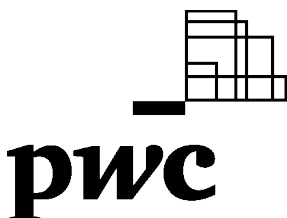




A growing appetite for geospatial analytics: Accelerating business growth in Saudi Arabia

The geospatial analytics market in the Kingdom is projected to grow to US\$570 million in the next five years, making significant impacts across various sectors



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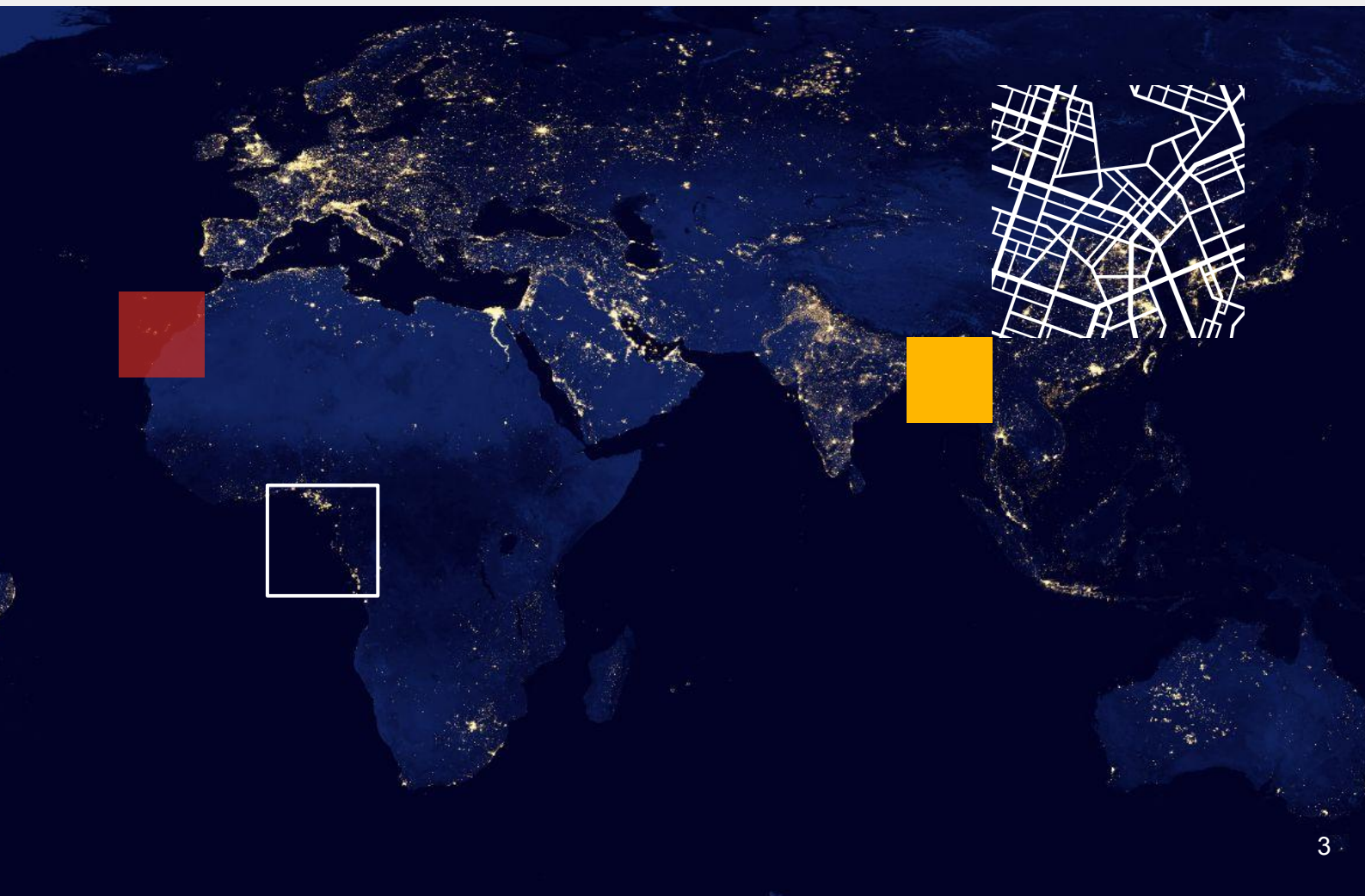
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Every activity occurs somewhere ...

