1spatial
YOUR WORLD SMARTER

The comprehensive guide to

Spatial Data Management

Know how to make your data smarter

Smarter data for a smarter world

The geospatial analytics market is presently experiencing considerable and steady growth; in fact, the market is expected to grow in value to USD 96.3 billion by 2025.

Demand for geospatial data, and for the systems to manage and maintain such data, continues to grow.

Today, geospatial data is everywhere - from utility smart meters to insurance company in-vehicle trackers. Even in supposedly traditional organisations like city councils, every department relies on location data: traffic flows, public facilities, the location of field staff and of client-citizens. Data centres are stuffed with disparate sets of spatial data.

With increased volume, and increased complexity, comes opportunity.

Combining data from multiple sources multiplies the insight available: preventative maintenance can be planned more effectively; customer service can become more usefully targeted and emergency services can be more accurately deployed.

However, an abundance of different and disparate data sets, nestled in siloes across the organisation presents challenges too.

The data was collected over different periods, at different frequencies, to different levels of accuracy and for different purposes. It is stored in different formats and at different levels of quality and completeness. Integrating that data to support a valid, single point decision is hard.

Managing and maintaining it for regular interrogation is even harder. The potential time and cost can appear unmanageable.

Many experienced integrators of complex geospatial data – like Ordnance Survey Great Britain, Northumbrian Water Group, the US Federal Highways Administration, Northern Gas Networks Ltd and the UK Ministry of Defence – adopt processes and tools that automate data validation and integration to reduce the cost and time involved in keeping their data fit for purpose.

This guide explores the rise of geospatial data and how an automated, rules-based approach to data management is making organisations' data smarter.

Smarter data means smarter decisions, and smarter decisions mean a smarter world.

Beyond maps

Geospatial data has always meant more than maps. Its real value lies in the combination of location with other data types to enable new insights.

You know something, John Snow

A well-known, early example of this is Dr John Snow's map of cholera outbreaks in 1854 London. On a street map, Snow marked the location and number of deaths from cholera during September 1854. The map also identified the location of water pumps (the only source of drinking water for residents).

At the time, the prevailing theory was that cholera was transmitted by "bad air", but observing his map, Snow realised almost all cases occurred in the vicinity of the Broad Street water pump. Disabling the pump was credited with ending the epidemic.[1]

It is this same approach, supercharged by the volume and velocity of big data, that is driving strategic advantage for today's organisations.

For example, utility firms can combine customer location with data on property tenancy and ownership to plan the effective roll-out of smart meters. Using known information on the nature and condition of assets (for example, a 100-year old, vitrified clay water pipe with a 300mm diameter) with geospatial data can help utility firms analyse and understand their entire network, inferring from known information what should fill the gaps in their knowledge.

Combining customer location with the location of network assets will enable forward-looking companies like the UK's United Utilities (UU) to anticipate the impact of problems or planned maintenance and advise their customers in advance. As UU's John Daniels says,

"We want to stop using our customers as sensors."

Figure 1 Dr John Snow's map of cholera deaths in London, 1854

"No longer is [geospatial] information just a back-drop map, it is actually a fundamental part of our users' business solutions."

- Colin Bray, Chief Executive, Ordnance Survey Ireland

In the retail sector, firms can combine proximity data from smartphones with the location of their stores to send location and time specific offers to passing (or even in-store) customers. Knowing where your customer is helps you personalise the shopping experience, as clothing retailer Burton found. Tailoring its website to a visitor's local weather brought a 12% uplift in sales conversion.[2]

Increasingly, as Telefónica's Daniel Rosen observed,

"Where you go is who you are."[3]

A spatial dimension brings actionable insights, like the famous 'No Left Turns' policy of logistics firm UPS. Eliminating left turns (in the US, which require trucks to sit idling while waiting for a gap in oncoming traffic) helped UPS save three million gallons of fuel (and 31,000 tons of CO2 emissions) in a single year.[4]

The opportunity

Overall, as noted by McKinsey and Gartner, the economic benefits are enormous. A separate, highly regarded analysis estimated that "geo services" saved 1.1 billion hours of travel time and 3.5 billion litres of gasoline each year. The report calculated that improvements to agriculture yielded global savings of $8-$22 billion and the globally added value from geo services was $100 billion per year.[5]

The value of geospatial data itself is also being more widely recognised. Ordnance Survey GB's authoritative reference dataset is independently valued at £100 billion.[6]

As businesses appreciate the strategic value of geospatial data, its importance rises through the organisation. In today's leading organisations, geospatial data is a boardroom priority.

