their work tasks. The contractor must pay an allowance to each worker equal to the workers daily wage when the worker attends practical training sessions. A provisional sum for this must be allocated in the bill of quantities.

4.6.2 Measure of project training provided

For the purposes of this study, respondents were asked if the labour that was employed in the 20 projects received training to enable them to skillfully complete the given tasks on the construction site. Training was broken down into four categories:

- Informal or non-accredited training before the commencement of the project.
- Formal or accredited training before the commencement of the project.
- Informal or non-accredited training during the implementation of the project.
- Formal or accredited training during the implementation of the project.

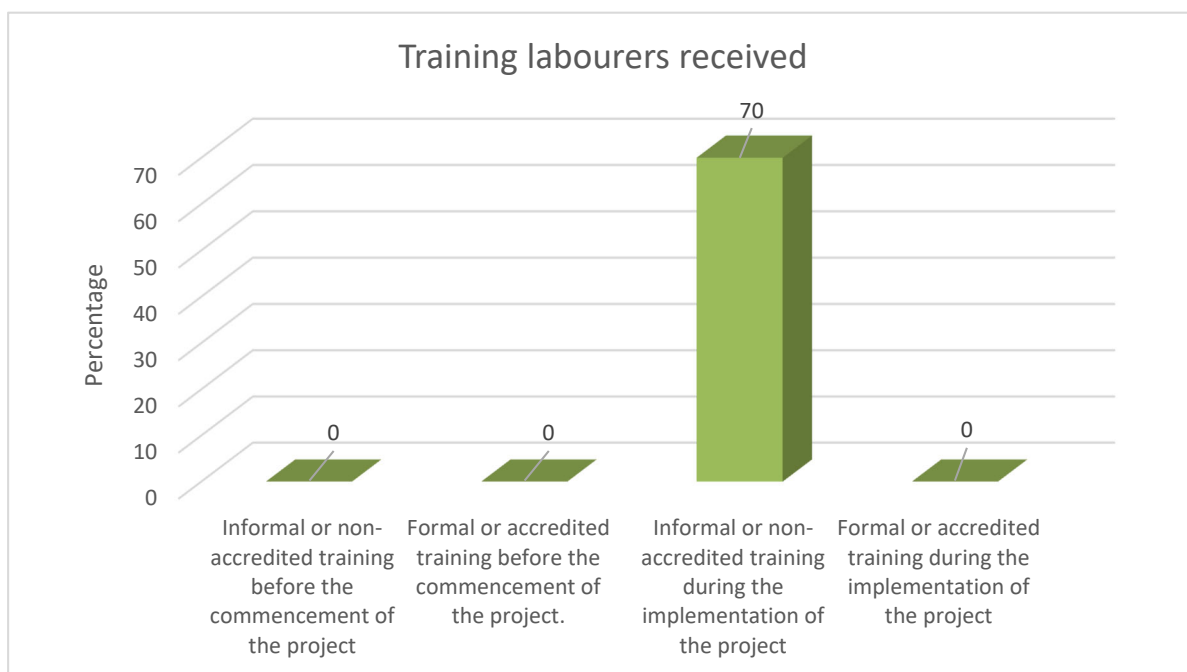


Figure 4.18: Training labourers received on the projects

Respondents were probed to establish which components of the training were delivered to labourers on the various projects. Findings from this evaluation (Figure 4.18) are discussed below.

All respondents stated that no formal accredited training was provided to the labourers who worked on-site both before the commencement and during the implementation of the projects. Seventy percent of the respondents stated that there was some form of informal training provided to the labourers during the implementation of the project. This was in the form of how to use a flag when controlling traffic, basic use of hand tools and the use of safety boots and construction helmets. This form of training was more orientated to protect the contractor from any claims due to injuries and accidents than empower the workers to increase their

construction skills. No informal training was provided before the projects commenced. The bill of quantities had an item for the provision of both accredited and non-accredited training to labourers. When the contractors were asked why this item was not used, they stated that they did not get permission from parastatal departments to use these items, or that the public body implementing the project did not make the necessary training applications for participants timeously resulting in these items not being utilised. This should have been commissioned timeously by the relevant project manager from the public body aided by relevant training staff from the National Department of Public Works. Unfortunately, therefore, a lack of experienced officials in public bodies and poor governance in releasing the skills development funds timeously for training of labourers resulted in no formalised training on all projects.

The purpose of providing accredited training is to empower the labourers with the necessary skills to carry out labour-intensive tasks. Accredited training also provides labourers with certificates, which they can use to seek future employment. Due to the lack of training many tasks that could have been carried out using labour-intensive methods were replaced with machine-intensive methods. An example of this, as shown in the photographs above, is the hauling and spreading of asphalt on the road surface. Because labourers and foreman in this case did not know how to coordinate this task properly, the contractor started to fall behind with the progress of works opted to establish a machine-intensive paver on site to carry out the task of spreading and laying the asphalt.

Ninety percent of the respondent's answers to question 7 of the interview survey regarding what type of formal training will best benefit local labour was on how to use a tape measure and a hand held level. All respondents stated that no formal training was provided to local labour. Answers for question 32 of the questionnaire regarding components, which require urgent attention, indicated that basic training needs to be timeously provided on the setting out of the works which could also have been done by labourers using a tape measure and a hand-held level. Answers to question 32.1 of the questionnaire regarding why the above components need urgent attention was that because no formal training was provided on how to use the instruments the contractor resorted to hiring a surveyor who used expensive survey equipment to do basic setting out tasks. As a result, fewer labourers were employed as the construction progressed, leaving many unemployed in the community.

4.6.3 Concluding comments on the training provided

The research data clearly reveals that proper training never occurred. The training that the contractors state they informally provided was more related to safety induction rather than empowering the labourers to carry out the tasks using labour-intensive methods. Respondents commented that there was difficulty in providing training because the necessary budgets were not in place. Although items were provided by the design engineer in the bill of quantities for training, these could not be used because the public bodies did not take the necessary steps to make the money available.

Some respondents' comments were that if training is provided then there is no time to do the actual construction work. Respondents in the interview survey answers to question 3 with regard to what contributions can parastatal make to the labour intensive construction of rural roads was that public bodies need to provide contractors with longer construction time periods. This simply meant that the public body did not provide the contractor with the correct construction period timelines. The respondents also reported that the contractors were warned that they would be charged penalties if they did not complete the works at the construction end date. Comments regarding the training provided was disconcerting. Nevertheless, contractors did acknowledge that they would have provided training prior to the commencement of the contract if the budgets were available.

4.7 Staff qualifications on labour-intensive road projects

4.7.1 Required skills programmes

All involved in the implementation of the EPWP projects should be competent in labour-intensive construction and or maintenance methodologies. The Guidelines for the Implementation of Labour-Intensive Infrastructure Projects under the Expanded Public's Works Programme recommends that personnel within public bodies, consultants, and contractors complete a skills programme for National Quality Framework (NQF) registered unit standards before they engage in labour-intensive construction. Tables 4.4, 4.5 and 4.6 list the skills programmes to be completed by staff who work on labour-intensive projects.


Table 4.4: Skills programme for client / employer staff

Personnel	NQF	Unit Standard Title	Skills Programme Description
Senior Management and Professionals	7	Develop and Promote Labour-Intensive Strategies	Skills Programme against this single unit standard
Middle (technical)	5	Manage Labour-intensive Construction Projects	Skills Programme against this single unit standard

Table 4.5: Skills programme for consultants

Personnel	NQF	Unit Standard Title	Skills Programme Description
Designer	7	Develop and Promote Labour-Intensive Strategies	Skills Programme against this single unit standard
Employers Representative / Site Supervisor	5	Manage Labour-intensive Construction Projects	Supervisors Skills Programme against this single unit standard

Table 4.6: Skills programme for contractors

Personnel	NQF	Unit Standard Title	Skills Programme Description
Foreman / Site Supervisor	4	Implement Labour-Intensive Construction Systems and Techniques	This unit standard or Qualification must be completed, and any one of the three below;
		Use Labour-Intensive Construction Methods to Construct and Maintain Roads and Storm Water Drainage	 Any one of these three unit standards
		Use Labour-intensive Construction Methods to Construct and Maintain Water and Sanitation Services	
		Use Labour-intensive Construction Methods to Construct, Repair and Maintain Structures	
Site Agent / Manager	5	Manage Labour-intensive Construction Projects	Skills Programme against this single unit standard

The EPWP Guidelines prescribe that personnel within public bodies complete skills

programmes for NQF unit standards qualifications as set out in the tables above. The professional responsible for the design and documentation of the labour-intensive works must have completed the NQF level 7 unit standard 'Develop and Promote Labour-Intensive Construction Strategies' qualification noted in Table 4.5 above. The employer's representative must have completed the NQF level 5 unit standard 'Manage Labour-Intensive Construction Projects' qualification noted in Table 4.5 above. Table 4.6 above outlines the unit standards for contractors.

4.7.2 Qualifications of staff who worked on the projects

This section attempts to highlight the qualifications and skills programmes completed by staff who were involved in the projects. These staff were from the parastatal, consultants and contracting companies who were directly involved in the projects. The purpose of this was to establish if they had the necessary skills to successfully design, project manage and implement labour-intensive road construction projects with a view to understanding how qualifications impact on rural road labour-intensive construction.