Spatial context adds significant insights to business processes, customer interactions and more

Every activity occurs somewhere, and this spatial context adds significant insights to business services, processes, customer interactions, and more. Geospatial analytics as **an emerging field of business intelligence and data science**, brings location intelligence to understand the spatial context. It identifies and visualises patterns, trends, and relationships offering new understandings that traditional data science methods cannot provide.

Geospatial analytics uses **maps to establish a thorough comprehension of spatial contexts** and present information through easily recognisable visual patterns and images. This facilitates quicker, simpler, and more accurate decision-making and predictions for effectively conveying complex spatial information. It unlocks new values for organisations by extending the reach of traditional analytics to provide powerful insights about where business activities are happening, should happen or might happen, thereby enhancing strategic planning and operational efficiency.



Geospatial analytics is transforming the public sector

Connecting seemingly disparate data points by referencing their location reveals the relationships among public services and people. By analysing data from geographical perspective, a more detailed picture of the issues and events that affect public service delivery emerges, leading to cost reductions, improved alignment between service supply and demand, enhanced service quality, increased productivity, more efficient resource allocation, and development of preventive policies.

Help city planners to make informed decisions for city services

For example, in the context of a city aiming to balance commercial and residential areas, Geospatial analytics can assist planners in making informed decisions. It analyses and visualises the spatial distribution of land use in different zones, helping to understand land use trends and determine suitable areas for commercial activities or residential living. Geospatial analytics modelling demonstrates how new housing development projects might impact schools, healthcare facilities, and traffic flow.

Enhance situational awareness and emergency response

With geospatial analysis, situational awareness and emergency response capabilities can be enhanced. Leveraging real-time spatial data feeds and predictive modelling techniques allows emergency responders to proactively identify high-risk areas, coordinate emergency operations, and allocate resources efficiently during natural disasters, humanitarian crises, or public health emergencies.

Enhance environmental monitoring and natural resource management

Geospatial analysis plays a pivotal role in environmental monitoring and natural resource management. It monitors land cover changes, deforestation rates and biodiversity hotspots, aiding in the development of conservation strategies, tracking habitat fragmentation, and prioritising conservation efforts effectively. Additionally, it facilitates sustainable land use planning, water resource management, and climate change adaptation initiatives, providing insights into ecosystem dynamics and environmental vulnerabilities.

The growing appetite for geospatial analytics

Recent research reveals that 74% of data buyers are currently utilising location data, sourced both internally and externally. Across various industries, at least 25% of enterprises are leveraging more location data than they did 3 years ago. Notably, the usage of location data has surged by nearly 60% in the transportation and logistics sector, while finance and retail/wholesale sectors have increased their already substantial usage by nearly 50%.

Furthermore, 73% of Software as a Service (SaaS) users are willing to pay extra for enhanced location capabilities within their applications. This indicates a significant demand for enterprise solutions that harness location and geospatial insights to enhance user value.

Geospatial components are increasingly integrated into enterprise applications and systems, playing a more prominent role in overall enterprise analytics. The geospatial analytics market is experiencing steady growth, revenue projected to reach US\$157bn by 2029, achieving an impressive 9.6% annual sales growth over the five-year review period. In Saudi Arabia, the geospatial analytics market is currently valued at US\$370mn, with an expected Compound Annual Growth Rate (CAGR) of 9.22% over the forecast period, reaching US\$570mn in the next five years.

At least 25% of enterprises are leveraging more location data than they did 3 years ago

In Saudi Arabia, the geospatial analytics market is reaching US\$570mn in the next five years

By 2029 geospatial analytics market revenue is projected to reach
US\$157 billion



KSA recognises the impact of geospatial analytics in decision-making and enhancing quality of life

Data and geospatial analytics are both game changers in the success of Saudi Vision 2030.

Government officials, C-suite executives, architects, engineers, and construction firms have adopted a geographic approach to enhance areas such as quality of life, urban and community planning practices, and the construction of smart cities.