Journey to the centre of decision-making

How do organisations put geospatial data at the heart of smarter decision-making?

Data sources

For many, it begins with the realisation that a wealth of geospatial data already exists untapped within the organisation. Often, the data is locked in departmental siloes. Sometimes it is locked in the heads of experienced employees.

In fact, society has gathered vast quantities of geospatial data over the years, spending large sums of money to derive the information it needs for critical decisions. Too often, this data collection was done in isolation with the result that the data sits in disparate and decaying siloes, inconsistent with other data-sets, often duplicated but of uncertain quality. When a new decision comes along, the organisation can't find or can't access the data it collected before. Even when organisations understand what they have, they can find that the data is stored in different, proprietary formats. Sometimes, they may not even own, or have the right to use the data they hold.

Decision making becomes slow and error-prone.

Understanding data's provenance is important in understanding its usefulness and credibility: data collected for a national survey may not be sufficiently accurate at a street level. What is adequate for a postal or courier service may be completely inadequate for cadastral purposes of registering a land sale.

As some organisations have found, publicly available and commonly used data may not really be fit for the purposes to which it is put. Understanding data provenance gives insight into the actual quality of the data.

Data quality

Assessing, understanding, maintaining and improving the quality of geospatial data is vital to its effective use in decision-making. Not only can poor quality data result in wasted effort (and even destroy otherwise sound initiatives), it is also essential for safety reasons. As organisations integrate, and then share, information from transport systems, power networks and emergency services, accuracy and reliability become of paramount importance. Just a few metres' error on a road layout can send vital emergency services many miles and precious minutes in the wrong direction. Misrepresenting the position of an electricity line can endanger the lives of workers and lead to power outages across a city.

Data sharing

To avoid perpetuating the complexities of managing data from different sources, organisations should consider how their cleansed (and now authoritative) data will be used by others.

Regardless of its quality, data will be of limited use if it cannot be shared by other systems, not just those of the project sponsors, but other departments and partner organisations.

Holding data in a standard format, ideally to internationally recognised standards is a valuable investment in the future. Over time, hardware and software will change, but data persists. Data is the basis for continuity.

Maintaining data interoperability requires a seamless interface between the tools used to manage data and the systems that make use of the data. Software tools that support openness through their ability to manage different data formats and interoperate seamlessly with other systems are particularly valuable.

Any providers of tools or consulting used on the core geospatial dataset need to be very familiar with the requirements of all interfacing systems.

Spatial data: an added dimension of complexity

The potential complexity of mismatched data is compounded for spatial data.

In non-spatial scenarios, a single “piece” of information is quite small (the few words of a Google search term, the digits of a date of birth). With spatial data, however, a single piece of information is much larger: every feature interacts with its neighbours; every building has location, footprint, form and function.

Not only that, but whereas non-spatial data is typically a full record of a particular piece of information (for example, a date of birth), spatial data is more usually a simplified representation of a real-world feature.

The extent of that simplification will affect the usefulness of the data for other purposes. For example, a low-resolution aerial photograph may be adequate for a land-use survey, but inadequate for use in a land transfer record.

In addition, spatial data is not transient; a building has history, as does a shoreline. A feature’s function or form today is not what it was five, ten or a hundred years ago. Seeing change over time can provide valuable insight: historic flood patterns or coastal erosion perhaps, or the London Docklands’ evolution from port, through dereliction, to rebirth as an area of upmarket offices and apartments.

Geospatial data is more complex than many data types. It becomes “big” faster than other data; and users encounter size-related problems much sooner. Consequently, the management of spatial data presents greater challenges.

Example: United Utilities unites its data

United Utilities plc (UU), the UK's largest, publicly listed water company has an estate of 8 million waste water and 12 million clean water assets to track and maintain.

The firm inherited responsibility for these assets at different points in time and, consequently, its historic records were often incomplete and inaccurate. Different parts of the business had developed their own estimates of where different assets lay and what condition they were in. To complicate things further, UU was running several different GIS systems, each in some way incomplete. In the field, it had over 400 individuals each working with his or her own version of the network.

Aware of the operational problems this fragmented approach caused, UU worked with 1Spatial to move to a single, authoritative view of its assets. This could then be used to drive better customer service, reduce operational costs and more easily meet the requirements of the industry regulator, OFWAT. As well as consolidating asset records into a single database, UU wanted a more complete record of these assets' various attributes such as age, diameter and material of particular pipes.

UU and 1Spatial used a series of stakeholder workshops to discover all the sources of existing data. Using 1Spatial's Data Improvement Process, the workshops also developed a set of rules to define the required level of data quality to meet UU's needs. An automated, rules-based approach was then used to resolve any data conflicts.

