SPECIAL REPORT

Mapping the Opportunities in Geospatial Services and GIS Software

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Executive summary

As geospatial technology rapidly evolves and demand for precise data intensifies, the insights derived from geospatial solutions will become increasingly crucial for decision-making processes across both the private and public sectors.

Due to strong market growth potential, investors and companies should consider the benefits of consolidation and integration of geospatial solutions. This includes the potential to deepen capabilities in focused spaces, diversify end markets, provide a fully integrated stack of geospatial services, take full advantage of the latest technologies and integrate geospatial solutions into other services.

Overview of geospatial solutions and services, including GIS

Geospatial solutions and services are used to capture the locations and characteristics of features on Earth's surface and provide insights into the precise planning, building and monitoring of assets. They play a vital role in enhancing decision-making, resource management and operational efficiency across industries within both the public and private sectors by providing location-based insights.

Geospatial solutions also address the need for detailed geospatial data necessary for critical operations (e.g., infrastructure planning, risk assessments, emergency response) as well as to minimize risks and liabilities (e.g., fires from vegetation encroachment, insurance fraud from inaccurate claims). The increasing need for precise and integrated data has amplified the importance of geospatial solutions in today's data-driven environment.

- **Government (state and county entities):** Perform topographical and geographical analyses, such as mapping, surveying and environmental monitoring, to prevent potential hazards to public safety and assist in project siting, engineering, construction and maintenance of public infrastructure, such as highways, bridges and railways.

- **Insurance:** Use geospatial solutions to collect property measurements and data to assess risks and claim and inspect properties before and after incidents, such as weather events, autonomous vehicle accidents and construction accidents, to mitigate liabilities and disputes.

- **Electric utilities:** Monitor vegetation growth near critical infrastructure to prevent encroachment and mitigate risk and help operate, monitor and maintain critical infrastructure to ensure reliability, increase performance and the lifespan of assets, and improve operational efficiency, regulatory compliance and safety.

- **Oil and gas:** Use geospatial solutions, such as aerial light detection and ranging (LiDAR) imaging, to gather data on aging pipelines and locate leaks and broken pipelines to respond timely and reduce the costs, number of hazardous incidences and environmental impact associated with pipeline abnormalities.

- **Telecom:** Use geospatial solutions to select locations for cell towers and operate, monitor and maintain the towers to ensure network reliability and improve their lifespan.

- **Forestry:** Timberland owners, management companies and related state/county entities use geospatial solutions to track inventory of species, estimate the forest density and carbon content, manage forest health, and prevent hazardous incidents, such as wildfires and pest outbreaks.

- **Construction:** Construction value chain participants use geospatial solutions to assist with project siting, engineering and construction management, while real estate and financial firms use geospatial solutions to assist in the valuation of properties and projects for financial purposes.

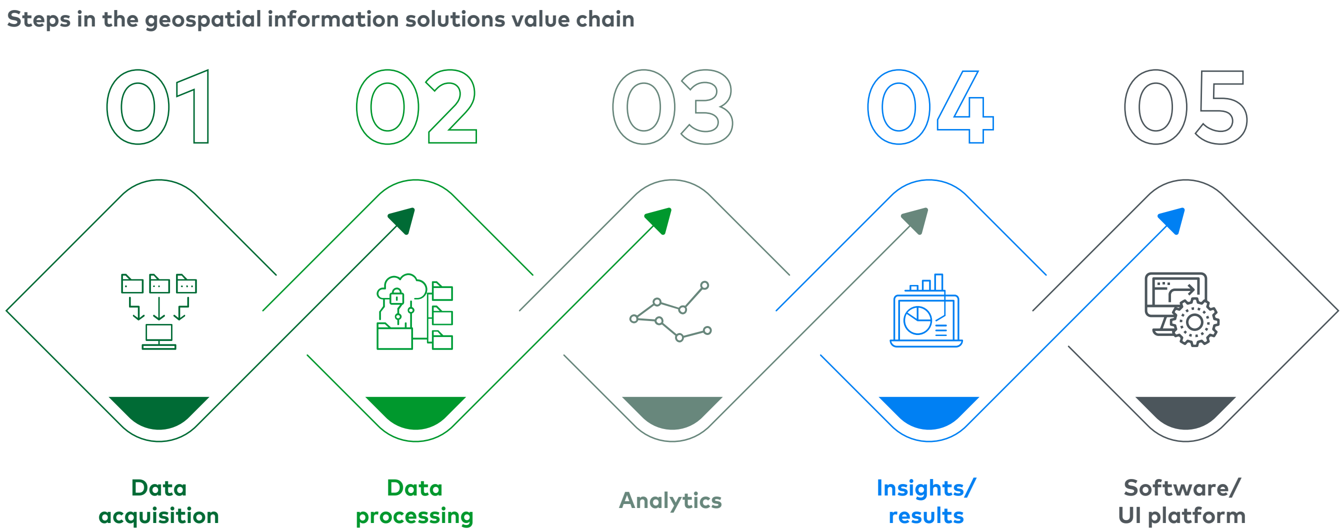
Geographic information system (GIS) software plays a critical role in geospatial applications. It stores, processes, analyzes, edits and visualizes geospatial data. GIS tools are the **primary platforms** used by customers to ingest and visualize geospatial data. Other software tools such as computer-aided design/computer-aided manufacturing, building information modeling (BIM) and enterprise asset management (EAM) are also key solutions that are often integrated with the GIS.