National level geospatial ecosystem created, with a platform of 12 fundamental datasets

The Kingdom has **created a national-level geospatial ecosystem, along with a platform of 12 fundamental datasets** to regulate the geospatial sector. It has taken significant strides towards achieving its digital goals with a new generation of geospatial data exchange environment that goes far beyond the capacities of existing national and international spatial data infrastructures. Geospatial analytics marks a key milestone in several giga projects like NEOM, AMAALA, The Red Sea Project, ROSHN, Diriyah project and AIUla project¹.

In NEOM, geospatial analysis used for assessing flood-prone development risks

In the NEOM project, geospatial analysis was used to assess flood-prone development risks, which helped **decrease life and property threats**. This included studying **topography data against the sea and surrounding rivers and their morphometric analysis** covering wetness index, elevation, slope, stream power index flow accumulation and geological formation among others. This study reduced flooding risk in some areas - from high to low - as well as helped in preparation for emergencies.

AIUla has developed a geospatial strategy for historical sites to prepare for global tourism

The Royal Commission for AIUla developed a geospatial strategy for historical sites, including AIUla's cultural and natural heritage, which embarked on a long-term plan to deliver a sensitive and sustainable transformation to the **region to prepare for global tourism**. **Geospatial analytics and smart maps** were pivotal to support all their data needs to help in the **development of a world-class public transportation system** that meets the needs of locals and tourists alike. This was achieved by accessing geospatial authoritative data, data management, base map viewing **for autonomous vehicles, electric vehicles and hybrid vehicles projected movement**, and advanced geo-reference capabilities like change detection.

Many leaders in Saudi Arabia have embraced Geographic Information Systems (GIS) technology to incorporate data-driven analysis in **high-level decisions on policy, science, and community designs**, in **assets management, wells, pipelines, plants and buildings, roads, utility network**. Smart maps and mapping applications help organisations **improve workflows, contextualise projects, increase collaboration** throughout project life cycles, and deliver repeatable solutions.

Why now: The impact of technology advancements

The rapid advancements in technology have significantly bolstered the field of geospatial analytics.

Technological advancements have significantly bolstered the field of geospatial analytics, transforming the way we perceive and utilise spatial data. These advancements enable the accurate, real-time processing of geospatial data, leading to a more precise mapping, monitoring, and predictive analysis, thereby deepening our insights. The advancements include:

Sensors and reality capture technologies:

Innovation in sensor technology and reality capture, particularly influenced by the consumer sector, have become mainstream, enhancing data quality and accelerating collection. **Reality capture solutions** particularly provided convenient access to geospatial data to enhance quality and speed of data collection. Advanced **3D scanners** and mobile mapping systems are reshaping the surveying and mapping industry by increasing data volume and precision.

IoT, 5G and social media:

The deployment of 5G networks and IoT devices has opened new sources for geospatial data analysis, including real-time data. **With more and more devices and applications being able to log location information**, the value of geospatial analysis has become widespread, and the use cases have multiplied. **A significant amount of geospatial data is coming from social media**, which is being generated by individuals when they check-in at a venue, tag a photo with location data from their GDS-enabled smartphones, or send a 'tweet'.

Satellites, drones and image analysis:

Investments in satellite and drone technologies have generated unprecedented data volumes, awaiting analytical processing for insights. These tools are crucial for **developing new geospatially reliant vehicles and applications**.

Computing power and affordability:

The **demand for data-intensive processing by geospatial analytics is met by requires data processing intensive infrastructure and cloud technologies**, which offer scalable processing and storage solutions. Cloud hyperscalers are enhancing their geospatial intelligence capabilities, leveraging large datasets for advanced location-based analyses.

Geospatial artificial intelligence (AI):

Artificial intelligence (AI) is refining the accuracy of geospatial analytics and enabling the detection of subtle environmental changes. Automated data analysis through AI significantly saves time and resources, while improving the efficiency of insight extraction from vast geospatial datasets.