With an established base of good data, UU was then able to extend its records using an inferential approach to filling data gaps.

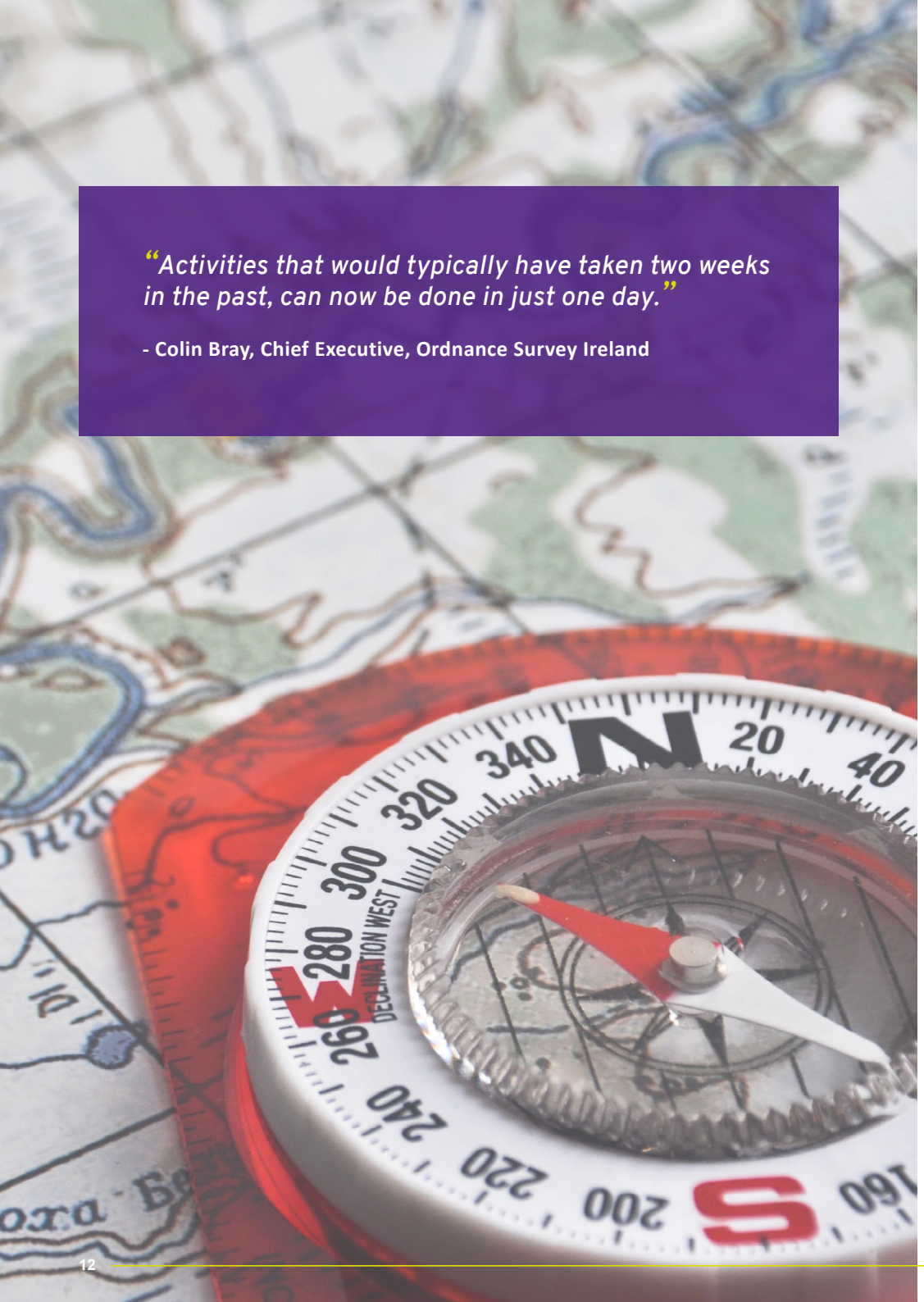
As a result, UU discovered an additional 6,000 km of private sewer stock recently transferred to water companies' responsibility by government (making their new responsibility 24% larger than initially estimated).

With more complete, more accurate geospatial data, UU can now run more accurate deterioration models and build better predictive maintenance plans. In turn, this enables the company to reduce cost and replace more assets at the optimal point, before they fail.[7]

View the United Utilities case study

"People are now seeing the benefit of visualising everything from a single version of the truth."

- John Daniels, Data Delivery Lead, United Utilities plc



"Activities that would typically have taken two weeks in the past, can now be done in just one day."

