Research Paper

Geographical Information Systems (GIS) in Municipal Planning and Management: A Pathway to Improve South African Service Delivery

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Abstract

In the years after 1994, the democratic government of South Africa worked to transfer and extend basic service provision to practically all sections of the country. The delivery of public services continues to be an embarrassment to humanity and the developmental state. Without proper basic services such as water, sanitation, power, infrastructure, health facilities, and housing, a large section of South Africa's people would continue to live and die. As a result, society remains disenfranchised and exposed to socioeconomic shocks, contributing to the economy's decline and destruction. To support successful service delivery, the integration of Geographical Information Systems (GIS) as a shift from human-led operations to computerized operations is now recognized and required in municipal planning and management. The central purpose of this study is to evaluate the feasibility of applying GIS as a crucial planning tool infused within integrated development planning in municipal planning and management. The current state of service delivery in existing municipal planning and management procedures, as well as the factors that influence it and the effect it has on society, will be examined. This conceptual study employs secondary data and follows a certain methodology. Using the Critical Discourse Analysis (CDA) methodology, secondary data were examined. The results demonstrate that political influence and manipulation, a lack of openness and accountability, insufficient citizen participation, a lack of personnel capability, and poor planning, monitoring, and evaluation contribute to poor public service delivery in South Africa. Furthermore, the findings indicate that GIS functions as a tool for visualization and collation of spatial information, map production, and data capturing and storage in local municipalities with the aim of enhancing public service delivery.

Keywords: *Geographical Information Systems (GIS); Service Delivery; Municipalities; Planning; Management*

INTRODUCTION

The local government oversees services delivery to communities in a sustainable way, encouraging social and economic development, and promoting a safe and healthy environment (Constitution of the Republic of South Africa, 1996). Nonetheless, Mamokhere (2019) argues that service delivery continues to be one of the primary issues of the 21st century regarding tasks delegated to local governments. Although the quality of the services is deemed insufficient to please the recipients, it can be agreed that since the advent of democracy, public services may have reached individuals who had never received them (Nkomo, 2017). Scholars like Naidoo (2004), Maserumule (2011), and Thornhill and Dlamini (2012) highlight that local government is the most crucial branch of government because it is the most accessible to the public and offers the widest range of services. Additionally, according to Section 152 of the Republic of South Africa's 1996 Constitution, local governments have the following goals: (a) to provide local communities with democratic and accountable government; (b) to ensure the provision of services in a sustainable manner; (c) to promote social and economic development; (d) to promote a safe and healthy environment; and (e) to promote social and economic development (Constitution of Republic of South Africa, 1996). As a result, municipalities in South Africa are obliged to guarantee that services are provided by the constitution through effective and efficient planning and management.

From this point on, the use of Geospatial Information Systems (GIS) in municipal planning and management models enhanced service delivery in South African local government. A

geographic information system (GIS) is a combination of computer software, hardware, and data specialists that makes it possible to enter, record, analyze, alter, and show data as well as information about a location on the surface of the planet (Community Development Office, 2021). The efficacy of the system is evident in various professions where personnel in managers, project managers, engineers, land surveyors, and other professionals have been utilizing geographic information systems (GIS) to store information in a two- or three-dimensional spatial computer database in layers that can be used as a multipurpose planning tool (Viitanen & Kingston, 2009). The Frances Baard Municipality District, which is located in a primarily rural area of the nation's northern central region, also successfully established an ArcGIS server that provided a Corporate GIS unit and made its data accessible to all local municipalities through a web portal. This district further fixed spatial errors by recreating the parcels in ArcGIS based on the coordinates provided in source documents and enabled the facilitation of more accurate utility billing, which in turn enabled the creation of new jobs (ArcNews Winter, 2013). Geographic information systems (GIS) are therefore crucial for municipal management because of the broad geographic spread of visible and invisible infrastructure and reliable and high-quality service delivery (Engelbrecht, 2011). The system will enable the capturing of necessary information relating to socioeconomic and environmental conditions using data-collecting methods such as remote sensing and field surveys using instruments such as a compass, measuring devices, and theodolites to measure environmental features in terms of their occurrence and location (UN-HABITAT, 2016).