Evolution of geospatial analytics software:

The geospatial technology landscape has witnessed remarkable growth — from traditional GIS transitioning to cloud-based services to the rise of open-source and no-code/low-code platforms. This evolution has expanded geospatial intelligence beyond traditional GIS applications, seamlessly integrating it into broader enterprise systems for enhanced insights.

Geospatial analytics: Navigating through maturity levels

Despite the increasing importance of geospatial analytics, it remains unexplored, with many organisations finding themselves at the lower end of the maturity spectrum. To understand this further, we examine the dimensions of a maturity model tailored for location and geospatial intelligence, which covers:

Vision: Strategy, alignment, leadership

People: Talent/skill management, structure/organisation

Technology: Development, deployment, adoption

Practices: Communication, governance, culture/style

Data: Data governance standards, accessibility, improvement prioritisation, data integration

The model outlines **five stages** of maturity, reflecting the evolution from nascent to advanced capabilities in geospatial intelligence:



Ad hoc

The use of location and geospatial intelligence is adhoc and unplanned, often confined to specific instances where it's prebuilt into purchased systems or requested by partners. There is a notable lack of strategic support or funding for comprehensive data collection and analysis, making success highly reliant on individual initiative.

Opportunistic

At this level, organisations begin to experiment with geospatial data, albeit in a disjointed manner. There are isolated initiatives and systems capturing location and geospatial data with no cohesive strategy for deploying this technology. Data management practices, governance, skills management, and technology selection are rudimentary and not standardised, limiting the scope and effectiveness of geospatial initiatives.

Repeatable

Recognition of geospatial analytics' value grows, leading to more structured internal workflows and some level of cross-departmental data sharing. Organisations at this stage start to digitise and automate processes that incorporate geospatial data, laying the groundwork for best practices that can be replicated and scaled.

Managed

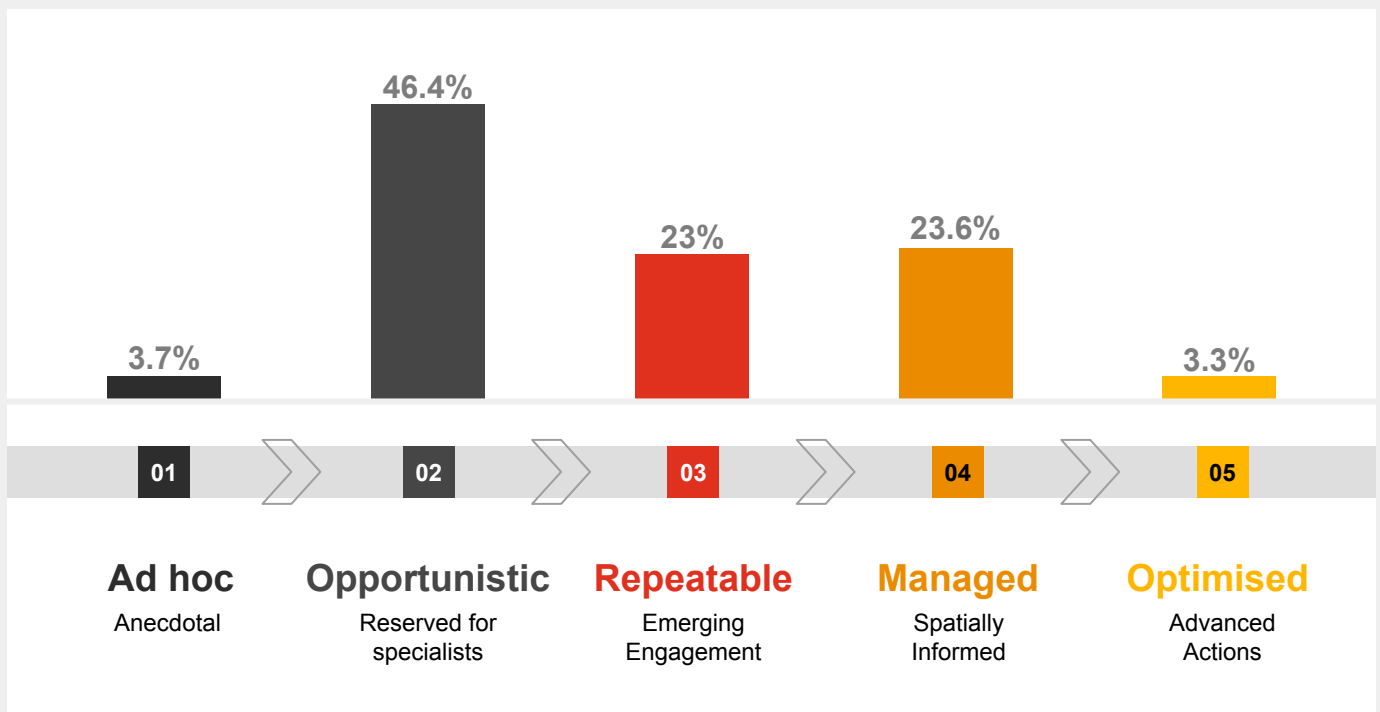
With an enterprise-wide strategy and funding, organisations support a broad portfolio of geospatial technologies. The spatial technology strategy aligns closely with overall business objectives, ensuring a cohesive approach to data readiness, governance, skills management, and technology deployment across the board.