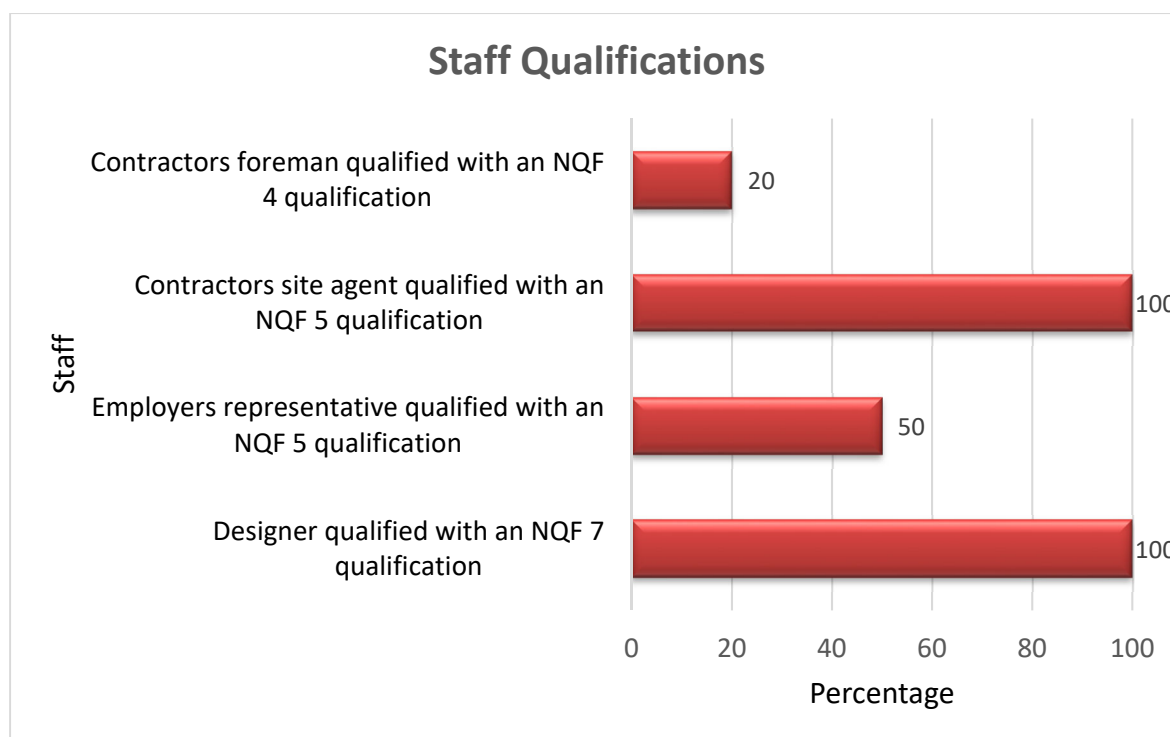


Figure 4.19: Qualifications of Staff who worked on the projects

Figure 4.19 reflects the skills programmes completed by the staff who were involved in the projects. The discussion will focus on the qualifications of staff from the parastatal, consultants and contractors. The engineers and technicians from the parastatal who were involved in

attending on-site meetings and monthly site visits were qualified with the necessary NQF 7 and 5 qualifications. The consultants who were involved in designing the road and putting together the contract documentation were also qualified with an NQF 7 qualification. It could not be verified if the design and contract documentation was actually completed by this qualified person or by a technician without this qualification and overseen by the NQF 7 qualified person. Consultants were afraid to divulge this information. Considering all the design and contract documentation flaws discussed in the sections previously, the design was most probably done by a technician and superficially overseen by an inexperienced NQF 7 qualified person, as stated by one respondent in the interview survey. The correct procedure is that the design drawings and contract documentation must be checked by the qualified parastatal staff for labour-intensive road construction compliance before being issued for tender by the consultants to contractors. Again, this was a very hurried process due to shortages of staff and skills in parastatal offices and the lack of necessary labour-intensive construction experience by parastatal staff. Only 50% of the consultants' on-site staff (the employer representatives) completed the necessary NQF 5 skills programme.

The contractors' site agents did complete an NQF 5 skills programme. Further probing from the interviews revealed that these site agents were not permanently on site but were hired by the contractor to come to the site on a monthly basis due to the poor allocation of funds in the bill for their payment. Answers to question 14 of the interview survey with regard to challenges and difficulties that prevented promoting labour-intensive road construction were that sufficient budgets need to be allocated for payment to the NQF 5 qualified staff to be permanently on site to monitor the labour-intensive construction process. Of all the contractors' site agents who were permanently on-site, none of them had the necessary NQF 5 qualification. Only 20% of the contractors' on-site foreman had completed the necessary NQF 4 programme. In essence, these projects were managed and designed by unqualified and inexperienced labour-intensive construction personnel.

4.7.3 Reasons for the lack of required labour-intensive construction skills and staff experience

Many respondents revealed in the survey that traditional civil engineering universities, colleges and service providers do not have the necessary practical labour-intensive construction skills training in their syllabus. The NQF 4 to 7 courses taught by the service providers had a very generalised labour-intensive construction syllabus which was not practical to the workplace. As

a result, the ground qualified managers, engineers, technicians, foreman and site staff have very little labour-intensive construction experience and knowledge. The NQF 4 and 7 training is more a generalised programme rather than a hands-on practical approach programme as stated by many respondents in the interview survey when answering question 5. Several more months of study and practical understanding of the EWPW Guidelines is necessary to fully equip staff to successfully manage and design a labour-intensive road construction project. Ninety five answers from respondents to question 11 of the survey interview, regarding challenges faced by consultants, contractors and parastatal in promoting labour-intensive road construction, were that practical training needs to be provided to the design, construction and project management staff because the staff on the job did not actually know the correct procedures to be followed when designing and managing labour-intensive road construction projects.

4.7.4 The practicality of the NQF 4 TO 7 skills programmes

The interviews were used to probe the respondents on the practicality of the NQF 4 to 7 skills programmes they attended. The responses were that they were very theoretically based and lacked a practical approach based on field experience. Respondents in the interview stated that part of the training needs to be provided on site where the actual construction takes place. It was also reported that the difficulties experienced by the staff who were involved in the actual implementation of the project were greater than any knowledge gained during the training received in the programmes. Many respondents reported that service providers were using these skills programmes as a money-making scheme by providing a very basic syllabus and exam to personnel so that they could easily pass and meet the EPWP target of having a certain number of personnel trained within a given year. Respondents also reported that training received from the skills programmes had very little technical and organizational content.

4.7.5 Concluding comments on staff qualifications and the skills programmes they attended prior to the labour-intensive road construction projects they were involved in

This section of the study considered inputs from participants regarding their qualifications and the skills programmes they attended and their relevance to labour-intensive road construction.

Almost all respondents reported that the skills programmes they attended did not adequately equip them to design and manage labour-intensive road construction projects. The respondents

reported that they were theoretically equipped with the labour-intensive road construction knowledge, but not practically experienced enough to successfully run and complete a labour-intensive road construction project. This contrasts with what is needed, as articulated by McCutcheon (2018b: 45): “successful construction operations require a range of construction operatives and skilled site supervisors. This applies to both equipment and labour-intensive construction. Thoroughly trained hands-on site supervisors are absolutely crucial for modern-day labour-intensive work”.

The majority of the respondents suggested that the skills programme needs to be overhauled to incorporate more technical and organizational examples pertinent to the production of hands-on site supervisors. To this end McCutcheon (2018: 45) reports that “during training sessions the difficulties of actual implementation overcame any knowledge gained during the training” (McCutcheon 2018b).

McCutcheon (2019b: 45) comments:

Nowhere in the EPWP in South Africa was there a formal program that linked the essential formal training required with a planned construction program. Formal linkages were not established between construction projects and technical, supervisory and contractual training. It cannot be overstated that specific training is required for all concerned at all levels national, provincial and local authorities, engineers, site and design, and a range of skills site personnel, and of critical importance are hands-on single and multi-site supervisors.

In addition, employees and staff from consultants and contractors who were involved in these projects agreed that the parastatal personnel who checked the design drawings and documentation for labour-intensive compliance were not practically qualified and did not have the necessary experience to guide the consultants and contractors as to how to make their design and documentation labour-intensive compliant.

It is concluded from this data that industry has very little direct input in the curriculum design of these skills training programmes, which has resulted in inexperienced and a lack of practical hands-on site supervisors and engineers who can successfully design and project manage labour-intensive road construction projects. More importantly, parastatal officials need to be cautious when awarding contracts to consultants and contractors who do not have the necessary on-site practical experience and skills to successfully design and manage labour-

intensive road construction projects.

4.8 Delivery from emerging contractors

In the EPWP, sustainable livelihoods are supported both during participation in the programme and post participation. EPWP participants receive income to sustain themselves and their dependents. Furthermore, skills acquired from the program can be used for future employability and entrepreneurship initiatives. Small emerging contractors and local emerging subcontractors are given this opportunity when they are invited to tender for these projects. However, their contribution towards improving labour-intensity in the construction process is questioned. Consultants and parastatal officials were asked to rate the contribution that these emerging contractors and local emerging subcontractors made towards improving the level of labour-intensity in the projects under discussion. The results are shown in Figure 4.20 for emerging contractors and Figure 4.21 for local emerging subcontractors.

