An Assessment of Available Access to Technology in KwaZulu-Natal

Enhle Kheswa[1] and Zama Dlamini[1]

[1] Moses Kotane Institute, Durban, South Africa

Enhlekheswa@gmail.com, zama.dlamini@moseskotane.com

Abstract

The digital transformation of South Africa presents various challenges, including inadequate infrastructure in rural and township areas, high costs of upgrading IT systems, and energy instability. This research paper focuses on evaluating the ICT infrastructure and internet accessibility in the public sector of KwaZulu-Natal (KZN) and aims to provide insights into the existing ICT infrastructure within KZN's government departments, public facilities, and municipalities, and make recommendations for infrastructure investments and policy improvements. The research methodology involved the collection of survey data from 1737 respondents representing 11 district municipalities in KZN. A mixed-method approach was employed, combining qualitative methods such as literature reviews with quantitative data collection through online surveys. The findings reveal significant disparities in the distribution of ICT infrastructure across KZN's districts. The Ugu and Ilembe districts had the highest number of respondents, while Amajuba, uMgungundlovu, and uThukela had limited participation. The education and health departments were the most represented in terms of institutions. Regarding computer devices and connectivity, approximately 82% of institutions had internet-enabled computers, but 43% lacked internet connectivity and relied on mobile data connections. Network ports were found to be scarce, limiting access to reliable network connectivity. Further-more, IT skills development initiatives were generally lacking, with most institutions not offering any IT training or providing only basic computing skills. These findings highlight the need for substantial improvements in ICT infrastructure and internet accessibility within the KZN public sector. Recommendations are made to address the shortage of equipment, enhance internet access, and expand IT skills development programs. The study's outcomes aim to guide policymakers and investors in making informed decisions regarding ICT infrastructure investments in the province, thereby promoting equitable access and bridging the availability gap.

Keywords: Digital Transformation, ICT Infrastructure, Internet Accessibility, Public Sector, IT Skills Development.

1   Introduction

According to the KwaZulu-Natal (KZN) Digital Transformation Strategy of 2020 (Moses Kotane Institute, 2019), South Africa is faced with various challenges including: poorly developed infrastructure in rural and township areas, insufficient connectivity and internet accessibility, high cost of upgrading existing IT infrastructure and systems, as well as energy instability. These factors are all viewed as obstacles for digital transformation.

The Moses Kotane institute (MKI) conducted a baseline study on ICT Infrastructure (Kheswa, 2022) which was limited to several public sector assets. This is a follow-up study, examining public sector ICT Infrastructure available for public access in KZN departments within all the province's local municipalities. ICT Infrastructure is defined here as the information and communications technology infrastructure and systems (including software, hardware, firmware, networks, and the company websites) that are used in an organization (Foko, et al., 2017; Cline, 2013; Kheswa, 2022).

1.1   Internet Speeds

The quality of internet connectivity can be an indicator of success (Ngcobo & Hershelman, 2007; Sithole, et al., 2013), of powerful infrastructure and regional advancement. In the latest Mobile Network Quality Report, the network performance of mobile operators was measured and compared using carefully designed methodology (Businesses, 2021). The research indicated that the national average mobile download speed was 40.86Mbps and the average upload speed was 13.82Mbps (BusinessTech, 2021). MTN was reported to have the highest national average download speed (64.23Mbps), while Vodacom came second (35.05Mbps), followed by Telkom (27.23Mbps), Cell C (19.26Mbps) and Rain (13.07Mbps) (BusinessTech, 2021). The current research surveyed the network speeds in various regions of KZN to indicate the prevailing network speeds per district.

1.2   Infrastructure

A 2012 report by CSIR, shows the distribution of ICT infrastructure in relation to schools (CSIR, 2012). In our study we indicate the distribution of ICT infrastructure in relation to public libraries, centres of excellence and other centres where communities and public servants can be trained (Kheswa, 2022).

Academic investigations have tended to focus on the effects and outcomes of ICTs primarily for the private sector (Sithole, et al., 2013). The public sector has been largely side-lined in literature, and it appears to lag in the processes of technology adoption and business reinvention. Recently, the public sector has come to recognize the potential importance of ICT and e-business models as a means of improving the quality and responsiveness of the services they provide to their citizens, expanding the reach and accessibility of their services and public infrastructure and allowing citizens to experience a faster and more transparent form of access to government services. ICT overhauls have been shown to yield positive results in KwaZulu-Natal, like in the pilot study run by the Dept of Health (Cline, 2013).