Although it is not occurring, municipalities in South Africa are entrusted with the responsibility of keeping streets clean, collecting sewage, and making sure taps have running water, but this is not occurring (Nkomo, 2017). However, people admire the ANC-led government, which continues to disappoint them with inadequate service delivery, according to Kgobe (2020). It is still contentious to provide services to South African society (Sebola, 2018). Furthermore, it has been argued that there are a variety of service delivery conundrums not just in South Africa. According to the study of Kgobe and Makalela (2018), service delivery is a pressing concern that affects nearly all municipalities in South Africa. The primary contributing cause, according to StatsSA (2018) and Mamokhere (2019), is unhappiness with the provision of basic civic amenities, especially in rural and unofficial settlements, such as running water, electricity, and toilets. High levels of poverty, poor infrastructure, and a lack of housing are further issues. Approximately 27% of people are officially unemployed. Moreover, Nkomo (2017) research found that at least 50% of South Africans thought municipalities handled maintaining roads (56%), markets (55%), and controlling land use (54%) "very poorly" or "extremely poor." According to Nkomo (2017), deficiencies in service delivery also reflect and support most towns' apartheid-era spatial planning, delaying racial and class integration and equality. The purpose of this study is to explore the application of Geographical Information Systems (GIS) in Municipal Planning and Management to respond to the current state of service delivery in existing municipal planning and management procedures, as well as the factors that influence it and the effect it has on society.

LITERATURE REVIEW
Theory of Change as a Lens for Analysis
The theory of change is a technique for defining how a particular intervention, or collection of interventions, is likely to result in a certain development change using a causal analysis based on existing knowledge, according to the United Nations Development Group (2015). A theory of change "is a purposeful model of how an initiative such as a policy, a strategy, a program, or a project contributes through a chain of early and intermediate outcomes to the intended result" (Serrat, 2017). Municipal planning and administration in South Africa are experiencing a service delivery backlog. Municipalities must develop or implement complicated interventions that will result in

system changes that will improve service delivery. Local governments confront a difficult challenge in tackling complex social problems by bringing together people from various origins, beliefs, ideas, and resources to plan integrated development (Van Tulder & Keen, 2018). Theories of change aid in navigating the complexities of social change, resulting in enhanced service delivery. One benefit of the theory of change is that it promotes the growth of the capacity for intentional theory and its successful implementation (Serrat, 2017). The adoption of geographic information systems (GIS) as a planning tool inculcated within integrated development planning is a critical capacity needed in local municipalities. Given the fragmented service delivery issues that South African local governments confront, A theory of change can help in finding remedies to successfully address the root causes of issues that obstruct growth and guide decisions on which strategy to follow (United Nations Development Group, 2015). The use of geographic information systems (GIS) as a planning tool in municipal planning and management will improve service delivery while also assisting with tracking and monitoring.

Public Service Delivery in South African Municipalities

The concept of service clustering represents an extension of the single-window approach and is a response to evolving societal needs and technological advancements. It involves the integration of services offered by a government department as well as those provided across departments, between different levels of government, and across various sectors. The initial organization is followed by a subsequent reorganization that prioritizes the needs and demands of the residents. South Africa is the country in question. To achieve its objectives for national development, an effective and proficient public service is also deemed necessary. To establish the expected standards of service quality, governmental entities have released service delivery charters and agreements. The charters and service delivery agreements (Batho Pele) are situated within the framework of the White Paper on the Transformation of the Public Service, which was released in 1997.

According to Crous (2004), service delivery refers to the mechanism by which a government entity fulfills its commitment to provide goods or commodities to a given community. According to Section 152 of the South African Constitution of 1996, local government is the operational mechanism for providing essential services. As per the South African Constitution of 1996, the responsibility of promoting social and economic advancement, cultivating a secure and salubrious milieu, and ensuring the conscientious provision of public amenities falls under the purview of the local government.