Optimised

At the pinnacle of maturity, geospatial analytics becomes a cornerstone of business innovation and success and strategic decision-making. Leadership teams, including C-suite and line-of-business (LOB) executives, fully recognise the transformative power of location and geospatial intelligence, aligning investments with measurable returns and strategic outcomes.

Geospatial analytics: Navigating through maturity levels

Despite the critical role of geospatial analytics, majority of organisations remain at the early stages of maturity. Only a small fraction, less than 1 in 20 enterprises or 3.3%, have achieved an optimised level of maturity, where comprehensive location and geospatial intelligence initiatives drive significant business improvements. In contrast, almost half (50.1%) are in the nascent ad hoc or opportunistic stages, indicating widespread underutilisation and a limited understanding of geospatial technologies' potentials².



Less than 1 in 20 enterprises (3.3%) have achieved an optimised level of maturity

Challenges in deploying geospatial analytics

The potential of geospatial analytics is vast, yet several challenges can impede its adoption within businesses.

Geospatial data challenges limit the ability to unlock the full potential

1. Data integration and interoperability

Unlocking the full potential of geospatial analytics requires integrating open, commercial third-party datasets with internal business data. Challenges include:

- Data fragmentation: Geospatial data is often scattered across various sources, making it difficult to locate specific files needed for problem-solving.
- Format diversity: The existence of geospatial data exists in multiple formats complicates seamless integration, as mismatched models can hinder effective analysis.
- Interoperability struggles: Achieving interoperability between different systems and datasets is crucial, but challenging, often requiring extensive data scrubbing and reformatting.

The substantial volume of geospatial data necessitates scalable processing capabilities

2. Processing scalability

Historically, organisations relied on desktop tools for their geospatial workflows. However, the expansion of data availability and prevalence of web applications demand geospatial analytics to efficiently manage increased processing loads. Computational power, storage capacity, and processing capabilities play a crucial role in ensuring that geospatial analytics add value within automated workflows.

The sheer volume of geospatial data compounds these challenges. For instance, consider the staggering estimate of 100 terabytes of weather-related data generated daily. This immense data flow poses significant scalability, processing, storage, and access hurdles for most organisations.

Organisations spend 90% of their time for the curation of data needed for geospatial analytics

3. Data curation

Effective data management is critical in the face of data abundance. Organisations find themselves inundated with information, prompting them to rely on their in-house data scientists for assistance. Astonishingly, with up to 90% of geospatial data scientists' time spent on data-curation tasks, such as organising, cleaning, and reformatting data, there is a pressing need for streamlined data processes to allow for more time analysing trends and deriving insights.

Challenges in deploying geospatial analytics

A thoughtful approach to utilising geospatial data demands an expert team

4. Technical expertise

Utilising geospatial analytics requires specialised knowledge and technical skills for tasks, such as the geospatial alignment of data layers. The scarcity of proficient and experienced analysts makes extracting value from geospatial data challenging, particularly for smaller organisations or those new to the field.