The 4IR has brought about a shift in impact on communications, technology, data, and analytics on an organisation's daily operations (Sutherland, 2020; DCDT, 2022). The ICT infrastructure capacity of provincial institutions is essential for the smooth application of a mandate for 4IR (Backhouse & Manda, 2017). The provincial staff complement must be adequately skilled to perform all up-to-date duties required and training can be provided utilising the existing infrastructure. It is not known which regions in the province are not fully covered by internet service providers. Theoretically, authors have stated that there is a lack of empirical data about IT capacity and infrastructure in the public service (Carolissen, 2014; Schofield, 2018). The problem is to be addressed by this study is the lack of knowledge concerning which regions in the province are under-served by in terms of ICT infrastructure and internet service providers.

In this study, ICT Infrastructure focuses on the following:
- Internet or network connectivity
- Connection points or ports
- Connectivity devices (computers/ laptops/ tablets)
- Whether existing devices are operational or not
- Availability for public use

There is a gap in the current knowledge ascertaining the available and the required ICT infrastructure and related resources within KZN province; for the purposes of advising provincial government and investors interested in provincial ICT infrastructure to know where to invest better with regards to technology, as well as guiding policy makers. This will further assist in avoiding duplication of distribution of these resource to similar places, and adequately bridging the availability gap.

2 Study Purpose

This study aims at reviewing KZN public sector ICT Infrastructure available in departments, public facilities, municipalities. While this study seeks to have an overall perspective regarding the KZN provincial public sector ICT infrastructure, the two key objectives of this study, including:
- To understand what kind of public sector ICT Infrastructure is available within the province.
- To recommend to the provincial government and other decision makers where ICT infrastructure investments can be made and how policy regarding these assets can be.

3 Methodology

This report presents analysis of survey data collected as part of the study conducted in KwaZulu-Natal province to review all public sector ICT Infrastructure available in various departments, and municipalities. The main objective was to understand available ICT Infrastructure within the province to better advise provincial government on where ICT infrastructure investments can be made. The data collection was administered via an online survey tool (MS forms) and gathered 1737 responses across the 11 district municipalities in the province. The data was analysed descriptively and visualized using MS Excel as tools, this report discusses the survey results.

To achieve the research aims and address the key research questions, this study conducted a comprehensive literature review to understand the status quo of the ICT infrastructure at both the national (legislative framework) and provincial levels, current developments, and technology deployment, adoption, and solutions. The following research strategy was applied:

3.1   Research Strategy

A mixed method approach was adopted in this study which included the qualitative methods used in the desktop literature review, and a quantitative survey questionnaire (Newman & Ridenour, 1998; Palinkas, et al., 2015). Quantitative methods were used to ascertain the extent of the ICT infrastructure.

3.2   Target Population

The target population was public sector institutions that used any ICT in KwaZulu-Natal, to ascertain the level of technology application and connectivity.

3.3   Sampling Strategy and Sample Size

The selection of research participants was based on purposive sampling, which was attributed to the fact that the targeted research participants are known and are embedded in a predetermined stratified sample in society. This study employed non-probability sampling through a purposive sampling technique to select the desired respondents. Secondly, purposeful sampling was used as this is a technique widely used in research for the identification and selection of information-rich cases. This involves identifying and selecting individuals or groups of individuals that are especially knowledgeable about or experienced with a phenomenon of interest.

3.4   Data Collection

Data collection was completed via questionnaires, phone calls, and online surveys. Primary data was collected via a survey questionnaire. The questionnaire was administered online, and responses was collected from respondents through face-to-face and telephonic interviews for capturing.

3.5   Data usage & storage

Data collection was completed via questionnaires, phone calls, interviews, and online surveys and stored on a secure private network that complies with the Protection of Private Information Act (POPIA, 2013; Adams, et al., 2021).

3.6   Ethical Considerations

As part of conducting ethical and credible research, research participants were not coerced into participating, and their participation was a voluntary process. There were no foreseeable risks associated with partaking in this study. Ethical clearance for the research was obtained from the Research Ethics Committee at the Moses Kotane Institute. Careful consideration went into questionnaire design and confidentiality and privacy of the participants is paramount. All information and data was kept confidential.