- Colin Bray, Chief Executive, Ordnance Survey Ireland

Example: Ordnance Survey Ireland

Ordnance Survey Ireland (OSi), Ireland's National Mapping Agency, had seen a steady increase in demand for reliable, spatial data.

"With the everyday use of information on our smartphones or tablets, there is a greater understanding of the value and use of spatial information."

Explains Chief Executive Colin Bray. "With spatial information, we link all those data-sets whose only common point is location. This has been recognised by all government bodies and there is demand to use spatial data for more effective decision-making."

OSi realised that the usual expensive and time-consuming method of managing map data was no longer adequate for their needs. The agency worked with 1Spatial to develop PRIME2, a real-world, object-oriented database made up of over 50 million individual objects, each with its own GUID (Globally Unique Identifier).

PRIME2 uses rules-based automation to ensure that its data is safe, accurate and always in a validated, publishable state.

Surveyors now receive their projects, along with all required data and imagery, direct to their tablet or laptop. As the survey work progresses, the system runs over 200 rules on the surveyor's device to ensure his or her data complies with data model requirements. Once the updated information is transmitted back to OSi's offices, a further 400 automatic rules are run before any new data is accepted into the core database. Expert intervention is only required to resolve flagged exceptions in the data.

Because only the required data is extracted for any survey, several projects can run concurrently. The system automatically resolves any conflicts and, as Colin notes, "Activities that would typically have taken two weeks in the past, can now be done in just one day."

With PRIME2, OSi can now provide its customers with richer, more current information in a standards-compliant format. For example, a utility company planning a new underground cable can gain a much better understanding of the target environment: which surfaces are hard or soft, the form and function of nearby buildings, etc. Richer information enables more accurate costing and more effective planning.

For government departments, PRIME2 provides a standardised and authoritative way for referencing all information that has
a location. In turn, this supports more effective decision-making for government. As Colin observes,

"No longer is OSi information just a back-drop map, it is actually a fundamental part of our users' business solutions."[8]

View the Ordnance Survey Ireland case study

Example: US Census Bureau

Carried out every ten years, the US Census is the largest civilian activity in America. It counts and profiles a population of over 318 million and involves checking 135 million addresses. The result is used to correctly apportion political representation within the House of Representatives and to allocate federal funds worth $400 billion each year.

Geospatial data underpins everything that the census bureau does and it aggregates data from 3,200 counties and other organisations. Effective data management is critical, but the process consumed a huge amount of resource and time. Tim Trainor, the Bureau's Geography Division Chief explains,

"Integrating the data was a very manual process. It took a very long time to deal with that level of data."

For the 2010 census, the bureau had hired 140,000 individuals to walk or drive every street in the country and validate the bureau's address records. After the census, the bureau also required over 600,000 people to trace non-respondents, ensuring individual participation as required by law or identifying addresses as vacant. The bureau has only a short time in which to collate and present the results of the census, so this follow-up work had to be completed quickly.

The total cost of manual work for data integration, validation and post-census follow-up was $12 billion. On a similar basis, the forecast for 2020 was $17 billion.

The bureau needed a more efficient way to manage the process and it worked with 1Spatial to automate much of the validation and integration. As a result, the bureau can now process more partner files, more quickly making its central database more accurate and up-to-date.

"One of the things we've seen from our engagement with 1Spatial is that our approach to data management is different," explains Tim. "We're seeing some real improvements in streamlining and automating our processes and we're managing our data in a more efficient and effective way."

For the approaching 2020 census, Tim now estimates that only 25% of 2010's 140,000 field canvassers will be required. The rest of the validation will be done by desk-based operators comparing the bureau's MAF/TIGER data set to aerial photography – a much more efficient solution.

Automating the process also enables the bureau to easily augment its data with additional data sets, such as "Gone Away" records from the US Postal Service or road network data from commercial providers. Adding this additional information further reduces the need for field canvassing in advance of the census and for post-census follow-up.

"We estimate that the cost avoidance will be a little over $5 billion," says Tim. "That's close to the cost of the 2010 census, and quite an achievement."[9]

Managing cost-benefit

The value of geospatial data as a corporate asset is clear.

Even if the value is unquestionable, the cost sometimes seems unaffordable. Managing data from multiple, disparate sources is complex and sounds both time-consuming and expensive.

Cleansing data for a single, point decision is a major project. Maintaining it for ongoing interrogation can sound impossible.

For geospatial data to deliver on its promise, it must be made cost-effectively reliable.

View the US Census Bureau case study

Cost-effective data management

Data management, or stewardship, is the process of ensuring that an organisation's data meets its requirements for accuracy, currency and compliance with standards.