The geospatial value chain

The value chain consists of a number of steps, including data acquisition, processing, analysis, reporting and visualization, with players specializing in specific steps or offering fully integrated end-to-end services.

The geospatial value chain consists of five major segments (see Figure 1).

Figure 1
Geospatial value chain



Note: UI=user interface
Source: L.E.K. research and analysis

A new geospatial solution request will typically go through the following five phases:

1. **Data acquisition**
   This phase involves gathering geospatial data through various methods, including ground surveys, satellite imagery, drones and aerial platforms.

2. **Data processing**
   After collection, the raw data is processed to ensure quality and accuracy. This includes cleaning, structuring and preparing the data for further analysis.

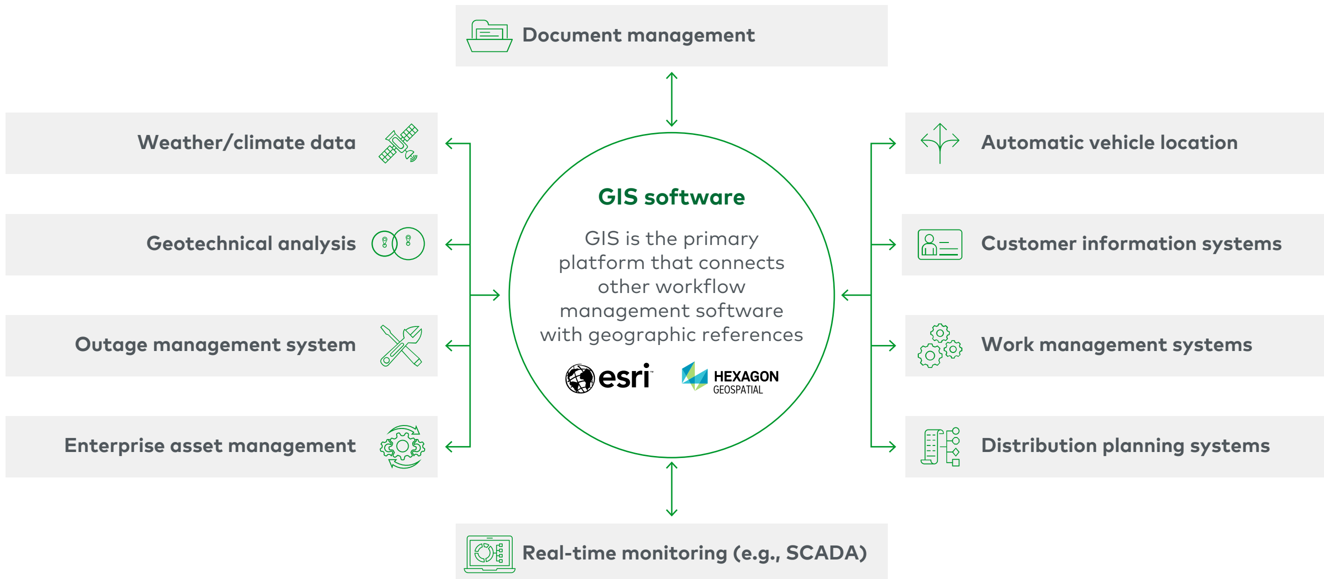
3. **Analytics**
   Advanced tools and algorithms are used to analyze the processed data, uncovering patterns, trends and relationships. This stage often includes model building to predict future scenarios based on the geospatial information.