4 Results

4.1 Respondents by district municipality

The collected data represents all district municipalities in KZN as intended, however it can be noted in Table 1 below that majority of respondents were from the Ugu and Ilembe districts and very few were from Amajuba, uMgungundlovu, and uThukela districts.

District Municipality	No of Institutions	%
Amajuba	42	2%
EThekwini	193	11%
Harry Gwala	123	7%
Ilembe	321	18%
King Cetshwayo	113	7%
Ugu	407	23%
Umgungundlovu	61	4%
Umkhanyakude	120	7%
Umzinyathi	136	8%
uThukela	54	3%
Zululand	167	10%
Grand Total	1737	100%

Table 1: No. of Institutions/respondents per district

As stated earlier, respondents were classified as government departments and municipalities. A total 1661 government departmental offices and/or institutions and 76 municipal offices were recorded. Table 2 below show that most institutions recorded belong to the department of education, this includes schools and other educational centres (see figure 1). Health department is also one of the notable represented departments in the data in it different structures (see figure 2)

Department	Frequency	%
Education	1160	70%
Health	272	16%
Social Development	47	3%
Community Safety and Liaison	39	2%
Agriculture and Rural Development	26	2%
Public Works	26	2%
Cooperative Governance and Traditional Affairs	23	1%
Arts and Culture	21	1%
Transport	19	1%
Economic Development, Tourism and Environmental Affairs	12	1%
Sport and Recreation	9	1%
Human Settlements	5	0%

Provincial Treasury	2	0%
Grand Total	1661	1

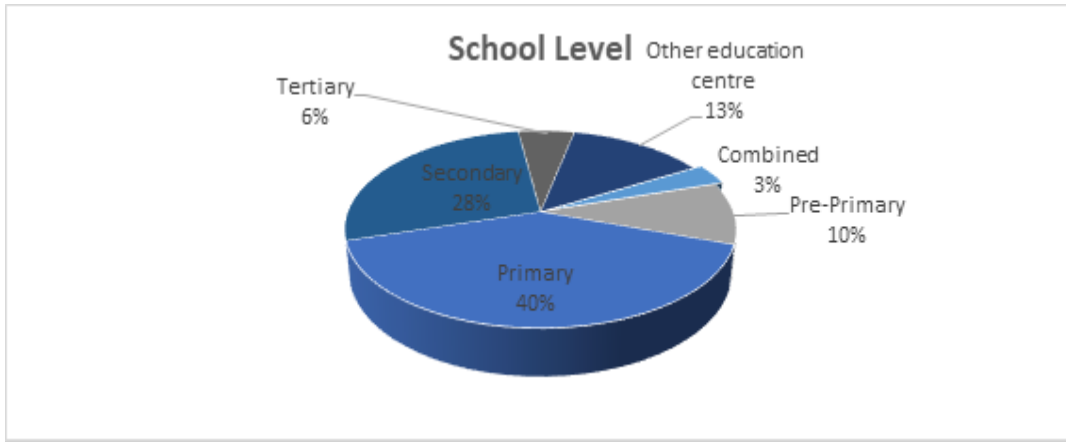**Table 2:** Department representation

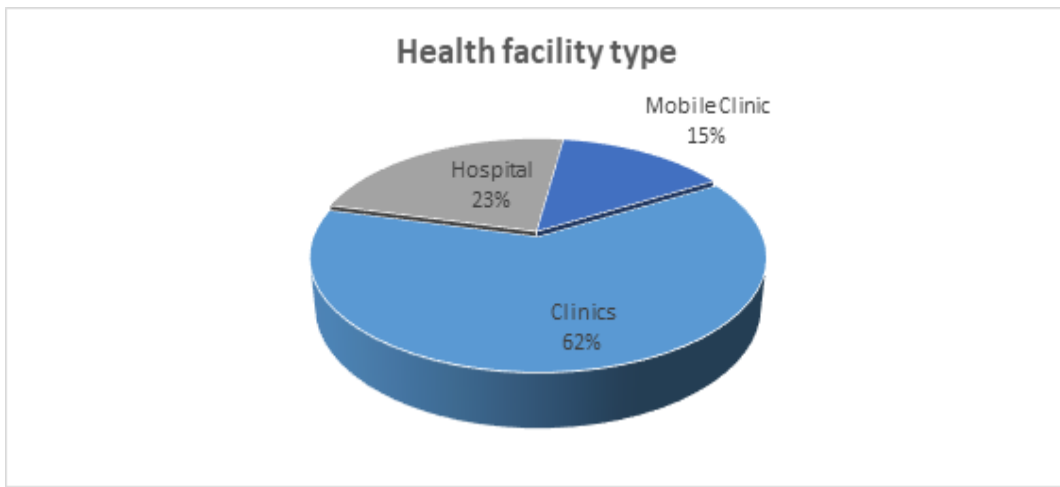**Figure 1:** Department of education representative types