Effective management covers the entire data lifecycle from inception to obsolescence and generally follows the three C's of data management: Control, Consistency and Compliance.

Why is effective data management difficult to achieve?

Data management must be a continual process to be effective. Data is constantly changing (through data edits or bulk import of new data), as is the world it represents. Tasks like data cleansing cannot be effective as a one-off project.

Business requirements change, too. Data standards evolve, as does business strategy. Organisations upgrade their systems and enter new data-sharing partnerships.

Data is often held in silos. Even within a single organisation, different departments often use different tools and adhere to different data standards. Data is collected for different purposes, over a different time period and with differing levels of accuracy.

Manually managing data to maintain a consistent, always-ready, quality level is hard. It can be expensive and time consuming.

Where to start

The starting point for effective data management is to establish a good understanding of both the current state of data and what is required of the data. However, surprisingly few organisations have a good view of the current state of their geospatial data. When the OGC (Open Geospatial Consortium) conducted a survey some years ago, only 57.5% of respondents felt that their data was fit for purpose.[9]

In the same survey, 39.6% of responding organisations were not involved in any spatial data quality projects. Only 42.5% felt they had the means to quantitatively measure the quality of their spatial data.

Validate, Cleanse, Enrich

1Spatial works with the keepers of the largest geospatial databases on earth. Its products and services guide customers on their journey to data excellence.

Many companies find that the following approach works well:

Validate - This is the discovery stage, when all of the possible sources of data are identified, data quality goals are determined, and the data is audited to understand the degree to which it meets the agreed quality goals. At this stage, customers are encouraged to focus on what they know and not to worry about what they don't know. The following stages, supported by a robust process and proven tools, will discover any gaps in knowledge.

Cleanse - Issues discovered at the Validate stage are resolved. Where possible, rules are determined to enable issues to be identified automatically, and then resolved automatically in accordance with 1Spatial's Data Excellence Principles (see page 18).

Enrich - Once known issues are resolved, the rules-based approach can be used to extend and enhance the database using advanced algorithms and predictive techniques. For example, United Utilities knowledge of historic sewer layouts enabled them to find an additional 6,000 km of private sewers.

Organisations with large geospatial databases deploy a variety of tools that use rules-based automation to maintain data quality to required standards in a cost-effective and time-efficient way.

These rules-based tools allow for sub-sets of geospatial data to be extracted, updated, validated and then returned to the database without affecting the usability of the core data. Such systems ensure that data maintenance can be carried out in a timely and cost-effective manner so that the master dataset is always as accurate and reliable as possible for all users. To be most effective, it is important that such tools interoperate seamlessly with other GIS and geospatial systems that the organisation may use, such as Esri's ArcGIS.

"The cost difference is quite significant. Our original plan was to physically map just one third of the transferred network within our current, five-year asset-management period. That would have cost £10 million. Working with 1Spatial, we're able to deliver a map of the whole transferred network in just two years, for £1.25 million."

- Mike Madine, Head of Wastewater Networks and Developer Services, Northumbrian Water

Data Excellence Principles

Too many data management initiatives are planned and run as one-off exercises. Too many run aground by targeting the most difficult problems, rather than considering where the return will be largest.

Successful projects are run in accordance with six data excellence principles:

1. Embrace automation
2. Ensure repeatability and traceability
3. Design simple solutions to difficult scenarios and avoid unnecessary technical complexity
4. Target the typical, not the exceptional, in order to maximise value
5. Adopt an evidence-based decision-making process to create business confidence in the outcome
6. Collaborate to identify issues and work towards a solution.

Ongoing excellence

Data management cannot be a one-off exercise. In fact, data becomes more valuable, and the return on investment higher, when a data set is maintained for ongoing interrogation.

The companies that are most successful in leveraging their geospatial data has a clearly articulated data strategy and recognise the importance of data stewardship; the management and maintenance of defined datasets to an agreed level of quality for a recognised purpose.

Data stewardship defines required levels of quality and then uses robust processes to ensure that any issues are resolved at source so that errors do not simply re-occur at the next data refresh.

Data stewardship addresses issues of data ownership and defining standards. The data steward also selects tools that interoperate seamlessly, reducing any scope for manual error or extra work in moving from system to system.

At 1Spatial, we see organisations planning their data management around four common issues:

- Data maintenance
- Data migration and transformation
- Data enhancement
- Data integration.

Data maintenance

Data that is always good to go

Keeping spatial data up to date and accurate on a day-to-day basis, right across its lifecycle, requires an ongoing process. Too often, organisations treat data management as a one-off, maybe annual, project. The latter approach means that some parts of their data will be inaccurate for most of the time.