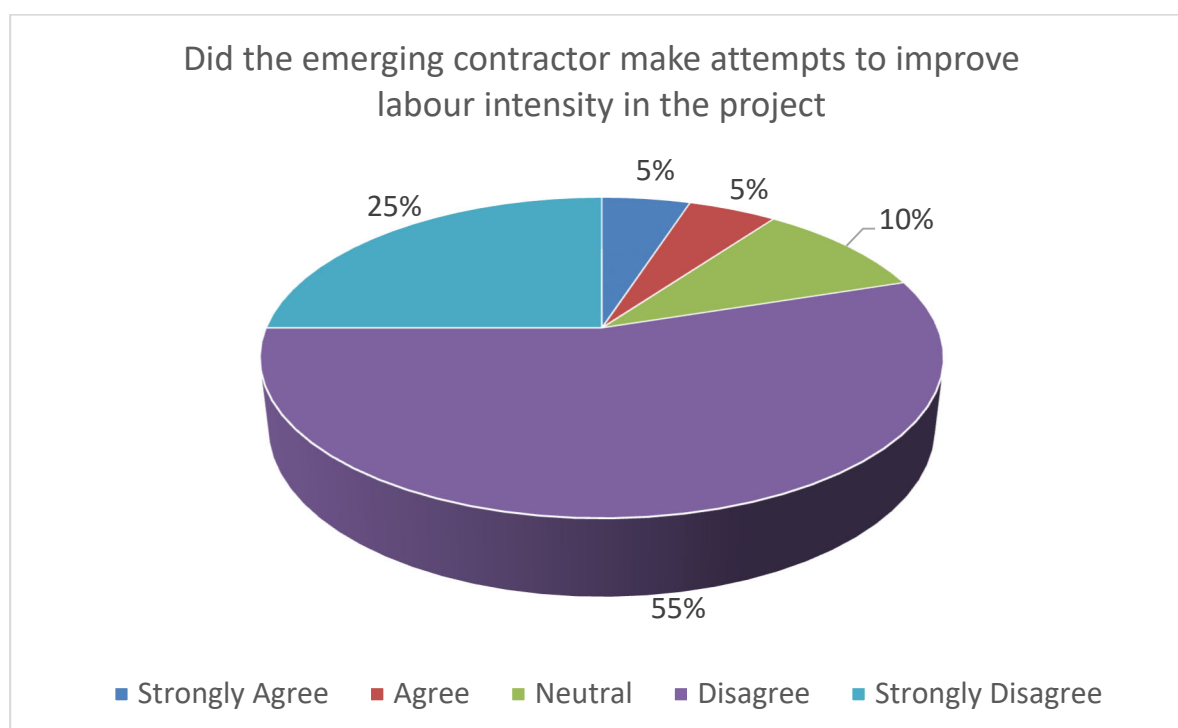


Figure 4.20: Emerging contractors' attempts to improve labour-intensity in the projects

Eighty percent (55% + 25%) of the respondents answered that emerging contractors did not make attempts to improve labour-intensity in the projects while only 10% (5% + 5%) answered that the emerging contractors improved labour-intensity.

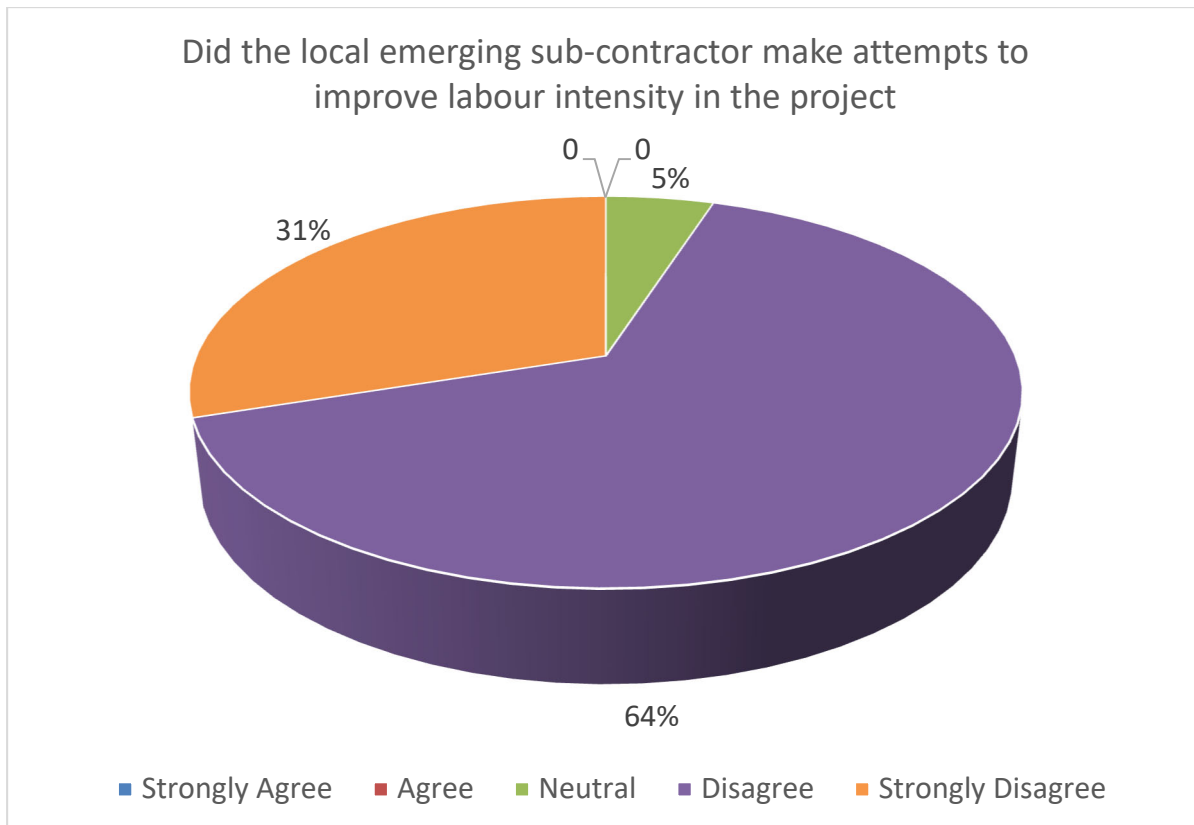


Figure 4.21: Local emerging sub-contractors' attempts to improve labour-intensity in the projects

Ninety-five percent (64% + 31%) of the respondents answered that local emerging subcontractors did not make attempts to improve labour-intensity in the projects and none of the respondents believed that local emerging subcontractors made any improvements to the labour-intensity in the projects, while 5% remained neutral in their answers.

The level of disagreement stems from respondents perceiving the following: the items which were constructed using machine-intensive methods could have been constructed labour-intensively, the low number of labourers employed, the lack of formalised and informal training provided to the labourers from the contractor, and the unchallenging tasks given to labour to successfully complete labour-intensive work. Question 2 of the interview survey which asked the question what contributions can contractors make to the labour-intensive construction of rural roads had eighty percent of the responses stating that contractors must learn to mix concrete in sufficient quantities on site which is a labour-intensive task rather than relying on ready mix concrete being delivered to site. Question 15 of the interview survey which asked the question which areas of the contract was not compliant in promoting labour-intensive construction received ninety three percent of the answers which stated that concrete must not be imported to site, it must be mixed labour-intensively on site. Respondents in the interview

survey mentioned that, in the case of local emerging subcontractors who were employed to construct concrete v drains and channels and lay kerbs, respondents questioned why the contractor used a concrete mixer instead of employing more labourers to mix concrete and why a bobcat was used to transport kerbs to the workplace instead of employing labourers to haul the kerbs using wheelbarrows from the site office to the place of work. In the case of the main emerging contractors, respondents questioned why the contractor did not provide sufficient prior training to the labourers to enable them to have the skills to haul hot asphalt and spread this evenly on the road surface instead of using an expensive machine-intensive paver.

4.8.1 Concluding comments on the delivery of labour-intensity from emerging contractors and local emerging subcontractors to the projects

The use of small contractors has been both troublesome and unsuccessful. Results above concur with McCutcheon's (2018c: 63) statement that the "reality for small contractors is an immediate need to run a successful business. This is far more important than skills development and employment creation no matter how important the latter are to government". The larger, more established, contractors have the necessary staff complement and capital to invest in skills transfer while the small emerging contractors are firstly trying to earn a living to put food on the table rather than invest in skills transfer. On this issue, McCutcheon (2018c: 63) makes the following observation:

There have been many emerging contractor programs, but the CIDB Construction Industry Development Board reported that these have not been as successful as envisaged. The route chosen for delivery of the EPWP using small contractors has not achieved the results anticipated. The severe difficulties experienced to date regarding the use of small contractors suggest that both policies and procedures need to be changed.

The emerging contractors should not be fully blamed for low levels of labour-intensity, when they should have not been approved and appointed in the first place. McCutcheon (2018c: 63) writes:

Municipalities and other public bodies should set up proper long-term programmes and implement these by instruction rather than the cumbersome and effective immediately action of contracts and emerging contractors for whom the immediate need is to run a successful and profitable business rather than get involved in skills development and employment creation no matter how important the latter are to government.

4.9 Compliance adherence

The EPWP Guidelines specifically state that public bodies must ensure functional tracking of labour-intensive activities and reporting of the EPWP projects on the EPWP reporting system. For successful project monitoring, a few compliance checklist forms are provided in the EPWP Guidelines, which are prescribed for use by public bodies.