According to Nkomo (2017), the delivery of services in South Africa is perceived as a means of promoting social integration and enhancing the quality of life for marginalized and disadvantaged individuals who have been excluded by the government's racially segregated policies. The term "service delivery" pertains to the dispensation of fundamental amenities and utilities, such as housing, water, sanitation, land, power, and infrastructure, which are crucial for the daily sustenance of communities (Reddy, 2016). The term "former" pertains to the allocation of municipal services that are recognized as conspicuous to communities, while the term "latter" pertains to services that are deemed essential but not readily observable, such as waste and sewage infrastructure and public safety regulations (Ndudula 2013; Reddy, 2016). According to Ndebele and Lavhelani (2017), it is customary for governments that impose taxes on both businesses and the labor force to assume responsibility for the provision of services to their constituents.

The regulation of public services is a constituent aspect of public service delivery, as posited by Nambalirwa and Sindane (2012). According to the objectives outlined in the Constitution of the Republic of South Africa 1996, multiple departments within both national and local levels of government are responsible for the allocation of public goods and services. These services

encompass a range of areas, including security, social welfare, and other services that may directly or indirectly contribute to individual satisfaction (Draai, 2010).

The Batho-Pele Principles, which were introduced in the White Paper for Transforming Public Service Delivery in 1997, serve as a foundation for service delivery in South Africa. These principles encompass various aspects such as service standards, value for money, and the provision of precise and prompt information. Additionally, the Batho-Pele White Paper for Transforming Public Service Delivery in 1997, as cited by Nambalirwa and Sindane (2012), also outlines these principles. The provision of public services involves a combination of tangible and intangible efforts aimed at enhancing the well-being of communities, fostering sustainable employment opportunities, and promoting long-term prosperity (Madue, 2015:96). As the governmental entity in the closest proximity to the populace, the local government possesses significant social potential to furnish communities with indispensable amenities (Ndevu & Muller, 2017).

Municipal Planning in the South African Context

Normally, the notion of "planning" does not receive the attention it deserves. Sometimes services appear out of nowhere, spawned by political allies who desire to meet their demands and interests without regard for planning considerations. In a democratic time when services are supplied and delivered without questioning unknown methods and without following planned procedures, the saying "the result justifies the means" becomes more pertinent. In the literature and reality, questions concerning the usefulness of GIS in municipal planning have been raised but not effectively addressed. As a result, the purpose of this article is to reveal, announce, and encourage GIS as a technology that may help with municipal planning and management. The following is a critique of GIS's utility in municipal planning. It is important to talk about the nature of service delivery because it is now being infused with the idea of planning and management.

Throughout the last ten years, governments have solicited, examined, and responded to citizens' ideas about the function of government and how it should deliver programs and services. Citizens have come to demand more from the government to provide high-quality services. Because of their embrace of the technological revolution, governments are concentrating their service delivery techniques on people's demands. They are attempting to discover people's expectations and should establish how to structure information, programs, and services in a citizen-centered manner. Other governments enhanced their ability to provide customized one-stop services to their customer groups in the 1990s (single windows). Service clustering evolved from citizen requirements and the promise of new technology. It expands on the concept of a single window, whereby it uses an integrated approach to link services from within a government department, between departments, between governments, and across sectors. They are initially organized, and when the needs of the population change, they are reorganized. South Africa is not different. To fulfill its national development strategy, it also needs a capable and effective public service. Service delivery contracts and service charters have been implemented by government agencies to delineate the expected standards of service. The charters and service delivery agreements were established on the basis of the 1997 White Paper on the Transformation of the Public Service.

Municipal planning comprises making decisions and managing change to eliminate uncertainty about public commodities like water, electricity, roads, transportation, education and schools, health care and clinics, and so on, all of which have a significant impact on human dignity (Tsheola et al., 2014). As a result, regarding service delivery planning, "it's all about people" from now on. The latter forms a direct link between service delivery planning and public engagement requirements. When "people power" is exercised in its totality and the community is engaged in public decision-making, two important elements of democracy ("popular control and political equality") are respected (Tsheola, et al., 2014).