Figure 2: Department of Health representatives

4.2   Computer devices availability and connectivity

It was established from the data that 82% of the institutions had internet enabled computer devices in the premises, only 18% indicated that they do not have computers. See Figure 3 below.
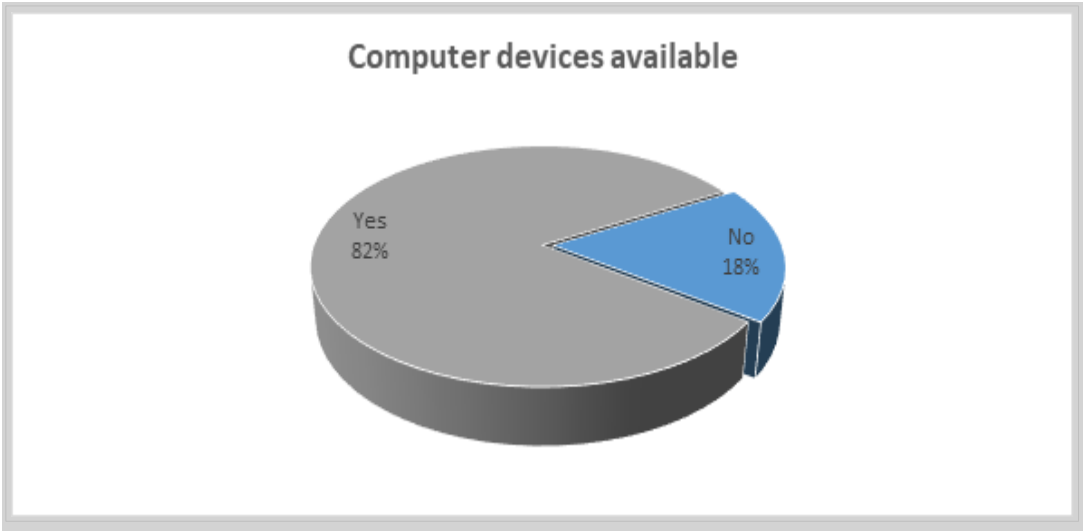
Figure 3: Availability of computers

However, it was also further established that some of these institutions (43%) do not have internet connectivity, as shown in Figure 4 below. The data indicated that they depend on mobile phones data connections to access the internet, those with connectivity uses LANs, WIFI, Broadband and DSL cables in order to get access.
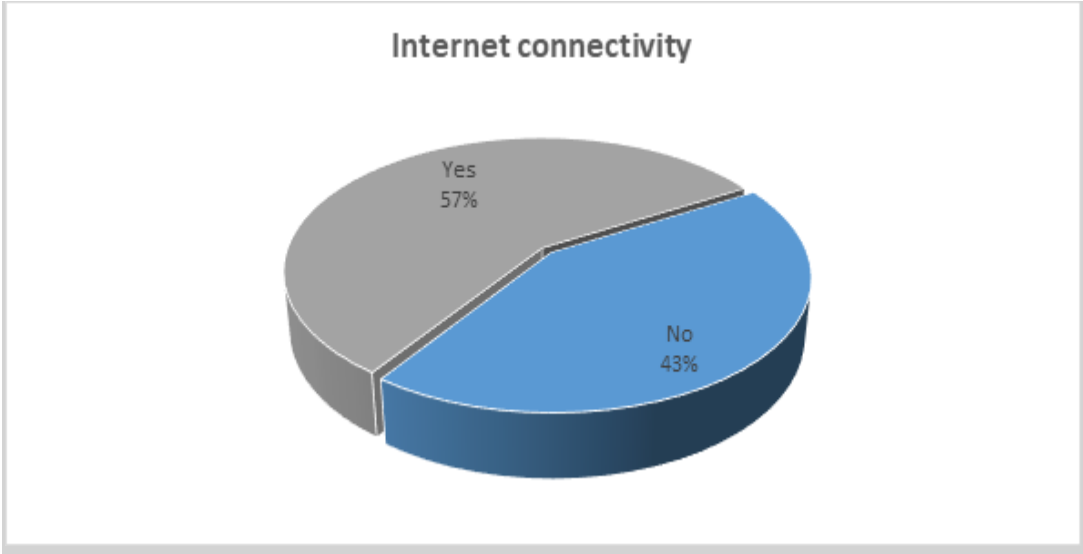