Successful organisations automate data maintenance as an ongoing process. This ensures their data is always in a known state and ready to use. It simplifies stewardship and builds organisational trust in the data.

Maintaining quality through automation

Organisations increasingly rely on spatial data, using it in real-time to inform critical decisions. Consequently, data must always be available, up to date and accurate.

An automated approach, with user-defined and user-managed rules can run in the background right across the enterprise and all its data, from inception to obsolescence.

Rules can run on data at the point of collection, before acceptance into the core data set and regularly to prevent or fix accidental corruption by users.

Data quality is enforced along the way, not treated as an after-thought.

At 1Spatial, our data maintenance solutions can report as regularly as required so that organisations always know the state of their data. Any errors that can't be fixed automatically are flagged for immediate attention, improving overall stewardship and ensuring data is fit for purpose.

Automated, rules-based data maintenance simply makes your data smarter.

"I can offer things I couldn't do before. Things that might have taken a day before, can now be done in half an hour."

- Riley Marsden, IT Systems Manager, Barnsley Metropolitan Borough Council[11]

Data migration and transformation

Moving data and meeting standards

Migrating mission-critical data to a new system needn't be a nightmare. Transforming data assets to comply with new standards like INSPIRE doesn't have to be an expensive, time-consuming project.

When organisations take an automated approach to data management, migration becomes a controlled, repeatable and traceable process.

Transforming data with confidence

New software systems or new industry standards can require significant changes to spatial data, but an automated, rules-based approach dramatically reduces the time and cost of data migration or transformation.

"Everything happens somewhere. We want to bring data sets together and show different departments the value of spatial information. It will work in different ways for different departments. Each will have its own geospatial view of the world, viewing the data sets that matter to them."

- Andrew Hopkins, GIS and Positioning Technical Consultant, Northumbrian Water[13]

It also provides an audit trail so that you always know what happened when. You can also repeat exactly the same process on different data-sets.

1Spatial's technology also performs the intelligent manipulation required, for example, to break single linear assets like roads or pipelines into separate records at every junction or join.

We help customers translate data to meet standards such as the European Community INSPIRE specification. We help them transform their data from one structure to another.

Data quality can be monitored and even actively improved as part of the same process, making your data smarter and fit for purpose.

Data enhancement

Add value to your data by adding the data you value

Incomplete data seriously hampers an organisation, yet it's surprisingly common. Business needs change, regulatory requirements evolve. Sometimes, like United Utilities you simply inherit partial and fragmented data.

Organisations with large amounts of legacy data, such as water companies and transportation agencies, are especially prone to this challenge.

Re-surveying can appear to be the only answer; revisiting your entire geography to re-evaluate the assets in question. It's an expensive and time-consuming project, but how else can you fill those blank data-fields?