Conceptualizing Geographical Informal Systems (GIS)

Geographical Information Systems (GIS), according to Ali (2020), are computer systems that are utilized as the foundation for capturing, storing, retrieving, analyzing, and displaying spatial data that provide descriptions of land properties as well as features for a given geographic region. As of late, GIS has been mostly used to visualize and compile spatial data related to development to provide support for the decisions being made during the planning process. In agreement, ESRI (2019) adds that GIS may be used to spot issues, track changes, handle and react to events, anticipate, define priorities, and comprehend trends. Franch-Pardo et al. (2020) suggest that the goal of contemporary GIS is participation, sharing, and cooperation, which strengthens bonds, increases efficiency, and establishes channels of communication within a community.

In this approach, GIS links data to a map and combines various types of descriptive information with location information to show (a) where objects are and (b) what the environment is like there (ESRI, 2019). This provides a basis for mapping and analysis in essentially every field and branch of science. Users can better understand patterns, linkages, and spatial context with the help of GIS. Better management and decision-making, as well as improved communication and efficiency, are some of the benefits (Ali, 2020). GIS is widely used in various fields such as education, health, manufacturing, retail, transportation, electric and gas utilities, petroleum, insurance, and governance (ESRI, 2019). In national health programs, particularly those in Bangladesh, geographic information systems have been widely used for planning, monitoring, and assessment reasons (Robin et al., 2019).

Additionally, there are variants of GIS that are fundamental for storing spatial data, which are raster and vector data. To store the specific geographic features that are present at a particular location in a single database, vector data is one of the spatial data models used. The use of vector data and its storage, according to Buckley (1997), entails the use of directional lines to represent geographic features. Furthermore, Rao (2017) claims that raster data models, which are frequently used for data storage, consist of a regular grid of cells arranged in precise order, each of which contains spatial data. The cell is the fundamental unit of raster data in which coordinates are used to express geographic features and traits, and every place is parallel to a cell (Rao, 2017). Each cell contains a single value that is addressed specifically together with the value of a feature, also known as a layer (Ali, 2020). Henceforth, a set of data can be made up of different layers covering the same environmental locations, such as a forest, water, cashew, etc., because cells are arranged into layers.

RESEARCH METHOD

This study employed a conceptual research design, characterized by an in-depth analysis of existing secondary data sources. Conceptual research can be classified as a form of qualitative investigation. Conceptual research is a form of inquiry that entails scrutinizing and assessing existing data on a specific topic. The subject matter encompasses intangible ideas or cognitive processes. Throughout history, philosophers have relied on conceptual inquiry as a means of formulating novel ideas or reinterpreting pre-existing ones. The conceptual research framework is formed by the amalgamation of a researcher's prior research and related work and serves to characterize the events that transpire. According to Jaakkola's (2020) assertion, the research study's tasks were meticulously delineated based on insights derived from pertinent ongoing research and the perspectives of other scholars on the topic. Regoniel (2015) posits that a conceptual framework is a researcher's amalgamation of existing literature that elucidates a particular phenomenon. The document delineates the procedural measures that must be undertaken during the investigation, considering the researcher's existing knowledge of other scholars' viewpoints and findings regarding the topic under scrutiny. The conceptual framework can be defined as the researcher's comprehension of the interrelationships among the variables

being examined. The aforementioned highlights the pertinent factors that a researcher must consider. The research plan functions as a guide for the investigator in completing the study.