4. **Insights/results**
   The results from data analysis are then compiled into meaningful reports, providing actionable insights for decision-makers. These insights can lead to enhanced decision-making, improved operational efficiencies and more precise planning.

5. **Software/user interface (UI) platform**
   Geospatial software, such as GIS, allows users to visualize and interpret the data. These visualizations help customers digest the geospatial insights. The software is often integrated with existing customer software systems, enabling seamless integration with day-to-day operations, such as real-time monitoring of assets, tracking of fleet locations, outage management and weather event management.

GIS is the primary platform used to store geospatial information; this integrates into a broader set of operational systems within an asset operator's tech stack (see Figure 2).

Figure 2
Overview of GIS interaction with other software systems



Note: GIS=geographic information system; SCADA=supervisory control and data acquisition
Source: L.E.K. interviews, research and analysis

A GIS integrates data from multiple data sources and workflow solutions.

- **Weather/climate data:** Real-time weather data overlaid on a GIS informs how weather events may affect an asset network or an operator's end customers.
- **Geotechnical analysis:** Data is used to inform and replicate current as-built asset data to drive decision-making.
- **Outage management system:** Outage information is optimized with geospatial data to better manage asset outages.
- **EAM:** Asset records are tied between the GIS and EAM platform to drive inspection and maintenance events on spatial relevance.
- **Document management:** A DM system connects information related to an asset to a data point in the GIS to simplify the document location process.

- **Real-time monitoring (e.g., supervisory control and data acquisition):** GIS data can be used to enable real-time monitoring of assets, in turn driving more-informed decision-making.

- **Automatic vehicle location:** Adoption of GIS data allows tracking of vehicle fleets through the transmission of GPS coordinates, enabling the real-time tracking of crew or staff in relation to assets.

- **Customer information system:** Coordination to share geospatial data across CIS and GIS allows informed decision-making based on an operator's customer needs.

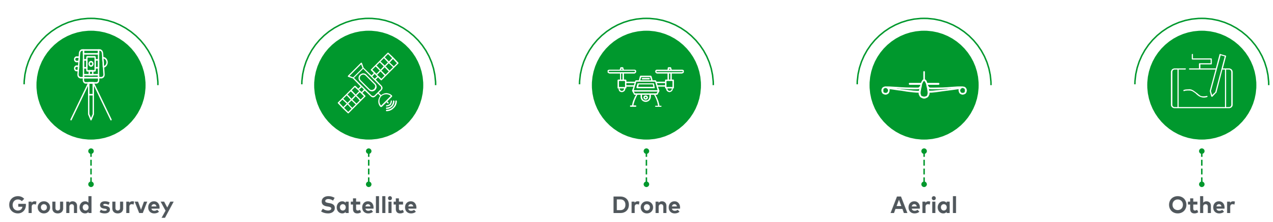
- **Work management systems:** They track work that is designated, approved and completed by an operator to be input into the GIS to minimize duplicate data entry/improve efficiency.

- **Distribution planning systems:** These systems aid operators in asset expansion plans through the use of geospatial data to best serve the operator's customer base.

Geospatial data collection

Various technologies, including traditional ground surveying, satellites, drones and aerial methods, are used to acquire geospatial data (see Figure 3).

Figure 3
Geospatial data acquisition methods



Source: NESDIS; U.S. Public Land Survey System; USC Spatial Sciences Institute; company websites; L.E.K. research and analysis

Ground surveying is used to create highly accurate measurements of natural and human-made features of a piece of land. A variety of instruments are used (e.g., magnetic locators, Gammon reels, prism poles, robotic total stations, GPS, terrestrial LiDAR) to help determine and create 3D positions of points and inform boundary, right-of-way and other topographic surveys. Land surveying technologies offer easy deployment and cost-effectiveness for small areas, but their labor-intensive nature can make them expensive for large-scale projects. They are often used in architecture and engineering since they provide highly accurate and detailed data for small areas that are difficult to capture aerially.

