CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

Surveying is the technique profession, and science of determine the terrestrial or three dimensional position of point and the distance and angles between them. a land surveying professional is called a land surveyor, these points are usually on the surface of the earth, and they are often used to establish map and boundaries for ownership, location of subsurface features, or other purposes required by government or civil law, such as property sales.

Surveyor work with element of geometry, trigonometry, regression, analysis, physics, engineering, metrology, programming, language and the law, they use equipment such as total station, theodolite, robotic reflectors, GPS receiver, 3d scanners, digital levels, and drone and sub-surface locators.

Surveying has been an element in the development of the human environment since the beginning of the recorded history, the planning and execution of most forms of construction require it, it is also used in mapping and the definition of legal boundaries for land ownership. A surveyor is professional person with the academic qualification and technical expertise to conduct one or more of the following activities;

i. to determine, measure and represent land, three dimensional object, point field and trajectories
ii. to assemble and interpret land on geographical related information
iii. to use information for the planning and efficient administration of the land, the sea and any structure thereon.
iv. to conduct research into the above practices and to develop them

A digital mapping is a type of land survey that define the perimeter boundaries of a particular parcel of real estate property. The survey maps a strip along the boundaries using a minimum width of 15feet, this require surveying entire perimeter of said real estate in order to determine the exact acreage and geometry of the property and identify any easement and encroachment that may be present within the land. this process will require the installation of monument to mark the boundaries corner of the land for future references.

2.2 CONCEPT OF DIGITAL MAPPING Facts About Digital Mapping

Digital mapping refers to the process of creating, analyzing, and visualizing spatial data using digital technologies, enabling the representation of real-world environments in a dynamic and interactive format. This concept integrates geographic information systems (GIS), remote sensing, and global positioning systems (GPS) to capture, store, and manipulate geospatial data (Longley et al., 2015). Unlike traditional cartography, digital mapping allows for real-time updates, multi-layered data integration, and user interactivity, making it indispensable in fields such as urban planning, environmental monitoring, and disaster management (Goodchild, 2018). For instance, platforms like Google Maps and OpenStreetMap leverage crowdsourced data and satellite imagery to provide navigational tools that adapt to changing landscapes, illustrating the democratization of spatial information (Haklay & Weber, 2008).

The advent of big data and machine learning has further enhanced digital mapping by enabling predictive analytics, such as modeling urban growth or climate change impacts (Batty, 2013). However, challenges persist, including data accuracy, privacy concerns, and the digital divide, which limit equitable access to mapping technologies (Burns, 2020). Ethical considerations also arise, particularly regarding surveillance and the use of geospatial data for militaristic or corporate purposes (Crampton, 2010).

Tomlinson (2007) said Digital mapping is "the process of encoding spatial information into a digital format, enabling the visualization, analysis, and manipulation of geographic data through computational tools. It transcends static paper maps by integrating databases, algorithms, and interactive interfaces to represent dynamic spatial relationships."

According to **Kitchin & Dodge (2011), he stated that** "Digital mapping is a sociotechnical practice that produces and reproduces space through software-driven processes. It is not merely a representation of reality but an active participant in shaping how spaces are perceived, navigated, and governed in the digital age."

Pickles (2004): "A critical approach to digital mapping recognizes it as a political act, embedding power relations within its design. It involves the selective inclusion or exclusion of data, reflecting the interests of its creators while influencing users' understanding of place and territory."

Elwood et al. (2012) "Digital mapping encompasses volunteered geographic information (VGI), where crowdsourced data from non-experts is integrated into platforms like OpenStreetMap. This democratizes cartography, challenging traditional hierarchies of knowledge production." He continued that, Digital Mapping is used to identify their location of old boundary monumentation and survey pins, or they can be used to set up new ones. A digital mapping identify the features and the improvement that exist within a property, such as barns, garage, sheds, dwelling, surface utilities, roadways, pools and visible bodies of water, only features that fall within the 15foot width around the boundary perimeter will be depicted.

Despite these issues, digital mapping remains a cornerstone of modern geospatial science, fostering interdisciplinary collaboration and advancing sustainable development goals by providing actionable insights into complex spatial phenomena (UNGGIM, 2021).