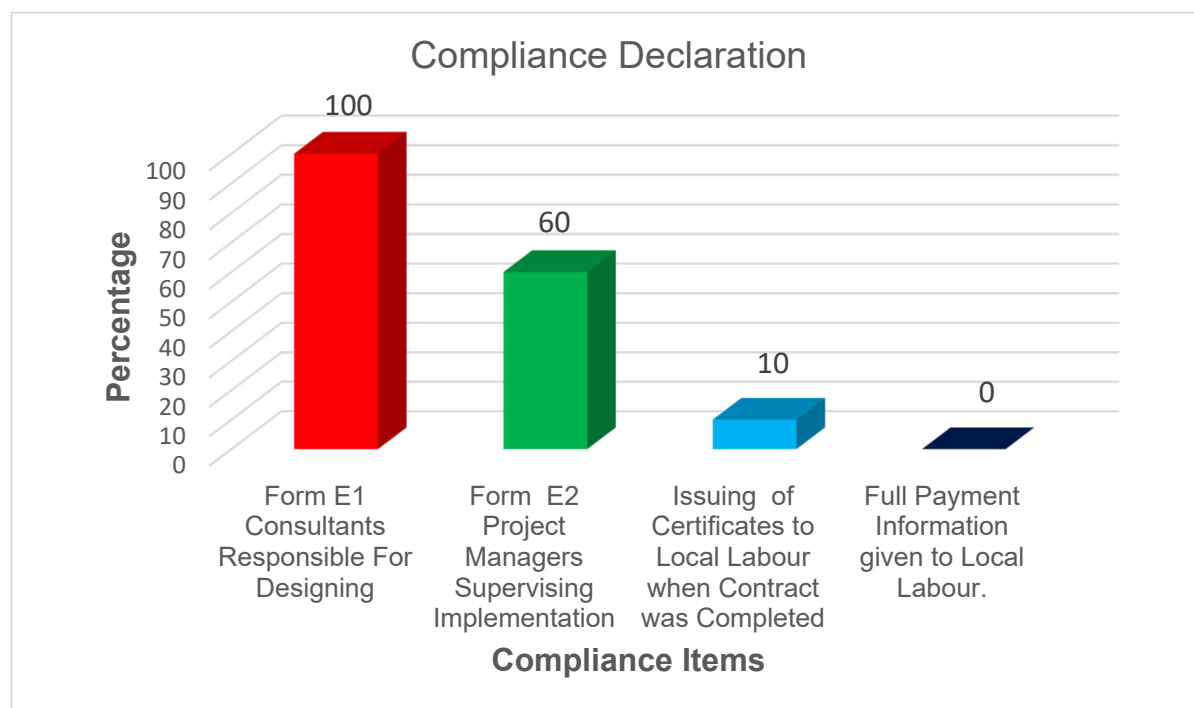


Figure 4.22: Compliance declaration forms for consultants, contractors and the parastatal

Figure 4.22 shows areas where compliance was followed and areas where compliance was severely neglected. Hundred percent of the consultants complied by producing form E2 to public bodies. One may argue why then were there so many labour-intensive design and documentation flaws as previously discussed in the projects. The interviews revealed that the consultants were forced to comply with the recommendations from the EPWP Guidelines and also stated that the design drawings and documentation was approved by the public bodies to go out to tender. One would conclude by saying that both the consultants and public bodies did not have the necessary experience in knowing what compliance information to look for in the drawings and documentation and the compliance form E2 was not appropriately designed to separate the inexperienced from the experienced consultants when appointments by public bodies were made.

4.9.1 Form E1 project managers supervising implementation and Form E2 consultants responsible for designing the roads

Sixty percent of the respondents reported that form E2 was used when appointing project managers on the projects. Here again several compliance items addressed in form E2 were neglected in the projects. These neglected items have been previously discussed. One may conclude that form E1 and E2 were filled in by the consultants and parastatal officials merely as an administrative requirement for filing purposes rather than interrogating if each item in the forms were complied with.

4.9.2 Issuing of certificates to local labour

Only 10% of the respondents reported that contractors issued certificates to the local labour when the contract was completed. According to the EPWP Guidelines the employer, which in this case is the contractor, needs to give the worker the following information on the certificate:

- The workers name.
- The name and address of the employer.
- The EPWP on which the worker worked.
- The work performed by the worker.
- Any training received by the worker as part of the EPWP.
- The period for which the worker worked on the EPWP.
- Any other information agreed on by the employer and worker.

Table 4.7: Information included in the workers certificate

Detail	Answer	
	No	Yes
a. The workers Name		100%
b. The Name and address of the employer		100%
c. The EPWP on which the worker worked	100%	
d. The work performed by the worker	100%	
e. Any training received by the worker as part of the EPWP	100%	
f. The period for which the worker worked on the EPWP		100%
g. Any other information agreed on by the employer and worker	100%	

Table 4.7 illustrates that, of the 10% of the contractors who did hand certificates to the workers after completion of the contract, none of them included the following details on the certificate:

- The EPWP on which the worker worked.
- The work performed by the worker.
- Any training received by the worker as part of the EPWP.
- Any other information agreed upon by the employer and worker.

The above details are an EPWP Guidelines requirement when issuing certificates to workers. This intention of the EPWP Guidelines is that these certificates will aid the worker in securing future EPWP work and will empower the worker to find future work in the labour-based market.

4.9.3 Payment information given to local labour

None of the respondents reported that full payment information was given to local labour when issuing payments on payday. According to the EPWP Guidelines the employer, which in this case was the contractor, must give the worker the following information on payment:

- The period for which payment was made.
- The number of tasks completed.
- The worker's earnings.
- The work performed by the worker.
- The money deducted from the payment.
- The actual amount paid to the worker.
- Any other information agreed on by the employer and worker.

Table 4.8: Payment information given to the worker

Detail	Answer	
	No	Yes
a. The period for which payment was made		100%
b. The number of tasks completed	100%	
c. The workers earnings		100%
d. The work performed by the worker	100%	
e. The money deducted from the payment		100%
f. The actual amount paid to the worker		100%
g. Any other information agreed on by the employer and worker	100%	

Table 4.8 illustrates that details b, d and g were not included in the payment details given to the workers on pay day. It can be concluded, therefore, that full payment details, which is an EPWP Guidelines requirement, were not given to workers in all the projects under this study. The details of the number of tasks completed, the work performed by the worker and other information agreed are all EPWP requirements that a worker needs to receive when employed in a labour-intensive contract. These details were omitted. For example, workers who had the task of bricklaying to construct manholes, catch pits, headwalls and wing walls would use this information to market themselves when seeking future labour-intensive employment. One of the major aims of labour-intensive road construction is to empower local labour to be able to seek future employment.

4.9.4 Concluding comments on compliance adherence

The above data reveals several serious inadequacies regarding compliance by consultants, contractors and the parastatal with the EPWP Guidelines. It also reveals the serious inability of the current authorities to separate conventional contracting compliance procedures from labour-intensive road construction compliance procedures. This means that the relevant personnel involved in the projects made very little attempt to understand the compliance guidelines for labour-intensive projects and implement the requirements.

4.10 Improving labour-intensity in rural road construction projects

In the final aspect of the analytical framework, the researcher interrogated the suggestions by industry for change to the labour-intensive rural road construction process. Bearing in mind that labour-intensive rural road construction is a highly contested terrain with a multitude of voices, each referring to what is constituted as legitimate knowledge, the researcher examined industry suggestions on labour-intensive road construction and whether the views incorporated current construction methodology. Evaluating the suggestions for change could ultimately contribute to making more informed decisions on labour-intensive rural road construction or argumentation for the Outer West region of eThekweni's roads department.

4.10.1 Labour-intensive road construction components that require to be changed

Respondents were probed to establish which components of the labour-intensive road construction they believed required changes. Responses covered components of the construction such as training programmes, contract documentation, specifications, contract

administration and design. These open-ended questions in the survey provided respondents with an opportunity to elaborate their points in their own words, and why they believed such changes were necessary. This provided a rich source of pertinent information but does however have its limitations. Comments could be biased according to each of the respondents' field of expertise. Nevertheless, their observations provided valuable insights into what they perceive as deficiencies in the labour-intensive road construction industry.

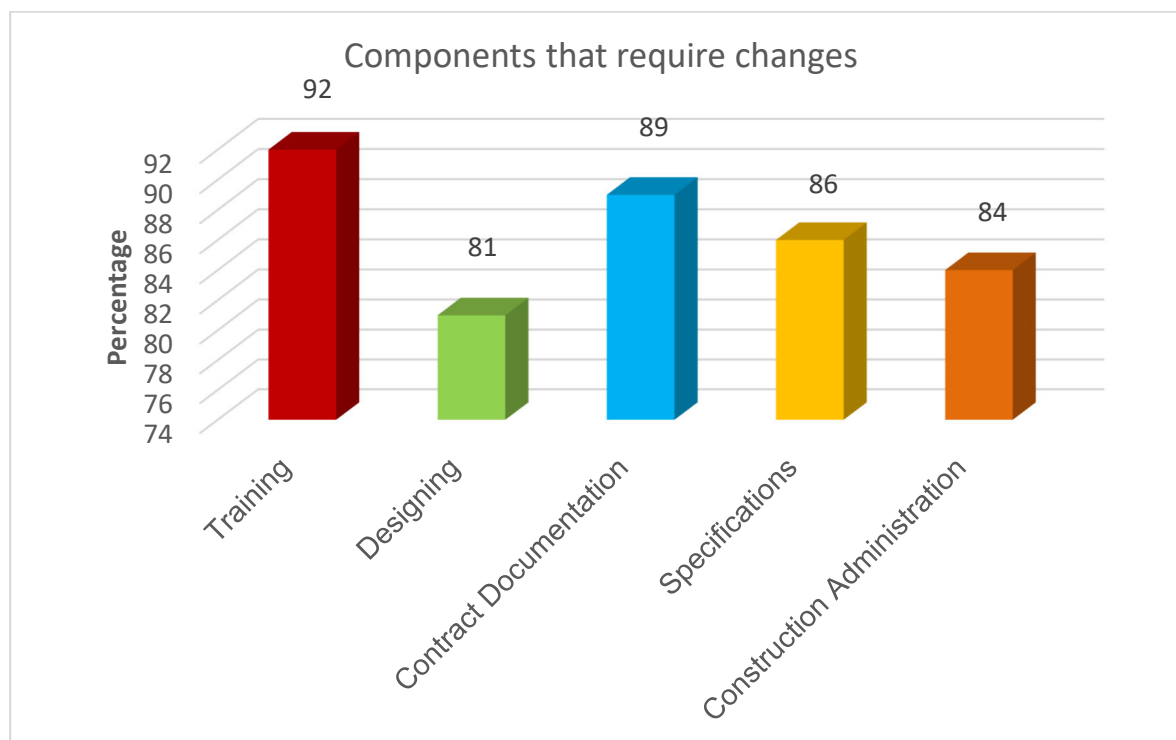


Figure 4.23: Areas needing urgent changes in labour-intensive road construction

Gauging industry's opinion on which aspect of the labour-intensive rural roads construction industry requires adjustments or alterations can provide valuable information on present labour-intensive road construction industry practices and indicate shortcomings that require attention during the upgrading process.