As per McGaghie et al. (2001) perspective, the conceptual framework serves as a foundation for investigating the particular research problem that propels the presented inquiry, as stated in the problem statement. The problem statement of a thesis outlines the circumstances and issues that motivated the researcher to undertake the study. Conceptual research relies on the analysis of pre-existing data on a specific subject matter, as opposed to conducting empirical experiments. The approach chosen by the researchers was based on the fact that conceptual papers can generate novel insights by integrating selected data sources in adherence to a pre-established framework of criteria. Conceptual papers differ from traditional research papers in their approach to supporting claims. Rather than relying on empirical evidence, conceptual papers incorporate and synthesize existing data using pre-established concepts and beliefs (Hirschheim, 2008). Conceptual papers incorporate empirical insights because they are grounded in validated ideas and concepts that have been evaluated through empirical research.
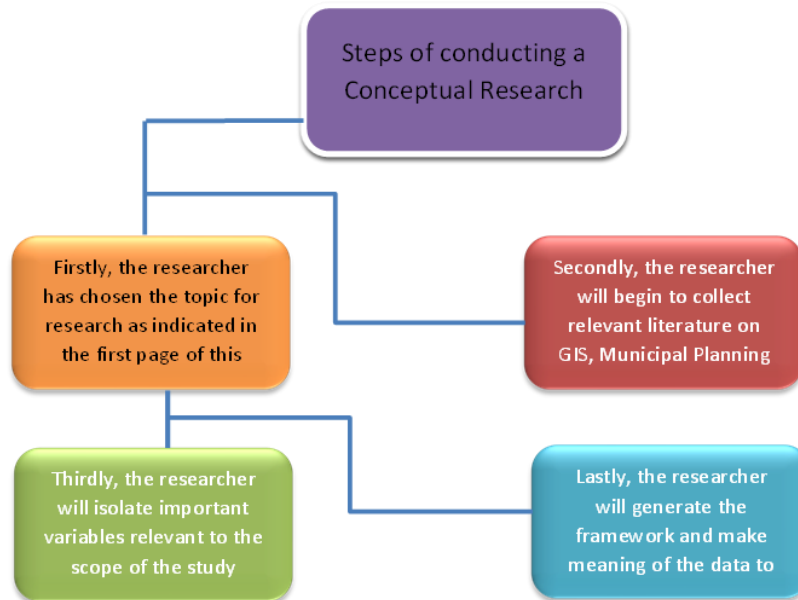

Figure 1. Steps for conducting a conceptual paper (Mamokhere et al., 2022)

The researchers employed several significant measures to conceptualize and execute this study. The model depicted in Figure 1 was used. This study employed a conceptual research design that involved a comprehensive examination of existing literature. The article starts with a description of the researchers' collaborative processes in conceptualizing the study's title, with a focus on the methodology employed. The scholars opted for a subject matter that pertained to their field of specialization. The researchers selected a subject that is currently under investigation because of its relevance to their academic discipline. The data were collected by the researchers through a comprehensive survey of the available literature, as depicted in Figure 1. The data presented in this article were compiled through the use of peer-reviewed academic publications, books, government laws, and online sources, as indicated by Sunday and Mamokhere (2021).

The primary objective of this study was to gather data on the planning and management strategies employed by South African municipalities in providing public services. In addition, the research identified the challenges faced by these municipalities in implementing their service delivery plans during and after the epidemic. The present study collected data from various

databases and sources, such as Google Scholar, Google, J-Gate, Scopus, and university libraries, in addition to the primary topics discussed in the article. According to Jaakkola (2020), it is advisable to employ scientific periodicals, research articles, and other materials authored by reputable social science researchers as primary resources. Consequently, the authors of this scholarly article extensively scrutinized secondary sources to substantiate their assertions.