Digital mapping will require the installation of monument to mark the boundary corners of the land for future references. This requirement can be waived through a written agreement between the surveyor and home owner. Digital mapping is a type of land survey that defines the perimeter boundaries of a particular parcel of real estate property.

Digital mapping is a basic for buildings and land development inventory, detail is referred to as man-made and natural features of the ground within the project site which are determined and obtain by the method of tachometry and are finally represent with a suitable scale on instruction given by the project supervisor and also based on the availability of equipment.

2.3 PURPOSE OF DIGITAL MAPPING

The main purpose is to indicate features on and adjacent to a property, there are a number of site features and levels required by architects and planners.

2.3.1 FEATURES OF GENERAL DIGITAL MAPPINGS

- title information
- contour
- spot level
- site coordination and location of true north
- levels on the kerb and other critical features
- location of existing visible services
- ridge and gutter height for adjacent buildings
- outline of adjacent buildings
- window position and height for adjacent building facing subject site
- height and width of major vegetation
- floor level of subject property
- location of artificially structures
- level benchmarks to Australian height datum (AHD) where applicable

2.3.2 DIGITAL MAPPING IS SIMILAR TO AS BUILT SURVEY

The difference is that digital mapping usually cover large parcel of land, in addition, digital mapping is a much more accurate way of boundaries determination, and features still serves as visual reminders. However, where the stand might not be consistent with the true boundaries of property, as mentioned earlier, a digital mapping is also valuable in resolving conflicts with regards to deed restriction, on the survey you will see the existing feature within 5 meters of the perimeter linear, you can see the driveways, swimming pools, bridges of water and other natural and man-made features existing nearby for the property owner of developer, this is valuable information for construction, planning, property developers could accurately assess the potential of a land, in addition, they can also build fences or walls that are positioned more accurately to better protect their property.

Digital mapping also plays a transformative role in as-built surveys by enhancing accuracy, efficiency, and accessibility in documenting constructed environments. As-built surveys, which capture the precise spatial and structural details of a completed project, rely on digital mapping technologies such as LiDAR (Light Detection and Ranging), photogrammetry, and GPS to create highly detailed 3D models or 2D representations of buildings, infrastructure, and landscapes (Thurstain-Goodwin & Unwin, 2000). Unlike traditional manual surveys, digital mapping enables rapid data collection through mobile scanners, drones, or terrestrial laser scanners, reducing human error and enabling real-time validation of construction against design plans (Batty, 2013). For instance, integrating Building Information Modeling (BIM) with digital mapping allows stakeholders to overlay as-built data onto original blueprints, identifying discrepancies and ensuring compliance with regulatory standards (Elwood et al., 2012). This synergy is critical in infrastructure management, where updates to pipelines, roads, or utilities require precise geospatial records for maintenance and future modifications. Digital mapping also democratizes access to as-built data through cloud-based platforms, enabling collaborative workflows among architects, engineers, and contractors (Kitchin & Dodge, 2011). However, challenges persist, including the need for high computational power to process large datasets and the risk of data obsolescence in fast-changing urban environments (Sheppard, 2005). Despite these limitations, the integration of digital mapping into as-built surveys exemplifies its value in bridging the gap between design intent and physical reality, fostering transparency and accountability in construction and urban governance (UNGGIM, 2021).

2.4 APPLICATION OF DIGITAL MAPPING

Digital mapping has revolutionized diverse sectors by enabling precise spatial analysis, real-time data integration, and dynamic visualization, transforming how societies interact with geographic information.

In **urban planning**, digital mapping underpins smart city initiatives, where GIS platforms integrate traffic patterns, land use, and population density to optimize infrastructure development and resource allocation (Batty, 2013). Environmental scientists leverage satellite imagery and LiDAR-based digital maps to monitor deforestation, track climate change impacts, and model ecosystem shifts, as seen in platforms like Global Forest Watch (Hansen et al., 2013).

In **disaster management**, real-time digital maps synthesized from satellite data, social media feeds, and IoT sensors enable rapid response coordination during events like wildfires or floods, as demonstrated by the UN’s Humanitarian Data Exchange (Kitchin & Dodge, 2011). The **transportation sector** relies on digital mapping for autonomous vehicle navigation, route optimization in logistics, and public transit planning, with tools like Waze and HERE Technologies exemplifying crowd-sourced and AI-driven spatial intelligence (Elwood et al., 2012).