Satellites use remote sensing technologies such as optical (i.e., using sensors to collect data from visible/nonvisible light) and radar (i.e., collecting the reflections of microwave signals sent toward Earth) imagery to capture high-resolution images. Satellites tend to exist in geostationary orbit (GEO) and low Earth orbit (LEO), which each provide unique benefits. For example, GEO satellites can remain over a fixed-point area on Earth's surface, which is particularly valuable for weather observation.

However, because GEO satellites orbit farther away from Earth, they have a lower spatial resolution than LEO satellites and are less effective at providing detailed images highlighting changes over shorter time periods. Both GEO and LEO satellites can regularly revisit a target area, allowing for automation and making them well suited for surveillance activities, especially for larger areas. Satellites are operated by a handful of highly specialized players but can be highly cost-efficient for large surveys compared to traditional ground survey methods.

- **Unmanned aerial vehicles** capture imagery with reduced field time and survey costs. They can fly at lower altitudes than satellites and manned aircraft, allowing for imagery of otherwise inaccessible areas at higher resolutions. Drones are best suited for localized and granular information such as crop surveys and event planning. Drones can be relatively cost-effective, especially when compared to other aerial platforms such as airplanes.

- **Manned aerial methods** (e.g., airplanes) capture geospatial imagery primarily through nadir (looking straight down) and oblique (40-to-50-degree angle to the ground) photography to map large areas or capture data in areas that are difficult to access by ground. They can also be equipped with LiDAR and other remote sensing technologies. Aerial methods can be expensive and require specialized equipment and expertise.

Within the geospatial value chain, products and solutions range in degree of complexity; commercial use cases typically require a mix of rudimentary and sophisticated solutions (see Figure 4).

Figure 4
Complexity by value chain

Geospatial solutions value chain	Data acquisition	Data processing	Analytics	Insights/ results	Software/ UI platform
Sophisticated Technically complex, more comprehensive, fewer vendors in the space, more expensive	Advanced imagery methods	Real-time processing, ML-enabled	Real-time 3D and advanced spatial modeling Specialized AI/ML algorithms	3D visualization and design capabilities Comprehensive planning and design tools	Advanced functionality GIS software ML-enabled applications
	Remote sensing methods (e.g., aerial photography)	Data cleaning Data integration	Measurement and 3D visualization	Automated reporting and monitoring solutions	GIS software with basic mapping visuals APIs and applications that integrate with GIS
Rudimentary Widely available, commoditized, basic offering	Manual/ automatic entry of GPS coordinates	Data storage	Polygon and line measurements using simple 2D vector visualization	Insights drawn from standard functions of GIS software (e.g., geostatistics)	Web-based mapping

Note: AI/ML=artificial intelligence/machine learning; UI=user interface; GIS=geographic information system; APIs=application programming interfaces
Source: NOAA; USGS; company websites; L.E.K. research and analysis

Data acquisition starts with the manual/automatic entry of GPS coordinates, and traditional survey methods obtain vector data on the ground, while the most sophisticated solutions use advanced imagery methods, including LiDAR, photogrammetry and hyperspectral imaging, that require sophisticated hardware.

Data processing starts with basic data storage, while the most sophisticated solutions integrate geospatial data processing with analytics and may leverage solutions such as cloud connectivity, data lakes and machine learning (ML)-enabled solutions.

Analytics starts with polygon and line measurements using simple 2D vector visualization, while the most sophisticated solutions use real-time 3D, advanced spatial modeling (e.g., suitability, normalized difference vegetation index analysis) and specialized artificial intelligence (AI)/ML algorithms.

Insights/results starts with insights drawn from the standard functions of GIS software (e.g., geostatistics), while the most sophisticated solutions use prepackaged AI/ML solutions or predictive analytics for the mapping and monitoring of asset conditions and reliability to support planning (e.g., identifying patterns, trends and anomalies in asset performance for insurance or predicting vegetation growth).

Software/UI platform starts with relatively inexpensive web-based mapping platforms that may in some instances use cloud computing and real-time sensing, while the most sophisticated solutions use advanced functionality GIS software with specialized use case analysis tools and may leverage ML-enabled applications.

Flying high: Geospatial growth drivers

Several tailwinds are fueling the growing adoption of geospatial solutions, particularly as businesses grapple with the explosion of data and the value of alternative data classes (e.g., geospatial data analysis) that can improve decision-making. Regulatory requirements related to safety, environment and infrastructure development are pushing organizations to adopt these solutions in order to monitor and ensure compliance, identify risks and streamline reporting. As governments invest in large-scale infrastructure projects (e.g., through the Bipartisan Infrastructure Law), the demand for detailed geospatial data that can assist in project planning, design and build is set to rise further.