Figure 4: Internet connectivity

4.3   Availability of network ports

Most of these centres indicated that they do not have network ports, as shown in figure 5 below.
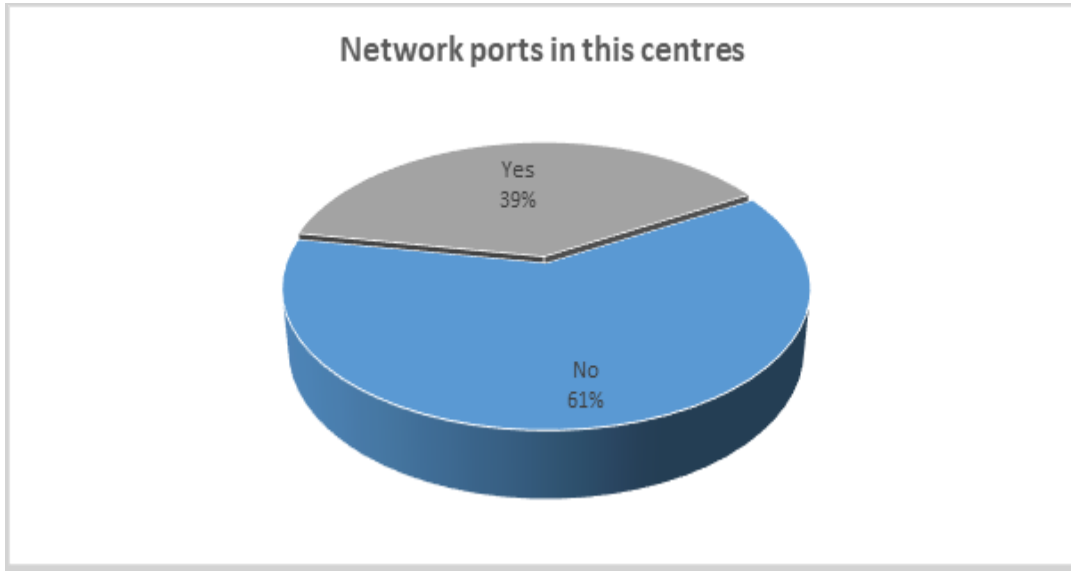

