DATA BY DESIGN

THE VALUE OF DOING THINGS DIFFERENTLY

Five ways data can help us protect people & places

Drones: The bigger picture

Three benefits of focusing on the IM in BIM

ATKINS

Member of the SNC-Lavalin Group

From the editor

The pace of change in the infrastructure sector is quickening. Developers, contractors and suppliers should be able to face the future with confidence, adapting to change and enhancing their reputation for delivering world-class infrastructure.

In this magazine, we've gathered together thoughts and opinions from our geospatial and data experts from across the UK. Whether it's collecting data in new ways, saving clients thousands of days of distribution, or using data to improve the safety and performance of our projects, we've touched on some of the topics shaping infrastructure today.

This is an exciting time in the evolution of infrastructure, and we hope we've captured what will be some of the industry 'game changers' in this magazine. These articles are intended to challenge and inspire – if you have any comments, please do get in touch.

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Geoff Waite
Associate Director

Geoff leads Atkins' award winning Geospatial and Asset Data Business. This team specialises in deploying innovative geospatial technology across the UK's largest infrastructure projects. He has over 19 years experience of leading geospatial teams and providing GI Solutions to clients ranging from major national organisations and local authorities to small private sector companies.

Louise Irvine
Senior GIS Consultant

Louise is a spatial solutions and asset information specialist, experienced in developing and implementing efficient and robust spatial solutions. She is involved in the development of BIM-compliant processes including the implementation of data standards, schema development and delivery.

Jenny Willbourn
GIS Consultant

Jenny's expertise centres on delivering high quality solutions and support for projects that have a requirement for spatial data interpretation, manipulation and analysis. Her skills include mobile data collection in remote locations, data management, spatial analysis, modelling and cartography.

Colin Henderson
Chief Software Engineer

Colin has over 18 years of experience in geospatial software engineering working in both private and public sectors. He is the lead architect delivering clients services and solutions with Open Source Software and Cloud-based technologies.

Jack Metcalfe
GIS Consultant

Jack is a core member of our Digital Incubator team who co-create innovations in the urban data sector. He is experienced in combining lean and agile methodologies with his technical background in geospatial science to drive user-centric design.

Charlton Bland
Digital Survey Lead

Charlton leads Atkins' Unmanned Aerial Vehicle (UAV) survey and mapping capability. He is a recognised industry expert in using UAVs for all types of topographical surveys and 3D geospatial data collection on critical national infrastructure projects from energy to water.

Harriet McQuade
Senior Geospatial Consultant

Harriet has over nine years experience working on large infrastructure projects, managing teams and BIM compliant data. She is currently working with HS2 on their information strategy for environmental and engineering works.

Information management

Helping you understand, manage and share corporate and project information

Geographic Information Systems

Linking your data to location so you can easily visualise and better understand your assets

Data analysis & modelling

Turning geospatial data into meaningful information to inform your decision-making

Web map services
GIS database design
BIM processes & management
Information strategy
Spatial Data Infrastructure design & implementation

Three benefits of focusing on the IM in BIM

I believe we've moved beyond the **B (Building)** in BIM and are now in the age of **Information Management (IM).** Founding BIM in the building world almost made us forget the big picture – our assets. It's distracted us from the fundamental of surviving this digital age: information management. It's good information management that will help us get the most from common data environments (CDEs) and 3D models.

Data can tell us a lot about our assets, but if we look beyond that to what's around them and their inter-relationships, we can learn so much more. This connected approach is an area of expertise that the geospatial industry has excelled in for many years. This is especially true on infrastructure projects.

Until now, BIM has focused on data management at a document or model level. What we need to recognise is that the data is as important as the model. In the long run, it might even be more important in realising the true value within full asset life data management.

Maps, or spatial data, come into play when we're looking at all of our assets rather than a single building or project section. You're used to using Google Maps to find information on restaurants – now imagine if that same technology could help you find information on any of your assets, anywhere in the world.

There's three big benefits of looking at data in this way.

1. We're not designing in isolation

When we think about things spatially, we're understanding the context for our designs by bringing in data from the outside world. We're moving from opening a CAD file, then a drainage file, then a signage file, to opening a single source of truth, an 'index' where information is all in one place.