Location-based data has the potential to reveal sensitive details about people

5. Geospatial Data privacy and confidentiality

While the capability to extract detailed spatial insights is immensely powerful, the broader industry must remain mindful of data protection laws and give precedence to the privacy rights of individuals and research subjects. Geospatial data, when linked to specific individuals, becomes a prime target for cybercriminals aiming to exploit personal information. Location-based data has the potential to reveal sensitive details about people's daily routines, residences, workplaces, and even their movement patterns.

Harnessing location-based insights, enhancing mission outcomes

With decades of unparalleled expertise in analytics and executive advisory services, PwC's Geospatial Analytics practice empowers government and commercial clients worldwide to harness the potential of location-based insights, overcome their challenges and thereby enhance their mission outcomes. Our committed team, comprising analysts, software developers, data scientists, and strategists, seamlessly integrates pioneering data-driven methodologies with state-of-the-art geospatial solutions to yield impactful results in strategic areas.

We focus on three key areas to ensure efficient execution of your geospatial analytics initiatives: Build a strategic base, deploy tactical accelerators, and boost geospatial analytics.

A- Strategic base	B - Tactical accelerator
Maturity level assessment	Build geospatial analytics data solutions using PwC solutions
Review of location and geospatial intelligence strategy	
Strategy development	
C – Boost geospatial analytics	
Data governance framework	Data quality framework
Data Analytics Framework to Boost your Business	Monetisation and digital Products

A- Strategic base

Our Geospatial Analytics strategic services provide a comprehensive approach to harnessing location-based data, driving critical decisions, enhancing operational efficiency, and fostering sustainable development through:

Maturity level assessment:

- Assess current state and readiness for location and geospatial intelligence enablement.
- Benchmark your maturity against peers.
- Identify gaps and areas for improvement to align with best practices.
- Outline steps for advancing to the next maturity stage.

Review of location and geospatial intelligence strategy

- Evaluate alignment with your enterprise strategy.
- Assess people, technology, and data for access and training needs.
- Plan for the curation and utilisation of location data.

Strategy development

- Broaden the application of location and geospatial intelligence across the organisation.
- Defining key business use cases and solve their challenges.
- Understanding geospatial analytics maturity and filling the gaps.
- Planning geospatial analytics journey to achieve needed outcomes.

Harnessing location-based insights, enhancing mission outcomes

B - Tactical accelerator

Our geospatial tactical accelerators services guide you through designing and implementing location-based intelligence, optimising existing practices or starting anew:

Build geospatial analytics data solutions using PwC solutions, including

- Geo data mart and location intelligence Hub.
- Geospatial enabled capacity demand analysis hub.
- Drones and remote sensing constructions Insights.
- Infrastructure and cities services powered with geospatial analytics.

Design and develop tailored solutions covering

- Integrate geospatial technology for mobile location analysis, cloud optimisation, and business intelligence.
- Define data points and spatial layers, blending statistical rigour, computational geometry, and geo-visualisation techniques.
- Design geospatial customer journeys, services, and products, and define internal and external interactions and integration points.

C – Boost geospatial analytics

Our Geospatial Data Management and analytical services empower organisations across diverse industries to efficiently manage, improve, and exchange their geospatial data for better decision making and realising the value of your spatial data. We ensure that this data is treated as a critical asset, facilitating smooth spatial data flows through deploying data standards and framework.

Data governance framework

- Our precisely crafted service offers organisation implement a robust framework for data collection, storage, and sharing, ensuring regulatory compliance and ethical practices.
- Customise a framework for optimised geospatial data utilisation while promoting transparency, accountability, and seamless integration of location intelligence into business operations.

Data quality framework

- Our expertise lies in designing and implementing the Geospatial Data Quality Framework, which ensures that your location-based information is trustworthy and of the highest quality. By systematically addressing critical components such as geometric coherence, topology validation, spatial accuracy, completeness, consistency, and currency, we elevate the overall reliability and precision of your geospatial data.

Monetisation and digital Products

- Our integrated approach combines cutting-edge geospatial analytics with strategic planning. Leverage geospatial analytics and strategic planning to transform your spatial data assets into revenue-generating business products.

Data Analytics Framework to Boost your Business

- Guide fact-based decision making with dashboards and models.
- Achieve business outcomes and values.
- Monitor data flow and updates.

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