Figure 5. Network pots availability

4.4   IT Skills Development

Most of these institutions (69%) indicated that they do not offer any IT skills training, see figure 6 below. It was also further established that, off those that does offer IT skills training are mostly at the basic computing level (51%) and some at intermediate (26%), only a few indicated that they offer advanced (23%) IT skills training (see figure 7 below).
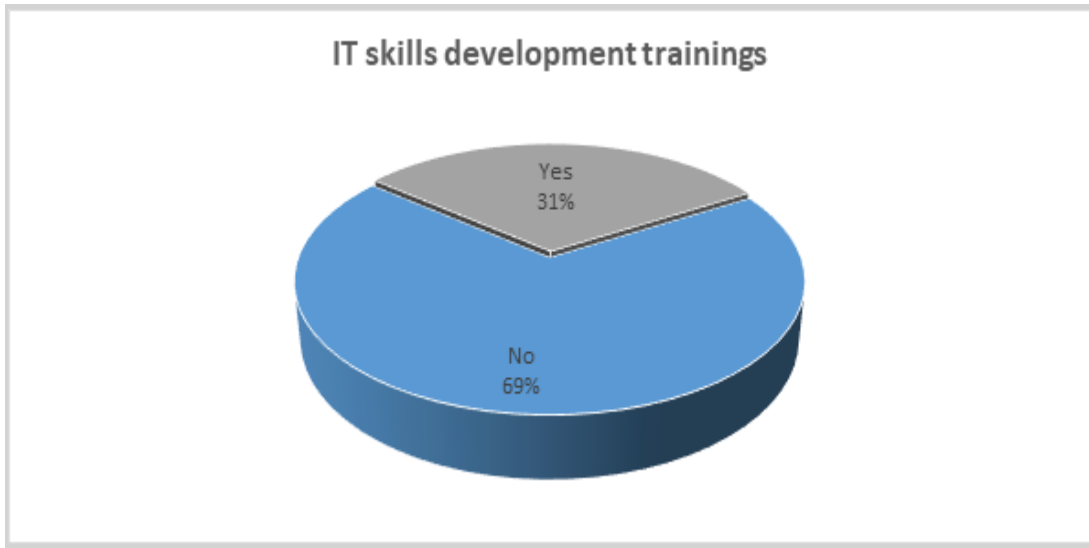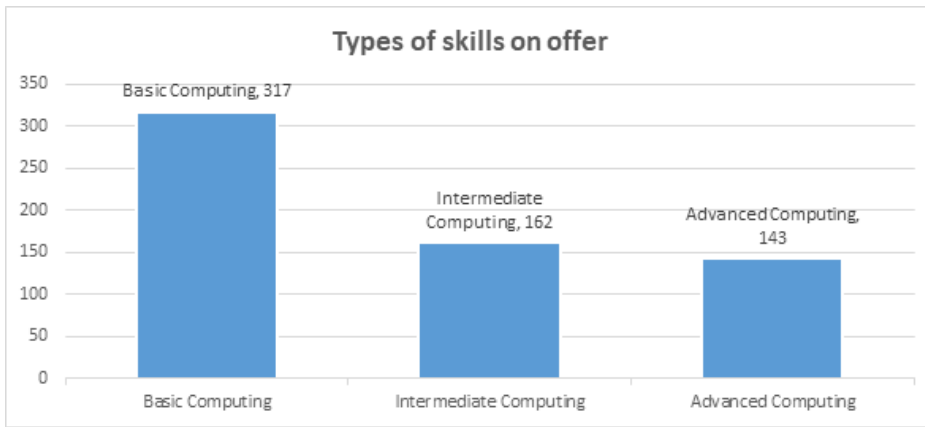
Figure 6. IT Skills development offered.

Figure 7. Level of IT skills training offered.

5   Conclusion

5.1   Contributions of the study

The survey results, as discussed in this report, indicates that there is still a shortage of ICT equipment in government institutions. Furthermore, internet access is still a challenge to an extent that people rely on their personal mobile devices to access the internet. Other network ports/points are rarely available in government establishments, those that are available are mostly dysfunctional.

The internet speed tests revealed that the average internet speed is sufficient, which can be a result of the recent connectivity upgrades which were conducted as part of the Covid-19 state of disaster in South Africa from March 2020. In the time since then, there was spectrum increase availed to all network operators (BusinessTech, 2021), allowing for improvements in the networks and allowing the capacity for people to work from home.

Access areas such as local municipal offices, teacher's training centres, public schools and colleges have a shortage of operational data centres. These data centres are available mainly at district municipal offices and digital hubs, which caters for only 11%. This indicates a shortage of the basic ICT access areas across the province.

IT skills development initiatives are still scarce amongst institutions, or rather offered at basic computing to intermediate level.

5.2   Limitations of the study

While the study provides valuable insights into the state of ICT infrastructure and internet accessibility in the public sector of KZN, several limitations should be considered. It may be that the study's cross-sectional design limits the ability to establish causation or explore changes over time. The reliance on self-reported data through online surveys introduces the potential for response bias and may not fully reflect the ground reality. Bunz, *et. al.* (2007) observed that when individuals provide information about their skills themselves, there is a tendency for them to overestimate their abilities, possibly influenced by a desire to present themselves more favorably in a social context. This is difficult to overcome due to ethical and privacy issues, but the level of inaccuracies is assumed to be low due to the training of the data collectors in the field.

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