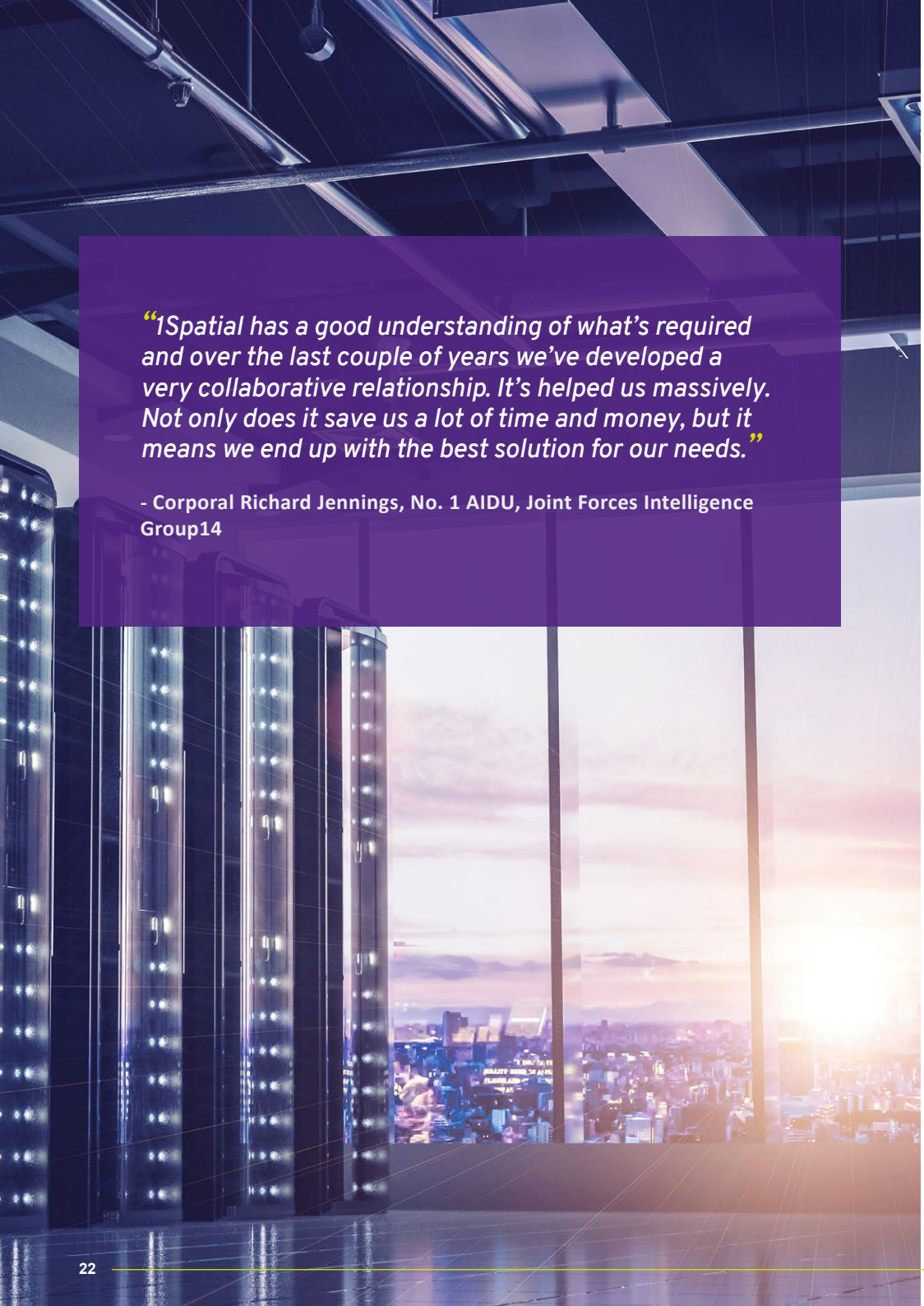
At 1Spatial, we leverage the data you do have, along with the knowledge of your experts, to determine – or infer – what's missing. This saves you the time and cost of surveying your entire estate.

We work with your experts – the creators and users of the data – to distil the experience, knowledge and expertise in their heads into consistent, objective and repeatable rules. For example, "a house of this age, size and location will have a sewer pipe of this size and construction located to the rear of the property."

Our knowledge management approach of encoding expertise enables clients to infer what their missing data should be with a high degree of certainty. Results can then be confirmed, as required, by surveying a small sample rather than the entire estate.

The savings can be substantial, as Northumbrian Water Group found. The company's Head of Wastewater Networks and Developer Services Mike Madine said: "The cost difference is quite significant. Our original plan was to physically map just one third of the transferred network within our current, five-year asset-management period. That would have cost £10 million. Working with 1Spatial, we're able to deliver a map of the whole transferred network in just two years, for £1.25 million."[12]

We cost-effectively improve the value of your data; making your data smarter and improving the confidence users have in it.



"1Spatial has a good understanding of what's required and over the last couple of years we've developed a very collaborative relationship. It's helped us massively. Not only does it save us a lot of time and money, but it means we end up with the best solution for our needs."

- Corporal Richard Jennings, No. 1 AIDU, Joint Forces Intelligence Group14

Data integration and conflation

Moving to a single source of spatial truth

Spatial data is increasingly important for competitive advantage. However, that data is frequently held in different places, in different formats and with different degrees of accuracy.

Organisations need a single source of spatial truth, a central data set they can trust.

Data integration, or conflation, takes the best of every data set and combines it into a consistent and reliable whole data set. It lets you re-use existing data investments by matching disparate data sets and taking the best of each.

Even when your data is from different sources, in different formats, at different accuracy levels and collected over different periods of time, our powerful matching technology can help you create a single, central and authoritative database.

Data from departmental silos, from large groups of partner organisations or from third parties can be extracted and combined by automatically applying user-defined and user-managed rules.

Rules-based automation dramatically reduces the time and cost of integration.
It turns data integration from a major, annual project into an easy, ongoing process ensuring your data is always as current as possible. These rules can also calculate a per-feature confidence score to allow users to review the results.

Our automation can also validate the data or fix common errors during integration, speeding up the time it takes to trust your data and build organisational confidence.

The 1Spatial Approach

1Spatial is a software solutions provider and global leader in managing geospatial data.