Findings from this analysis (Figure 4.23) revealed that more than 90% of the respondents believed that the training methods require transformation, while over 80% of respondents agreed that the design, contract documentation, specifications and contract administration require alteration.

4.10.1.1 Training

More than 90% (92%) of the respondents agreed that the training required major changes from various segments. They recommended that training should be relevant to industry as they are currently not practical according to industry standards. This suggests that training should have more practical content with a view to moving away from theory to industry applications. To this end, McCutcheon (2018a: 60) maintains that “although the formative training may be allowed to vary the author is convinced that it is essential for class instruction to be closely related in time to the field experience”. Respondents proposed that training must be structured so that the learners can complete industry-orientated practicals. They perceived that the order of assessments during training is too content focused rather than applications focused. Respondents recommended that the training programmes should have more assessments that are practical and related to labour-intensive road construction methodology. This supports McCutcheon’s (2018a: 60) point that “thoroughly trained hands-on site supervisors are absolutely crucial for modern labour-intensive work”.

4.10.1.2 Contract documentation

A substantial percentage (89%) of the respondents commented that the contract documentation needs to move away from supporting conventional construction processes towards a structured labour-intensive road construction methodology. The bill of quantities, specifications and clauses all need to be adapted to enforce labour-intensive road construction methods. They stated that if this were the case many of them would have completed the projects that they were involved in using mostly labour-intensive construction methodology. The contract documentation did not enforce them to do so resulting in many contractors resorting to using conventional construction methodologies.

4.10.1.3 Specifications

A substantial percentage (86%) of respondents perceived that there is no formally approved policy document making them accountable when designing and constructing labour-intensive road construction projects. However, all that type of information is available in the EPWP Guidelines document which is merely a guideline, not a specification document, of which the contractors and consultants could easily take advantage of.

McCutcheon (2018b: 42) explains that the

lack of an in-house capacity to implement labour-intensive construction from design through contract documentation to site work, means that there is no in-house capacity or competence within public bodies to assess and evaluate the quality of implementation. This has been outsourced to consultants. Unless these consultants have been thoroughly trained, they cannot design labour-intensive projects or prepare appropriate contract documentation. The same applies to the need for contractors and site supervisors to be properly trained. In turn, this is one of the reasons for the absence of enforcement of the contractual conditions and specifications.

4.10.1.4 Construction administration

A substantial percentage (84%) of the respondents reported that the lack of labour-intensive construction administration was responsible for the failure in adopting labour-intensive construction methodologies on-site during the construction phase of the projects. Furthermore, the amount of money allocated to a NQF 5 qualified supervisor was insufficient for full time employment on-site during the construction phase. As a result, this specialised person could only visit the site twice a month. The labour-intensive administration processes on site were neglected due to no fulltime specialist being permanently on-site.

The monthly reporting forms used and prescribed by the EPWP Guidelines during the construction phase of the project lack the necessary detail for highlighting the problems which prevent the use of labour-intensive methodologies. As a result, problems in construction administration cannot quickly and easily be corrected. This results in contractors not being penalized for not adopting labour-intensive construction methodologies from the onset of the construction phase. Contractors are still being paid for using conventional construction methodologies rather than labour-intensive construction methodologies.

4.10.1.5 Design

A substantial percentage (81%) of the respondents reported that the design drawings did not have the necessary labour-intensive road construction information needed to enable the contractor to adopt labour-intensive construction methodologies. For example, setting out information on the drawings relied on sophisticated survey equipment rather than the use of tape measures for setting out points. This results in much money being wasted on expensive surveyors being used to carry out simple setting out tasks. The lack of labour-intensive items in the bill of quantities also gave the contractors full permission, as it were, to use conventional

construction processes. Here again McCutcheon (2018b: 42) comments that “unless consultants have been thoroughly trained, they cannot design labour-intensive projects or prepare appropriate contract documentation”.

4.10.2 Concluding comments on suggestions for change from industry

The respondents shared the perception that the NQF training was not practical and requires more alignment and relevance to industry. The same sentiments were shared for the assessments during training, requiring more practical content. The underlying consensus is that real-life projects and training need to be integrated on a greater scale.

Comments regarding the contract documentation were disconcerting. Respondents perceived that the manner in which the contract documentation is written is inadequate and ineffectual in cultivating labour-intensive road construction methodologies. They commented further that labour-intensive specifications are poor to nonexistent in the contract documentation.

Respondents also indicated that civil engineers were not adequately trained to effectively design labour-intensive road construction projects, and contractors do not have the necessary experience to effectively manage a labour-intensive road construction project. Furthermore, there were comments that some basics of labour-intensive road construction design and work methodologies were not included in the curriculum that they studied at university and tertiary institutions. To this end McCutcheon (2018c: 66) states that the “existing socio-technical system of the construction industry is based on the use of fuel powered, heavy equipment. In the face of this fact engineers have to perform extensive re-engineering of the product and processes to achieve social economic objectives”.

The findings in this section provide a basis for the development of relevant recommendations that bode well for the labour-intensive road construction industry. In the final chapter, the researcher presents such recommendations, which are defined by the objectives of the study and informed by the data analysis just presented.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

In Chapter 4 the results and analysis of the data were presented. In this chapter, the researcher presents a summary of the findings of this research and attempts to explain what has been found in light of the research questions that were set out at the beginning of the study. The aims of the study were to investigate the nature of industry's engagement with labour-intensive road construction, how this engagement happens, how it influences labour-intensive road construction, and why engagement is the way it is.

The thoughts and views resulting from the analysis of the data as laid out in Chapter 4, were straightforward and to the point. The themes that emerged can be used to inform new, more beneficial directions in the labour-intensive road construction industry. Labour-intensive rural road construction is imperative in reducing the unemployment rate in South Africa because it provides jobs to the local rural communities who are the poorest of the poor who reside in the rural outskirts.

5.2 Summary of the main points of this research

Due to the lack of practical training programmes being administered to consultants, contractors and parastatal, key personnel are still entrenched in delivering machine intensive construction projects rather than delivering projects that can be constructed fully labour intensively. This was evidenced from consultants, contractors and parastatal contributions who were involved in labour-intensive rural road construction during the period from 2015 to 2019 in the Outer West Municipality of EThekweni.

5.2.1 Summary of evidence concerning consultants involvement

The municipality employed consultants to carry out the design and produce a contract document for tendering and construction. Poor levels of design compliance towards labour-intensive rural road construction was evidenced in all projects. Design of manhole and trench depths were greater than 1.5m, which does not comply with the guidelines. The design of the roads did not have simple geometric layouts and manual setting out information was not provided in the

construction drawings resulting in expensive surveyors and sophisticated survey equipment being used. This resulted in more expenditure and less monies being available to pay labour to do basic setting out tasks. There was poor evidence of labour-intensive specifications in the scope of works especially in the bill of quantities. Specific items were not flagged as labour-intensive items in the contract document, which resulted in the contractors completing the tasks using machine intensive methods. The contract documents did not have specifications stating that items flagged with an LI abbreviation will not be paid for if these items were constructed machine intensively. This gave the contractor's license to use machine intensive methods of construction.

5.2.2 Summary of evidence concerning contractors involvement

Employment of locally recruited labour was not according to the code of good practice for employment and conditions of work for the EPWP. Workers were not recruited through a fair and transparent process. None of the projects met the demographic percentages of the labour that needs to be employed in accordance with the Guidelines For the Implementation Of Labour-Intensive Infrastructure Projects Under The Expanded Public Works Programme. Emerging and sub-contractors involved in the construction of kerbs and channels and concrete V drains used ready mixed concrete instead of mixing concrete by hand labour-intensively on site. This activity provided less jobs to the unemployed. Contractors were not compliant in issuing the relevant certificates to labour when the contract was completed. Full payment information as per the Guidelines For the Implementation Of Labour-Intensive Infrastructure Projects Under The Expanded Public Works Programme were not given to workers.

5.2.3 Summary of evidence concerning parastatal involvement

Short construction timelines provided by the municipality forced contractors when pushed for time to use machine intensive methods to complete the project quickly and avoid paying penalties. The municipality did not enforce the community to form a project steering committee at the onset of the project. This poor community involvement made sourcing the required local labour difficult. The municipality did not allocate a training budget resulting in no formal training provided to workers to perform the tasks labour intensively. There was also insufficient monies provided by the municipality in the bill of quantities for allocation for a full time NQF 5 qualified staff to be permanently on site to monitor the labour-intensive work. There was no formal program that linked the essential practical form of training required with a planned construction

program. The municipalities also did not enforce the contractors and consultants to submit labour-intensive compliance declaration forms.

5.3 Summary of components that require changes

Parastatal needs to provide more monies for practical training programmes for consultants, contractors and parastatal staff so that consultants can design labour-intensive rural roads, produce the relevant contract documentation and specifications, which will enforce contractors to use labour-intensive methods to construct rural community access roads. Contractors will also become more practically experienced to construct labour intensively.

5.4 Conclusion and recommendations

The main insights arising from the data are outlined below.

The data strongly suggests that industry's mindset is still focused on completing the job quickly to provide the needed level of service to impoverished rural communities, based on old conventional thinking that the use of heavy fuel-based machinery is the quickest way to deliver the much needed product. Engineers, contractors and their supervisory staff have to be re-directed given the current mindset, which is based on the use of heavy equipment.