The evolving impact of climate change on extreme weather events is also spurring use cases for geospatial solutions that can enable risk assessments, real-time monitoring and improved disaster response. Further, advancements in technology, including drones, satellites and real-time data analytics, are continuing to improve decision-making processes in industries such as agriculture, defense and intelligence, heightening the value proposition of geospatial solutions.

Regulatory demands and liability avoidance — Increasing regulation may require private and public entities to leverage geospatial solutions in order to ensure regulatory compliance in cases such as:

- Mandatory inspections of utility lines to comply with safety regulations
- Management/inspection of vegetation surrounding a proposed/existing site to comply with environmental regulations
- Detailed mapping for emergency services to comply with response time regulations
- Deployment of geospatial solutions to prevent problems from occurring, even when regulation does not demand it

Infrastructure development — The increasing need for geospatial data to assist in project planning, design, build and monitoring is spurred on by the following factors:

- The Inflation Reduction Act and Bipartisan Infrastructure Law — Congress has allocated billions of dollars for major future infrastructure projects that may lead to increased demand for geospatial solutions.
- Growing demand for energy-intensive products and services such as electric vehicles and data centers may result in significant grid modernization and expansion, which will require extensive use of geospatial data.

Climate change — The increasing severity of natural disasters (e.g., wildfires, hurricanes, floods) may lead to increased planning and monitoring requirements that leverage geospatial data, such as:

- Mapping and monitoring of vegetation near power lines to prevent wildfires
- Risk assessment of coastal infrastructure to prepare for tropical storms and hurricanes
- Risk assessment of low-lying infrastructure to prepare for flash flooding

Advanced analytics/real-time location data — Technological advancements in imaging/sensing provide more precise and actionable data, which boosts demand for precise real-time data across industries, leading to an increased need for geospatial solutions in cases such as:

- AI and ML enhancing the analysis of geospatial data by automating tasks such as data classification, pattern recognition and predictive modeling
- Drones and helicopters providing real-time streaming of survey and field data to infrastructure construction teams
- Real-time assessment of forest growth, including the types of vegetation, for wildlife management and forestry industry teams using aerial and satellite geospatial solutions
- Tracking of agricultural growth for farmers using geospatial data gathered by drones to better optimize management

Investment activity

The geospatial solutions market is experiencing robust growth, making it an attractive investment area for companies seeking to expand in the sector and for investors. Investments can expand existing geospatial offerings and integrate in-house geospatial capabilities for players who frequently rely on them.

The geospatial industry has experienced significant M&A activity over the past six years, particularly within the U.S. and Canada (since 2018, the market has had approximately 16 transactions per quarter), but they can also be organic investments and partnerships. Key investment rationales include the following:

- **Deepening/expanding capabilities:** Acquisitions support a geospatial firm's ability to grow and develop greater capabilities within specific services and sections of the value chain in order to better address the diverse set of customer needs. For instance, firms may acquire additional head count or technologies to strengthen existing capabilities. NV5 acquired GEO1 in 2022, which allowed NV5 to expand its low-medium altitude analytics capabilities and grow its utilities end-market footprint by gaining access to GEO1's customer base. NV5 also acquired myBIMteam and GIS in 2024, further expanding NV5's utilities customer base and obtaining around $14 million in additional utilities asset and vegetation management contracts.

- **Geographic expansion:** Investment may be driven from the need for firms to expand their geographic footprint. **SAM** acquired PrecisionPoint Inc. (PPI), a 3D laser scanning to BIM firm that assists architectural, engineering and construction professionals in accelerating data collection and documentation processing. The acquisition further establishes SAM's presence in the Midwest and expands its ability to offer BIM services to inform predictive analyses on facilities and infrastructure. **Trimble** acquired MidStates VRS LLC in 2020, which enabled it to expand its virtual reference stations coverage to more than 1 million square miles in North America, supporting its geographic expansion strategy. Additionally, the acquisition also expanded the range of services offered to its clients.