We work with our clients to deliver real value by making data current, complete and consistent through the use of automated processes - ensuring that decisions are always based on the highest quality information available.

Our unique, rules-based approach delivers enterprise-scale, cross-platform, automation to all stages of the data lifecycle. It builds confidence in the data while reducing the time and cost of data management.

We build long term partnerships with our clients and deliver real value to them through solutions that are grounded in a deep understanding of their needs and challenges.

Our global clients include utility and telecommunications businesses, national mapping and land management agencies, government departments, emergency services, defence, census bureaus and transportation organisations.

A leader in our field, we have a wealth of experience and a record of continual innovation and development.

We partner with some of the leading technology vendors including, Esri, Oracle, SAP, Safe Software and Latitude Geographics.

Today, with an ever-increasing reliance on geospatial and location-critical data, demand for our expertise has never been greater.

Our goal is simply to make your data smarter.

To learn more about how 1Spatial can help make your data smarter, visit:

www.1spatial.com/about-us

Key Industry Sectors

- Engineering
- Utilities
- National Mapping Agencies
- Transportation & Infrastructure
- Land Management
- Government

Conclusion

Smarter data for smarter decisions in a smarter world.

These are exciting times for spatial data specialists. There are more devices producing more data more cheaply than ever before and that data is being put to more useful purposes as the value of geospatial data in underpinning effective decision-making is recognised.

There are challenges too, of course. Geospatial data proliferates in a variety of formats, held in different places and of different – too often, unknown – levels of quality.

Geospatial data is increasingly recognised as a valuable corporate asset and organisations are taking a more structured approach to stewardship. Data management is being treated as an ongoing process rather than a one-off exercise so that valuable data is available for continued interrogation.

1Spatial solutions automate even the most complex processes for the management, integration and manipulation of spatial data. Our enterprise-wide, rules-based approach puts ownership and control firmly in your hands. The experience and knowledge of your experts is encapsulated in a central set of user-managed rules that are repeatable, objective and consistently applied.

As a result, your experts are freed up to focus on driving innovation while the time and expense of effective data stewardship is dramatically reduced.

1Spatial has a wealth of experience working with the largest geospatial databases on earth. We help national mapping agencies, utility companies, defence departments and the governments of countries, regions and cities to collect, store, manage and interpret location-specific information. Our open approach to data excellence ensures that our tools, processes and the data we manage work seamlessly with other leading players in the geospatial sector.

Read more about us:

https://1spatial.com/about-us/

Speak to a data quality management expert

1Spatial has been at the forefront of data quality and governance for the past 30 years. We've helped more than 1,000 customers develop strong data foundations, unlocking the value of their data and enabling them to make critical decisions.

Contact us now

End notes

[1] For further information on Snow's work and other graphical representations, see Edward Tufte, The Visual Display of Quantitative Information (Graphics Press, 1983)

[2] Qubit (2016) Weather targeting and visitor history personalization. Available at: **http://www.qubit.com/case-study/burton**

[3] Daniel Rosen, Global Director of Advertising at Telefónica speaking at the Mobile World Congress in Barcelona, 2016, MWC 216: There's Value In Location Data, But It's Still A Bumpy Road (2016), **https://adexchanger.com/mobile/mwc-2016-theres-value-location-data-still-bumpy-road/**

[4] New York Times, Left-Hand-Turn Elimination, New York Times (2007), **http://www.nytimes.com/2007/12/09/magazine/09left-handturn.html?_r=1&**

[5] Oxera (for Google) (2013)

[6] Please see the OSGB case study at **https://1spatial.com/customers/ordnance-survey-great-britain-osgb/**

[7] Please see the United Utilities case study at **https://1spatial.com/customers/united-utilities/**

[8] Please see the Ordnance Survey Ireland case study at **http://1spatial.com/customer/ordnance-survey-ireland**

[9] Please see the US Census case study at **https://1spatial.com/client/u-s-census-bureau/**

[10] Open Geospatial Consortium Data Quality Working Group, Geospatial Data Quality Survey (2008). A survey of 750 responses from organisations of all sizes across 107 countries. Q14: Is the data in your organisation used by your end customers for its intended purpose?

[11] Please see the Barnsley MBC case study at **https://1spatial.com/customers/barnsley-metropolitan-borough-council/**

[12] Please see the NWL case study at **https://1spatial.com/customers/northumbrian-water/**

[13] Please see the NWL case study at **https://1spatial.com/customers/northumbrian-water/**

[14] Please see the No.1 AIDU case study at **https://1spatial.com/customers/no-1-aeronautical-information-documents-unit/**

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