The contribution from industry towards labour-intensive road construction is largely based on the limited skills and experience that they currently have. Data suggests that industry needs to put more emphasis on improving the skills necessary to successfully design, construct and project manage a labour-intensive road construction project. Engineers and supervisory staff need to be fully trained on how to deliver this new product. In the study by Haupt & Harinarain (2017: 102) aimed to determine the image of the South African construction industry from the perspective of high-school students, employers and employees currently working in the construction industry, "participants from the four industry employers reported that, when vacancies were advertised, the applicants were *poor quality*, either *had no training or experience*. They had to *always train applicants*".

Data from the questionnaires and interviews overwhelmingly suggests that industry is not making the required effort to promote labour-intensive rural road construction methodologies. In fact, most respondents stated that they were not aware of any policy forcing them to do so.

Policies need to be in place to enforce engineers to deliver this new product. Conventional contracting methodologies using heavy machinery need to be re-engineered to suit labour-intensive road construction methodologies. As a recommendation, as recommended by respondents, contractors should not be paid for items in the bill of quantities that can be constructed using labour-intensive methods if they actually used heavy plant based machinery to complete the task.

Data from both questionnaires and interviewees overwhelmingly suggest that industry's contribution towards the labour-intensive road construction industry is minimal, devoid of feeling and not constituting any positive way forward. There is a misalignment between the current methods used in training of engineers, contractors and parastatal officials on how to promote labour-intensive road construction, and what industry wants. As recommended by many respondents, a large-scale practical approach to training should be applied so that the supervisory staff are well equipped with the skills to design, construct and project manage labour-intensive rural road construction projects.

It is imperative that labour-intensive road construction methodologies be included in design and contract documents, including the conditions of contract, bill of quantities and specifications. Major changes need to be made to the tender and evaluation processes. Data revealed that this was severely lacking in the projects from which data was extracted.

Experienced engineers who are and were involved in large-scale labour-intensive road construction projects in North Africa should be given an opportunity to write a code of good practice suited to the South African conditions. This code of practice will enforce our South African engineers who have neglected or shunned the use of the EPWP Guidelines to conform to some sort of specification and policy. A database should be set up to register all engineers and contractors who have shown effort in promoting labour-intensive road construction projects. This database can serve as a pool of experience and expertise which can be drawn on when awarding future labour-intensive road construction tenders for design and construction.

The design, project management and construction methodology curriculums at the tertiary institutions that train civil engineering and construction students must incorporate and examine

labour-intensive design, construction and project management skills in their syllabus. Currently the syllabus has too much emphasis on the use of heavy machinery to perform construction work.

It must be emphasised that priority be given to practical training which is far more important than the amount of job opportunities to be created and the amount of construction that needs to be done. The construction implementation programme can only progress at the rate in which competent trained engineers and supervisors are produced. Expansion can only occur at the pace at which trained personnel are produced.

Consultants and contractors who do not make an effort to adhere to the EPWP Guidelines should not be given an opportunity to tender for design or construction work for labour-intensive road construction projects in the future.

The Engineering Council of South Africa (ECSA) and the Constructional Engineering Association of South Africa (CEASA) must adopt a separate registry of labour-intensive construction specialists who will be professionally recognised for their labour-intensive road construction skills and who can be used by councils to design a full-scale practical labour-intensive road construction training programme. The many theoretical non-practical training programmes being offered by many service providers who want to make quick profits should not be recognised by ECSA and CEASA.

In summary, the data reveals business as usual. The use of heavy fuel-based machinery is still the adopted method of construction. The current state of the civil engineering industry makes it impossible to meet the needs of the EPWP.

5.5 Limitations of the study

The study focused only on the labour-intensive construction of rural community access roads in the Outer West Municipality of EThekweni during a five-year period from 2015 to 2019. It is important that surveys be conducted in other municipalities to get a complete picture of the civil engineering industry's contribution towards the labour-intensive construction of rural community access roads.

5.6 Concluding remarks

The data generated by this study has been outlined and discussed and salient issues that emerged have been discussed. The main findings are that industry's poor involvement in promoting labour-intensive road construction is due to their lack of the necessary labour-intensive road construction, design and project management skills and expertise. The non-existence of policies and specifications mean that they are not forced to at least try. They are therefore reluctant to try. They have a fear of failing to complete the job quickly due to council's pressure to use up the budget within the financial year. In addition, areas, which require improvement, were pointed out and recommendations for the way industry could be more involved in the labour-intensive road construction were made.

This chapter outlined the main conclusions and recommendations arising from the findings of the study. The study has met its primary objective, because the study was able to examine the performance of the civil engineering industry in promoting labour-intensive construction of rural roads.

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APPENDICES

Appendix A: Survey and Interview Guide

Dear participant,

Thank you for taking the time to complete this survey. This study is being undertaken to explore the Civil Engineering Industry's contribution to the labour-intensive construction of Low Order Rural Community Access Roads, in the Outer West region of eThekweni, in accordance to the Expanded Public Works Programme guidelines. This research is a case study. Your input is greatly appreciated. This survey and interview will take approximately 20 minutes to complete.

Title of the research study: Exploring Industry's Contribution to the Labour-intensive Construction of Rural Community Access Roads. (M. Eng. Civil Engineering).

Researcher: Santosh Jairam (Email: santosh@dut.ac.za) (0824744648 / 031 373 2894)

Supervisor: Prof D Allopi (Email: allopid@dut.ac.za) (031 373 2310)

Introduction and purpose of the study: The purpose of this survey is to gather Information from the Civil Engineering industrial fraternity in an effort to understand their contribution to the labour-intensive construction of Low Order Rural Community Access Roads, in the Outer West region of eThekweni, in accordance to the Expanded Public Works Programme guidelines. The results from this study will be used for research and publications purposes only and will be made available in the DUT library, in the form of a Masters dissertation.

Confidentiality: We would like to assure you that the information that you offer in this survey is strictly confidential and that no personal details are required of you. Your participation is voluntary and should you choose to refuse or withdraw from participating, you may do so at any time with no consequence. Your name will not appear on the survey and the individual answers you give will be treated as strictly confidential.

Persons to contact in the event of any queries:

Researcher: Santosh Jairam 0827474648 / 031 373 2894.

Supervisor: Prof D Allopi (Email: allopida@dut.ac.za) (031 373 2310).

If you understand and agree to participate in this study kindly proceed with the survey.

Appendix B: Survey Questionnaire

Please answer the following questions as completely as possible.

1. Was the design related and supportive of labour-intensive construction /maintenance methodology- such as;

Item	Yes	Neutral	No
Kerb and Channel instead of Asphalt Haunching			
Use of V Drains			
Manhole Depths less than 1.5m			
Trench Depths less than 1.5m			
Low fill and Cut Banks			
Simple Geometric Layout			
Appropriate information to facilitate manual setting out of works or setting out information not reliant on sophisticated survey equipment			

1.1 If not then briefly explain why-----

2. Was the following compliance declaration forms used on the project
- a. Form E1 as a guideline for agreements with consultants responsible for designing.
- No ☐ Yes ☐

2.1 If not then briefly explain why-----

b. Form E2 for project managers supervising implementation of labour-intensive projects.

No ☐ Yes ☐

2.2 If not then briefly explain why-----

3. Was the staff member of the company who designed the project qualified with an NQF 7 (Develop and promote labour-intensive construction Strategies) Qualification?

No ☐ Yes ☐

3.1 If no briefly explain why.

4. Were the employer's representative / Site supervisor qualified with an NQF 5 (Manage labour-intensive construction projects) Qualification?

No ☐ Yes ☐

4.1 If no briefly explain why.

5. Was a project steering committee formed prior to the design and construction of the project?

No ☐ Yes ☐

- 5.1 If no briefly explain why.

6. In the table below list the demographic characteristics of the local labour employed on the project.

Demographic	Number of workers
Adult Men	
Adult Women	
Youth Men (aged 35 and under)	
Youth Women (aged 35 and under)	
Disabled	

7. In the table below list the demographic characteristics of local labour that received informal training before the implementation of the project.

Demographic	Number of workers
Adult Men	
Adult Women	
Youth Men (aged 35 and under)	
Youth Women (aged 35 and under)	
Disabled	

8. In the table below list the demographic characteristics of local labour that received informal training during the implementation of the project

Demographic	Number of workers
Adult Men	
Adult Women	
Youth Men (aged 35 and under)	

Youth Women (aged 35 and under)	
Disabled	

9. In the table below list the demographic characteristics of local labour that received Accredited training before the implementation of the project.

Demographic	Number of workers
Adult Men	
Adult Women	
Youth Men (aged 35 and under)	
Youth Women (aged 35 and under)	
Disabled	

10. In the table below list the demographic characteristics of local labour that received informal training during the implementation of the project.

Demographic	Number of workers
Adult Men	
Adult Women	
Youth Men (aged 35 and under)	
Youth Women (aged 35 and under)	
Disabled	

11. Was the employment of locally recruited temporary workers on this project in accordance with the current Code of Good Practice for Employment and Conditions of Work for the Expanded Public Works Programme?

No ☐ Yes ☐

- 11.1 If no briefly explain why and how were they recruited.

12. Were workers recruited through a fair and transparent process? Kindly tick the appropriate box in the table below.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Can be Categorised as poor					
Are Unemployed or Underemployed					
Live close to project area					

13. Did the consultant for the project sign an undertaking confirming they have complied with the EPWP requirements at design and implementation stage?