The process of analyzing non-textual data, such as interview transcripts and observation notes, to gain a deeper understanding of a phenomenon is commonly referred to as data analysis in the context of qualitative research (Wong, 2008). The analytical process commonly involves the classification or categorization of qualitative data, as noted by Mamokhere et al. (2022). To comprehend vast quantities of data, it is imperative to minimize the volume of raw data, identify significant patterns, and ultimately derive meaning from the data by constructing a coherent chain of evidence (Patton, 2002). Qualitative data analysis often involves a comprehensive review of numerous transcripts, followed by the identification and development of themes and categories, as noted by Sunday and Mamokhere (2020). This article used the Critical Discourse Analysis (CDA) methodology to examine perceived documents or secondary data. Discourse Development Analysis (CDA), a qualitative analytical approach, is utilized to scrutinize, construe, and elucidate the mechanisms by which discourses engender, sustain, and legitimize societal disparities (Mullet, 2018), as per the tenets of CDA. In contrast to the quantitative research paradigm that prioritizes numerical data, the Critical Discourse Analysis (CDA) methodology is predominantly employed in qualitative research. A systematic approach was employed to examine and synthesize the existing literature on GIS, municipal planning, public service delivery, and other emerging factors. In other words, the researcher collected secondary data from diverse sources such as scholarly articles, books, legislative documents, and online platforms.

FINDINGS AND DISCUSSION
Causes of poor public service delivery
Political influence and manipulation

Political influence and manipulation significantly contribute to poor public service delivery. The politicization of administrative components in municipality results in poor local governance (Masuku & Jili, 2019). This is particularly evident in South Africa, where the political interface in local municipalities greatly affects effective and efficient administration as well as growth opportunities (Masuku & Jili, 2019). Political interference in the appointment of municipal officials and tender processes often prioritizes patronage over competence, hindering service delivery efforts (Gauteng News, 2024). Therefore, municipalities adopt the merit system and abandon the spoils system, which is highly characterized by political favors and interference (Masuku & Jili, 2019).

Lack of openness and accountability

Lack of openness and accountability is another major factor contributing to poor public service delivery. In South Africa, access to basic services is largely crippled by the mismanagement of public funds, a lack of prioritization by the government, and a legacy of spatial segregation and unequal development at the local level (Keller, 2021). Furthermore, corruption within government structures at various levels siphons off funds meant for service delivery (Gauteng News, 2024). Mismanagement of resources, poor procurement practices, and a lack of accountability exacerbate service deficiencies (Gauteng News, 2024). Therefore, promoting transparency and accountability is crucial for improving public service delivery.

Insufficient citizen participation

Insufficient citizen participation in public service delivery is a significant issue. In South Africa, there is a continuing decline in public participation at the local level, often resulting in poor service delivery, tension between decision makers and communities, and a rise in violent service delivery protests (Kgobe et al., 2023). Public participation is a key tool in the effective, efficient, and economic delivery of services in municipalities across South Africa (Mamokhere and Kgobe, 2023). However, the study found that there is a lack of communication between the local government and the residents (Nkomo, 2017). Therefore, promoting citizen public participation, which focuses on increasing collaboration between communities and municipal officials at the policy implementation stage, is essential (Mamokhere, 2022).

Lack of personnel capability

Lack of personnel capability is a critical factor in poor public service delivery. Many municipalities lack the necessary technical expertise, skilled personnel, and financial resources to effectively manage and deliver basic services (Thabang et al., 2022). This results in inefficient project planning and execution and an inability to maintain the existing infrastructure (Naidoo, 2011). Furthermore, the study revealed that poor public office ethics, lack of adequate resource capacity, lack of strategic awareness by key personnel, lack of staff training and development, undue political interference, lack of digital transformation, and lack of accountability and transparency were the top-ranked contributing factors to decelerated public service delivery (Chelechele, 2009).

Poor planning, monitoring, and evaluation

The absence of effective coordination and regulation of plans is a major constraint in development (O'Neill, 2010). This has led to a sense of dissatisfaction with planning, linked to an unrealistic notion that simply because something is included in a plan, it will necessarily happen (Keeton & Nijhuis, 2019). In some instances, charismatic spatial plans are formulated, although they are coupled with a dose of lack of facilitation during implementation. Lack of proper planning tools constantly weakens the planning systems and approaches that are put forward for spatial development. However, this heightens the awareness that one cannot get anything done when their sole tools are effectively control devices, meant to stifle rather than stimulate development. Moreover, the lack of essential technical skills in municipal planning, management, and operations decreases the potential success of integrated development in communities (Senyakoe, 2011).