- **Horizontal/cross-end-market investment:** Players in similar parts of the value chain (e.g., data acquisition, software) can benefit from cost savings resulting from streamlined processes and efficiencies, as well as access to additional markets; for example, ESG's acquisition of Whitestar in 2024. ESG is a global leader in energy software-as-a-service (SaaS) solutions and acquired Whitestar to gain access to geospatial solutions targeted at energy customers. This allowed ESG to enhance its SaaS offerings and provide detailed geospatial data to its existing customers as well as tap into new markets from Whitestar's portfolio, such as forestry, mining and utilities.

- **Technology investment:** Rapidly advancing technologies, including drones, small satellites (SmallSats) and LiDAR, present significant growth potential due to their enhanced capabilities and market reach. Acquisitions of new technologies can be a straightforward way to expand capabilities, become more competitive and access new markets without requiring major changes to a company's existing business structure.

  - **Drone** technology advancements have revolutionized data collection, offering superior image resolution and sophisticated sensing capabilities with enhanced flexibility and portability. As battery and automation technology continues to rapidly evolve, drones can offer larger and more frequent surveys. This could be especially helpful for end markets that benefit from real-time data, such as agricultural customers that are monitoring crops or utility customers concerned with power line management.

- **Satellites**, much like drones, provide a value-add opportunity for geospatial data acquisition. SmallSats have the potential to transform real-time satellite imaging capabilities. Their compact size enables more cost-effective and frequent launches, creating unprecedented opportunities in geospatial data acquisition. By deploying large networks of these miniature satellites, continuous streams of real-time imagery and data could be collected.

- **LiDAR** improvements in portability, resolution and size could offer additional deployment options, including ground-based, airborne (via drones or helicopters) and space-based (satellite) platforms, providing highly precise height and location data.

Cross-value-chain investments: Investment opportunities and M&A may be driven by the desire to build capabilities across the value chain, although ownership of each value chain step is not essential. Given the need for vertical-specific expertise and technology, vendors often partner and subcontract with each other to access other parts of the value chain. Partnering dynamics are such that it is not essential to own assets within the value chain, and a range of partnering solutions are possible:

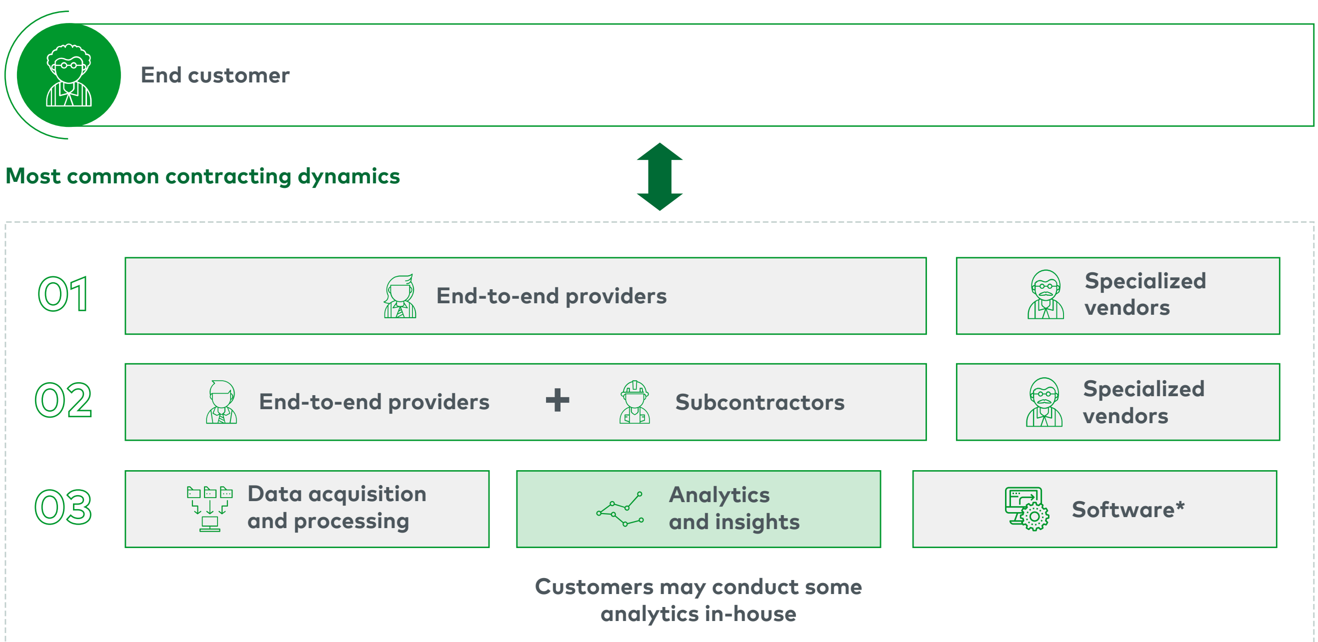
- **End-to-end providers plus specialized vendors** — Customers often contract with end-to-end providers to address broad geospatial solution needs. While contracting with one primary end-to-end vendor, customers may also adopt/partner with additional specialized solution vendors for deeper vertical expertise, more advanced technology or additional data acquisition methods. For instance, utilities customers addressing asset management adopt end-to-end solutions with less subcontractor involvement, given that these projects require less monitoring and sophistication than vegetation management.