No ☐ Yes ☐

13.1 If no briefly explain why.

14. Were labour-intensive items identified in the scope of work?

No ☐ Yes ☐

14.1 Was the above items constructed using only labour-intensive methods.

No ☐ Yes ☐

14.2 If No. briefly explain why.

14.3 What other items were constructed using labour-intensive methods not listed in question 14.1 above.

15. Was payment made for any machine-intensive works that that could have been constructed using labour-intensive methods?

No ☐ Yes ☐

15.1 If your answer to question 14 is yes then briefly explain why payment was made.

16. Was the contractor's foreman / Site supervisor qualified with an NQF 4 (Nation certificate: Supervision of Civil Engineering Construction Processes) Qualification?

No ☐ Yes ☐

16.1 If no briefly explain why.

17. Was the contractor's site agent / manager qualified with an NQF 5 (Manage labour-intensive construction projects) Qualification?

No ☐ Yes ☐

17.1 If no briefly explain why.

18. Was a provisional sum for training of local labour allowed for in the contract document.

No ☐ Yes ☐

19. What was the monetary value of the project including vat and contingencies.

20. Was effort made to maximise opportunity for training before the implementation of the project.

No ☐ Yes ☐

20.1 If no briefly explain why.

21. Was local labour paid a daily wage when they attended formalised training?

No ☐ Yes ☐

22. Briefly list the formalised training that local labour attended.

23. Briefly list the work carried out using labour-intensive methods of construction.

24. Was a local emerging subcontractor employed on this contract?

No ☐ Yes ☐

24.1 If no briefly explain why.

25. What work did the contractor in question 24 above construct?

26. Did the Emerging contractor promote labour-intensive road construction methodologies. Kindly tick the appropriate box in the table below.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

27. Did the Local Emerging subcontractor promote labour-intensive road construction methodologies. Kindly tick the appropriate box in the table below.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

28. Was a community liaison officer employed for the full duration of the contract?

No ☐ Yes ☐

29. Did the local labour receive certificates after termination of their contracts.

No ☐ Yes ☐

30. Did the certificates include the following details.

Detail	Answer	
a. The workers Name	No	Yes
b. The Name and address of the employer		
c. The EPWP on which the worker worked		
d. The work performed by the worker		
e. Any training received by the worker as part of the EPWP		
f. The period for which the worker worked on the EPWP		
g. Any other information agreed on by the employer and worker		

h. List the information for item 30. g above

31. Did the employer give the worker the following information during payment.

Detail	Answer	
a. The period for which payment was made	No	Yes
b. The number of tasks completed or hours worked		
c. The workers earnings		
d. The work performed by the worker		
e. The money deducted from the payment		
f. The actual amount paid to the worker		
g. Any other information agreed on by the employer and worker		

h. List the information for item 31.g above

32. Briefly list the areas or components in the construction of the rural roads which require urgent attention for them to be constructed labour-intensively.

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32.1 Briefly explain why the above list of components needs urgent attention.

End. Thank you for participating in this survey

Appendix C: Interview Questions

Consultant ☐

Contractor ☐

Parastatal ☐

Interview Questions

1. What contributions do you think that consultants can make to the labour-intensive construction of rural roads?

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2. What contributions do you think that contractors can make to the labour-intensive construction of rural roads?

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3. What contributions do you think that parastatal can make to the labour-intensive construction of rural roads?

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4. What aspects of the EPWP guidelines needs improvement in order to further promote labour-intensive rural road construction?

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5. How practical is the NQF 4 to 7 training programme.

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6. What type of informal training, which will most benefit local labour and the project, should the main contractor provide during a roads construction project?

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7. What type of formal training, which will most benefit local labour and the project, should the main contractor provide during a labour-intensive roads construction project?

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8. Besides the EPWP guidelines which has contributed to the promotion of labour-intensive construction and design of rural roads, what other documentation is

necessary to fast track the construction of rural roads using labour-intensive methods of construction.

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9. What are some of the opportunities that can be open for consultants and contractors who promote labour-intensive construction and design of rural roads?

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10. How could these opportunities be sustained?

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11. What challenges do you see for consultants, contractors and parastatal in promoting labour-intensive design and construction of rural roads?

a. Consultants.....

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b. Contractors

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c. Parastatal

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12. Why do you see these challenges and how could you overcome them.

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13. What can local communities do to promote the successful labour-intensive construction and maintenance of their rural roads?

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14. Briefly, list the challenges and difficulties that has prevented you from promoting the labour-intensive design and construction of rural community access roads?

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15. In your opinion which areas of the contract do you think was not compliant in promoting labour-intensive road construction.

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15.1 Briefly explain why were the above areas not compliant.

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Appendix D: Labour Intensive Construction (LIC) Accredited Training Within The Expanded Public Works Programme

The Guidelines as published in the Government Gazette 26180 of 2nd April 2004 requires that personnel of the following groups have to complete a skills programme in Labour-Intensive Construction methods:

Table D 1: Skills Programme For Client / Employer Staff			
Personnel	NQF	Unit Standard Title	Unit Standard
Senior Management and Professionals	7	Develop and promote Labour Intensive Construction Strategies.	114913
Middle Management (Technical)	5	Manage Labour - Intensive Construction Projects	15162
Middle Management (Admin)	5	Manage Labour - Intensive Construction Projects	15162
Table D 2: Skills Programme For Consultants			
Designer	7	Develop and promote Labour - Intensive Construction Strategies.	114913
Administrator / Site Supervisor	5	Manage Labour - Intensive Construction Projects	15162
Table D 3: Contractors			
Site Agent / Manager	5	Manage Labour - Intensive Construction Projects	15162

Appendix E: Statement of Achievement from CETA. Develop and Promote Labour-Intensive Construction Strategies

Contact us:
Tel: 011 265 5900

Postal Address
P.O. Box 1955
Halfway House
1685

Physical Address
163 Kerk Street
Halfway House, Midrand
1685



STATEMENT OF ACHIEVEMENT

This is to certify that

Santosh Jairam

6410215227088

Has achieved the unit standard(s) stated below that are part of the following Skills Programme:

**Construction Management
SP-ND-CM-7-E-1-20**

Unit Standard Title	Unit Standard Number	Number of Credits	Achievement Date
DEVELOP AND PROMOTE LABOUR INTENSIVE CONSTRUCTION STRATEGIES	114913	20	26/09/2014

Date of issue 17 August 2016

Reference number C/577US021870/16

Chief Executive Officer

Manager: Quality Assurance

Appendix F: Statement of Achievement from CETA. Manage Labour Intensive-Construction Projects

Contact us:
Tel: 011 265 5900
Fax: 011 265 5925

Postal Address
P.O. Box 1955
Halfway House
1685

Physical Address
563 Old Pretoria Main
Building No.5, Midrand Business Park
1685



STATEMENT OF ACHIEVEMENT

This is to certify that

Santosh Jairam

6410215227088

Has achieved the unit standard(s) stated below that are part of the following Unit Standards:

**MANAGE LABOUR INTENSIVE CONSTRUCTION PROJECTS
15162**

Unit Standard Title	Unit Standard Number	Number of Credits	Achievement Date
MANAGE LABOUR INTENSIVE CONSTRUCTION PROJECTS	15162	8	07/10/2014

Date of issue 7 March 2016

Reference number C/577US020713/16

Chief Executive Officer

Manager: Quality Assurance

Appendix G: Certificate of Accreditation. Conduct Training in the Labour-Intensive Sector. SAFCEC

Certificate of Accreditation



SAFCEC

The
Civil Engineering Industry Training Scheme
(Administered by the Civil Engineering Industry Training Board)

Hereby accredits provider

SANTOSH JAIRAM

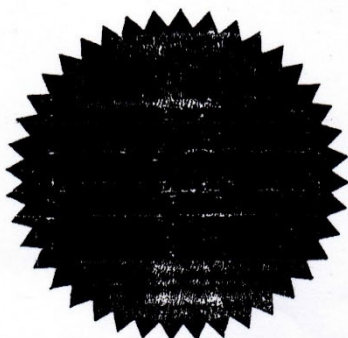
25/6410215227054/NA19/M18/0595 25/6410215227054/NA20/M17/0595
Ref. no. 25/6410215227054/NA16/M5/0595

To conduct training in the Labour Intensive Sector
of the

Civil Engineering Industry
in the following courses

ROADWORKS SKILLS GRADE III & GRADE II AND DRAINAGE & SERVICES SKILLS GRADE III

MODULES: LRM1B1; LRM1C4; LRM1C7; LRM3G1; LRM3G2; LRM3G3 AND LDM1F6.



Director:

Date of Accreditation: 15 MAY 1995

Number is also the Data Reference number.

Appendix H: Certificate of Accreditation. Conduct Training in the Labour Intensive Sector. SAFCEC

 SAFCEC	Serial Number Reeksnommer 95/15727
CIVIL ENGINEERING INDUSTRY TRAINING SCHEME OPLEIDINGSKEMA VAN DIE SIVIELE INGENIEURSNYWERHEID <small>REGISTERED WITH THE DEPARTMENT OF MANPOWER IN TERMS OF THE MANPOWER TRAINING ACT (NO. 56 OF 1981) GEREGISTREER BY DIE DEPARTEMENT VAN MANNEKRAG IN TERME VAN DIE WET OP MANNEKRAGOPLEIDING (NR. 56 VAN 1981)</small>	
<i>Certificate • Sertifikaat</i>	
THIS IS TO CERTIFY THAT HIERMEE WORD GESERTIFISEER DAT S. JAIRAM <i>name of candidate - naam van kandidaat</i> 641021 5227 05 4 <i>national identity number - nasionale identiteitsnommer</i>	
has completed the following course het die volgende opleidingskursus voltooi ON-THE-JOB-TRAINING which included the following modules: wat die volgende modulus ingesluit het:	
course instructor kursusinstrukteur	regional training manager streek opleidingsbestuurder
date of issue 24/03/95 datum van uitreiking	

Appendix I: List of Conference Presentations

South African Transport Conference (SATC 2018)

Jairam, S. and Allopi, D. 2018. Exploring Industry's Contribution to the Labour-intensive Construction of Low Order Rural Community Access Roads, *Proceedings of the 37th Annual Southern African Transport Conference (SATC 2018) held at the CSIR Convention Centre*, 2018, Pretoria, South Africa, pp. 141-150.