Application of Geographical Information Systems (GIS) on public Service delivery
Visualization and collation of spatial information

Given the recent times, GIS is mostly used for the visualization and collation of spatial information that relates to development to be able to offer support to the decisions that are undertaken in the planning process. The Geographical Information system is critical in municipalities because it allows municipal developers to plan and manage day-to-day operations as well as target infrastructure and service delivery investments (Saladin et al., 2002). Bezegmez (2020) highlights that, with the use of GIS, municipalities may perform several tasks, such as resource and infrastructure inventory, transportation planning, public service delivery improvement, management of land development and administration, and income generation by boosting economic activity.

Map Production

Municipalities use the system for development planning and management to organize community infrastructure and assets, forecast future growth demands, improve public safety data and reporting, and extend public involvement possibilities and platforms (Community Development Toolbox, 2021). The maps produced by GIS can potentially assist in the improvement of service delivery as they better illustrate the locations of individuals and the number of people receiving services in various localities, capturing the daily socioeconomic conditions and updating infrastructure data. As a result, updated infrastructure data usually assist in maintaining community facilities and plans (ArcNews Winter, 2013).

Data Capturing and Storage

The value of a geographic information system in municipal development planning and administration is observed through the provision of essential tools for public officials to undertake development activities in their jurisdiction. Computer hardware and software are vital instruments for development planning and administration and are embedded within the GIS program. The integrated system integrates hardware, software, and spatial data to capture, manage, analyze, and display spatially linked data (UN-HABITAT, 2016). Computer hardware refers to the external computer, mouse, screen, keyboard, and drive that are used to type, record, show, and store strategic plans, ideas, and development information (Rushton, 2014). The computer software encapsulates various programs that allow information to be entered, edited, manipulated, and placed in a map format (Ali, 2020). The computer software is also embedded with multiple databases for drawing, statistical analysis, imaging, and other purposes.

CONCLUSIONS

This article summarizes or highlights the theoretical findings to conclude. According to the findings, political influence and manipulation, a lack of transparency and accountability, poor citizen participation, a lack of personnel capability, and poor planning, monitoring, and evaluation contribute to poor public service delivery in South Africa. As previously highlighted, this article sought to evaluate and look into the feasibility of having GIS adopted as a crucial planning tool infused within integrated development planning as it serves as a hub for municipal planning and management. Municipal development planners will be able to capture necessary information relating to socioeconomic and environmental conditions using instruments like remote sensing and field surveys, utilizing instruments such as a compass, measuring devices, and theodolites to measure features in the environment regarding their occurrence and location. The activities of GIS spatial data include socio-economic planning where municipal development practitioners perform zoning, plan sectoral initiatives, and manage public assets. GIS is utilized in the design of infrastructure such as streets, gas pipelines, public water facilities, drainage systems, and telephone networks.

The management and upkeep of municipal services such as the postal service, solid waste collection, potable water distribution, and sewage system operations and maintenance can be facilitated by a system. As a result, the computerized planning and management tool associated with GIS is the ultimate solution to the public service delivery constraint factors by enabling spatial data collection, archiving, retrieval, analysis, and display of descriptions of land characteristics as well as features of geographical localities using modern technology that relates to development for decision-making processes that are undertaken in the service delivery planning process. Therefore, municipal development planners and managers can use computer hardware and software to establish maps that fit their criteria, such as cadastral maps, thematic maps, and plans. GIS will play an essential role in development planning and management in urban settings because numerous

public service activities require spatial data that are attainable through the application of GIS. To establish a comprehensive GIS database for the area of authority, municipalities with an approved cadastral layer conduct surveys and capture data on community amenities and infrastructure.

LIMITATION & FURTHER RESEARCH

There is very little research on this topic. The Geographical Information System is a relatively new tool in the public service and an evolving phenomenon that does not have a vast amount of research, which requires attention from scholars.

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