- **End-to-end providers plus subcontracting** — Customers' primary end-to-end solutions vendors may subcontract or partner with smaller, more specialized vendors to provide a more comprehensive geospatial solution. For example, utilities companies addressing vegetation management typically adopt comprehensive vendors with subcontractor involvement, given the technological sophistication and additional resources required to accurately evaluate encroachment risk. Customers may also adopt specialized vendors to augment capabilities where primes and subcontractors may be lacking.

- **Separate adoption of acquisition, analytics and software** — Customers may acquire data from a third-party data acquisition vendor and conduct analytics partially in-house and partially outsourced to a third-party vendor when advanced technical support is required. Customers may also white label software provided by third-party software/UI vendors. For instance, some forestry sector owners may conduct some basic analysis in-house and adopt specialized point solution vendors.

At the same time, geospatial players can increase their capabilities through partnership (see Figure 5). For instance, EagleView and CAPE Analytics announced a 2024 partnership that draws on their respective capabilities.[1] CAPE Analytics integrates multiple data sources and applies analytics to deliver property insights at a large scale, complementing EagleView's deep library of property images.

Figure 5
Geospatial partnering dynamics



*While some customers build geospatial software in-house, they often white label their software with geospatial-specific software providers (e.g., Esri)
Source: L.E.K. research and analysis

While there are multiple partnership avenues and contracting methods, there is a case for ownership and M&A across the value chain. Ownership provides a higher degree of control over the quality of data and insights, expands the suite of solutions available to customers, improves the value proposition of an offering, and enables cross-selling opportunities. Customers indicate that they would like a provider that helps coordinate services across the value chain, and M&A investments have emerged to address that need.

For instance, in 2024, SAM purchased Theorem Geo, which brings front-end data viewer capabilities and the ability to ingest and combine structured and unstructured data from multiple sources and users. This is part of SAM's Managed Geospatial Services that provide consulting support and an integrated set of solutions across geomatics, aerial mapping, engineering inspection, utility engineering, GIS and BIM so that utility and other customers can benefit from a more integrated, data-driven and analytical approach to geospatial data rather than a project-based approach.

Combining end-market and geospatial capabilities — There are some synergies in combining geospatial services with other capabilities within a specific end market. For instance, a non-geospatial services provider to the utilities industry can cross-sell geospatial services alongside other utility services. Bringing together geospatial and other end-market services can potentially create new services and sources of value. There are also potential operational synergies (e.g., by combining oil and gas non-geo and geo services or vegetation management and geo services). For instance, Osmose Utilities Services, a provider of critical inspection and asset management services for energy, acquired Effigis Geo-Solutions, a satellite imagery and analytics firm.

Conclusion

As geospatial technology rapidly evolves and demand for precise data intensifies, the insights derived from geospatial solutions will become increasingly crucial for decision-making processes across both the private and public sectors.

Due to strong market growth potential, investors and companies should consider the benefits of consolidation and integration of geospatial solutions. This includes the potential to deepen capabilities in focused spaces, diversify end markets, provide a fully integrated stack of geospatial services, take full advantage of the latest technologies and integrate geospatial services into other services.

For more information, please **contact us**.

Endnote

[1]PRnewswire.com, "CAPE Analytics and EagleView Announce Long-Term Imagery Collaboration Expanding Coverage, Recency, and History Across CAPE Property Intelligence Products." www.prnewswire.com/news-releases/cape-analytics-and-eagleview-announce-long-term-imagery-collaboration-expanding-coverage-recency-and-history-across-cape-property-intelligence-products-302198535.html

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GIS