Appendix J: Researcher's Labour-intensive Design and Construction Management Qualifications and Experience

The researcher has been involved in the design and construction management of rural community access roads for the past twenty-five years, and also has the NQF 5 and 7 (Designers and management of labour-intensive projects) qualifications. The researcher is also a professional civil engineering technologist registered with the Engineering Council of South Africa and is a long-standing member of the South African Institute of Civil Engineers (SAICE).

Appendix K: Statement of Achievement. Research Methodology



D U R B A N
INSTITUTE of
TECHNOLOGY

P O BOX 1334
DURBAN, 4000

EXAMINATION RESULTS

MR S JAIRAM
79 HATFIELD RD
RESERVOIR HILLS
DURBAN
4091

Campus : Durban
Faculty : 13
Exam Sitting : 20056
ID Number : 6410215227088
Student No. : 19503816
Qualification : BT:BIOTECHNOLOGY
Code : BTBIO1

Subject	Code	Year Mark	Exam Mark	Final Mark	Result Description
RESEARCH METHODOLOGY:NATURAL SCIENCE	RMNS201	86		86	PASS DISTINCTION
Comments / Messages If you have completed the Qualification for which you have registered, you are compelled to apply for the award of your qualification in terms of Rule G18(1) Comments : REGISTRATION TIMETABLE : SEMESTER/YEAR B TECH DATE : 23-JUL-2005 TIME : 08H00 MINIMUM REGISTRATION FEE: SEMESTER : R850.00 ANNUAL : R1700.00 YOU ARE REQUIRED TO BRING IN ANY OUTSTANDING DOCUMENTS eg. ORIGINAL SENIOR CERTIFICATE, PASSPORT, IDENTITY DOCUMENT. LATE REGISTRATION IS FROM THE 25-JUL-2005 TO 29-JUL-2005. 22 JULY 2005 - CLOSING DATE FOR SCANNING AND RE-MARKING					

Enquires : Faculty Arts: 031-2036521/3 ; Commerce: 031-3085156/7 ; Engineering: 031-2042506/2548/2717 ; Health: 031-2042566 ; PMB: 033-8458818
WebSite: www.dit.ac.za ; Results Line: 0822362222

Appendix L: Editing Certificate

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EDITING CERTIFICATE

Re: **Santosh Jairam**

Master's dissertation: **EXPLORING INDUSTRY'S CONTRIBUTION TO THE
LABOUR-INTENSIVE CONSTRUCTION OF LOW ORDER RURAL
COMMUNITY ACCESS ROADS**

I confirm that I have edited this dissertation and the references for clarity, language and layout. I returned the document to the author with track changes so correct implementation of the changes and clarifications requested in the text and references is the responsibility of the author. I am a freelance editor specialising in proofreading and editing academic documents. My original tertiary degree which I obtained at the University of Cape Town was a B.A. with English as a major and I went on to complete an H.D.E. (P.G.) Sec. with English as my teaching subject. I obtained a distinction for my M.Tech. dissertation in the Department of Homoeopathy at Technikon Natal in 1999 (now the Durban University of Technology). I was a part-time lecturer in the Department of Homoeopathy at the Durban University of Technology for 13 years.

Dr Richard Steele

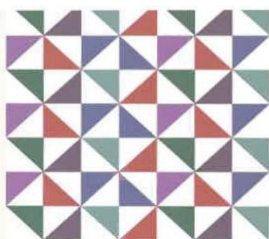
04 February 2021

per email

Appendix M: Ethics Certificate



Appendix N: Ethical Clearance



Institutional Research Ethics Committee
Research and Postgraduate Support Directorate
2nd Floor, Bervyn Court
Gate 1, Steve Biko Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4001

Tel: 031 373 2375

Email: lavishad@dut.ac.za

http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

8 August 2017

IREC Reference Number: **REC 100/16**

Mr S Jairam
P O Box 284
Ilala Ridge Estate
La Lucia
4021

Dear Mr Jairam

Exploring Industry's Contribution to the Labour Intensive Construction of rural community Access Roads

I am pleased to inform you that Full Approval has been granted to your proposal REC 100/16.

The Proposal has been allocated the following Ethical Clearance number **IREC 054/17**. Please use this number in all communication with this office.

Any adverse events [serious or minor] which occur in connection with this study and/or which may alter its ethical consideration must be reported to the IREC according to the IREC SOP's.

Please note that any deviations from the approved proposal require the approval of the IREC as outlined in the IREC SOP's.

Yours Sincerely

Professor J K Adam
Chairperson: IREC



Appendix O: Letter of Approval from EThekwini Municipality to Conduct Research in the Outer West Region of the Municipality



ROADS PROVISION UNIT

Dear: Mr Santosh Jairam

RE: PERMISSION TO CONDUCT RESEARCH IN THE OUTER WEST REGION OF ETHEKWINI

Your letter of request dated 27 January 2017 refers.

You are hereby granted permission to conduct research within the Outer West Region of EtheKwini area towards your master's degree studies, provided Ethical clearance has been obtained.

We note the title of your research project is:

"Exploring Industry's Contribution to the Labour Intensive Construction of rural community Access Roads".

As the Deputy Head: Roads Provision, I give my permission to the researcher to conduct semi structured interviews with the staff members of EtheKwini Municipality that are working within the Planning, Municipal Services, Finance and Civil Engineering department that could be of the assistance towards your fulfilment of your research.

Please note that the data collected must be treated with due confidentiality and anonymity.

On behalf of the Municipality, I would like to wish you all the best in your research.

Yours sincerely,

.....
Mr D. Thomas

DEPUTY HEAD: ROADS PROVISION

Appendix P: Letter of Information



LETTER OF INFORMATION

Title of the Research Study: Exploring Industry's Contribution to the Labour Intensive Construction of low order rural community Access Roads

Principal Investigator/researcher: Mr Santosh Jairam Pr Tech Eng; BTech Civil Eng (DUT); MSAICE; NQF 5 & 7 Labour Intensive Design and Construction management.

Supervisor: Professor Dhiren Allopi DTech (Civil Eng); MDT(Civil Eng); Postgrad Dip.Eng.;Dip.Datametrics (Cum laude)

Brief Introduction and Purpose of the Study:

Outline of the Procedures: Exploring Industry's contribution to the labour intensive construction of low Order Rural Community Access Roads, in the Outer West region of eThekwin, in accordance with the Expanded Public Works Programme guidelines.

Due to the persistently high unemployment situation in South Africa, the Expanded Public Works Programme (EPWP) was launched by Government in 2004. Its objective was to provide essential services and infrastructure to disadvantaged communities, develop skills among the unemployed and create the much needed employment through the application of labour-intensive work methods.

The Expanded Public Works Programme (EPWP) is a nationwide programme in which public expenditure is systematically used to generate additional employment through the use of labour-intensive work methods thereby contributing towards national poverty alleviation goals (Department of Public Works 2012: 1).

The programme spans four sectors comprising infrastructure, social, non-state and environment and culture, of which infrastructure works is the largest component. Within the

Infrastructure sector, roads provide the highest employment creation potential. The use of labour-intensive work methods is well supported by the government as a means of generating employment.

This study will focus on exploring both consultants and contractors contribution to the labour intensive construction of Low Order Rural Community Access Roads, in the Outer West region of eThekweni, in accordance to the Expanded Public Works Programme guidelines.

A qualitative approach will be used in this research to gain the necessary data that will allow for meaning and interpretation of the contribution both consultants and contractors have made in promoting labour intensive road construction methods. This approach will allow for an understanding of motivation and the experiences that both consultants and contractors have had as a result of the design and construction management choices they have made.

Based on the results and findings of the research, recommendations will be made on how consultants and contractors could improve the labour intensive component during the construction of rural community access roads.

Risks or Discomforts to the Participant: None.

Benefits: Based on the results and findings of the research, recommendations will be made on how consultants and contractors could improve the labour intensive component during the construction of rural community access roads. The researchers aim is to publish at least one conference paper during the progress of this dissertation depending on the interest of findings and work pressure.

Reason/s why the Participant May Be Withdrawn from the Study: There will be no adverse consequences for the participant should they choose to withdraw.

Remuneration: The participant would not receive any monetary or other types of remuneration.

Costs of the Study: The participant will not be expected to cover any costs towards the study.

Confidentiality: The researcher will personally collect the data from participants who have the option of remaining anonymous. The research questioners will be stored in a locked metal filling cabinet. Hard copy of research questioners and interviews will be stored in a locked

metal filling cabinet. The questioners will be shredded after the researcher passes the masters qualification. Electronic data will be password protected and will be stored on memory sticks in a lockable metal filling cabinet. Electronic data will be erased after the researcher passes the masters qualification.

Research-related Injury: No injuries expected due to the nature of the research.

Persons to Contact in the Event of Any Problems or Queries:

Please contact the researcher (tel no. 031 3732894), my supervisor (tel no. 031 3732310) or the Institutional Research Ethics Administrator on 031 373 2900. Complāints can be reported to the Director: Research and Postgraduate Support, Prof S Moyo on 031 373 2577 or moyos@dut.ac.za

General:

Potential participants must be assured that participation is voluntary and the approximate number of participants to be included should be disclosed. A copy of the information letter should be issued to participants. The information letter and consent form must be translated and provided in the primary spoken language of the research population e.g. isiZulu.