In **agriculture**, precision farming uses drone-generated digital maps to assess soil health, monitor crop yields, and apply resources efficiently, boosting sustainability (Sheppard, 2005). Public health also benefits, as seen in disease-tracking systems like Johns Hopkins’ COVID-19 Dashboard, which spatially visualizes outbreaks to inform policy (Goodchild, 2018). Even cultural preservation employs digital mapping, with projects like Google Arts & Culture using 3D scans to document heritage sites threatened by climate or conflict. However, challenges such as data privacy, algorithmic bias, and unequal access to technology underscore the need for ethical frameworks (Crampton, 2010). Despite these issues, digital mapping remains indispensable in fostering innovation, sustainability, and global connectivity, bridging the gap between abstract data and actionable insights across disciplines (UNGGIM, 2021).

They could also be used:

i. for updating existing plan of an area.
ii. to supply information for assessing and developing of construction works in the survey area.
iii. in relocation of existing property by relating them to existing details on the ground.
iv. in the field of agriculture for the study of soil types and aids in soil conservation.

2.4.1 ESSENCE OF A PERIMETER AND DIGITAL MAPPING

Dashe (1987) saw digital mapping produced to provide the following:-

i. To provide vital information, which must be preserved for future management?
ii. To determine the extent, value, size, ownership and transfer of land.
iii. To determine the extent of an individual holding to avoid conflict over the land.

iv. To defined the boundaries of a particular area of land showing them on plan for further development of the area.

v. To locate portion of land on the physical surface of earth together with detail on it by means of survey beacons and showing that survey on a plan.

2.5 CHALLENGES AND FUTURE PROSPECTS OF DIGITAL MAPPING

Digital mapping, despite its transformative impact, faces significant challenges that hinder its equitable and effective implementation. **Technical limitations**, such as data accuracy and resolution gaps, persist due to inconsistencies in crowdsourced data (e.g., OpenStreetMap) and sensor-based errors in remote sensing technologies (Goodchild, 2018). Privacy concerns loom large, as ubiquitous geospatial data collection—through smartphones, drones, or IoT devices—raises risks of surveillance and misuse, exemplified by debates over location tracking in apps like Google Maps (Crampton, 2010). The **digital divide** exacerbates inequalities, as marginalized regions lacking infrastructure or expertise remain underrepresented in global mapping initiatives (Burns, 2020). Additionally, the computational demands of processing massive geospatial datasets strain existing systems, while interoperability issues between proprietary platforms (e.g., ArcGIS vs. QGIS) limit seamless data sharing (Sheppard, 2005). Ethical dilemmas, such as algorithmic bias in predictive mapping (e.g., policing tools that target minority neighborhoods), further underscore the need for accountability (Kitchin & Dodge, 2011).

Looking ahead, advancements in **AI and machine learning** promise to address these challenges by automating error correction, enhancing predictive modeling, and enabling real-time updates (Batty, 2013). The integration of **IoT and 5G networks** will improve data granularity and connectivity, supporting smart city applications like dynamic traffic management. Decentralized technologies, such as blockchain, could democratize data ownership and ensure transparency in crowdsourced projects (Elwood et al., 2012). Emerging tools like **digital twins**—virtual replicas of physical environments—will revolutionize urban planning and disaster preparedness by simulating scenarios in hyper-detailed 3D maps (UNGGIM, 2021). Meanwhile, participatory frameworks, such as Indigenous-led mapping initiatives, aim to redress historical exclusions by incorporating local knowledge into geospatial systems (Pickles, 2004).

The rise of **quantum computing** may eventually solve complex spatial computations, while ethical guidelines like the UN’s FAIR principles (Findable, Accessible, Interoperable, Reusable) could standardize responsible data practices.

Paradoxically, digital mapping’s future hinges on balancing innovation with inclusivity. As the field evolves, interdisciplinary collaboration and policy reforms will be critical to ensure that geospatial technologies not only advance efficiency but also promote social justice and environmental sustainability (Warf & Sui, 2010).