2. We're saving time, now and in the long run

Too many people see these spatial common data environments (sCDEs) as an add on and an upfront cost. The truth is, people don't like spending money on data. But what they don't see are the huge efficiencies teams get every day from using these tools. A half hour each day for a project team of thousands of people adds up!

The biggest benefit though is when clients hand over to the contractor or maintainers (and vice versa). Too often there's a cost every time we change contractors because they don't trust the data. We spend too much time at the design and construction stage questioning and gathering data. In the long-term, it's about being able to operate and maintain our projects at asset, rather than building, level.

3. We're using experts to ensure we have the right data in the right place

There's an entire profession out there – Geospatial Specialists (using GIS) – who thrive on managing data, ensuring its integrity and making it easy to access. Geospatial experts can build automated processes that ensure data is checked, validated then shared. What you see at the end is a web map, a 'Google Map' for your project that you can use without any training. A simple front end with thousands of layers of quality data behind it, where the geometry and tabular or database information are bought together in one place

BIM has taken off in the building world – now let's help it take off in the asset world. Let's invest the time upfront in data, and its presentation, so that years from now we don't look back and wish we had.

This article first appeared in Infrastructure Intelligence.

Louise Irvine
Senior GIS Consultant

Five ways data can help us protect people and places

Everything happens somewhere. That seems like a simple enough concept. But when I speak to people about what I do (Geographic Information Systems) I'm often met with complete bafflement.

One of the best ways I can demonstrate the power of GIS, or the effective management of spatial data, is by putting it in the context of one of the most important things to all of us – our safety.

Below are five ways that GIS can help us protect people and places.

1. Planning site visits

On large sites it's essential we know where we're going and the safest way to get there. For the A9 in Scotland, we brought together a range of health and safety data into a map to help people visiting the site see the safest routes, points of entry and places to park.

2. Mapping hazards

Once we're on site, it's important we know where potential hazards are so we can avoid them. With GIS we can create report views that can be printed out for your site visit, or mobile views that you can access on the go. For East West Rail, one of the UK's largest transport projects, we did a hazard map that was colour coded by the number of hazards so that people could easily spot, and avoid, the danger areas on site. When it is not possible to avoid the danger areas, then GIS enables us to plan appropriate modes of working and to create safety plans.

3. Preventing crime

At a macro level, looking at our data spatially can help us identify hot spots, or areas of higher activity, which is particularly useful for things like crime prevention. If we can see where the majority of crimes are occurring, then we can prioritise our strategy by location. So, if we can see there's higher incidents of muggings we can add additional layers of information to help make sense of it. For example, we might look at the locations of ATMs and see a correlation between them and the cluster of muggings; we can use this information to target resources more effectively and increase public awareness efforts in those areas.

4. Monitoring buildings

Modern buildings are constantly collecting data – on temperature, lighting, usage and of course, security. If you put the data you already have on your building into a spatial format, you can visualise exactly what is happening in your building, and where. In a safety context, this is particularly useful for mapping out where your CCTV is, its range and potential dead spots. Using GIS, you can easily identify which areas your CCTVs are picking up, and which they're not. Analysing the patterns of security access might help you derive information about common routes through your building, which could be useful for creating more effective evacuation routes.

5. Planning flight routes

Another area where spatial data comes into play is in finding safe flight paths and optimal routes for aircraft. By bringing outside data in to our flight path planning, we can quickly determine whether aircraft will stay in a 'safe zone' during their journey.

The power of GIS is its ability to layer information and enable us to make sense of it in context. I truly believe that when we make spatial data available, great things can happen. Embedding this in our safety and security measures should be our first priority.

This article first appeared in the April/May 2019 issue of GeoConnexion.

Colin Henderson
Chief Software Engineer

How we collected data from over **10,000 homes** in rural Africa in just **9 weeks**

In 2016, the Kenyan Government undertook a nationwide renewable energy assessment. They knew they wouldn't be able to have informed policy without data. In just nine weeks, Atkins and Acuity completed over 10,000 door to door surveys to give them a picture of what renewable energy people have, use and want.

So how do you collect data from so many people in such a short time in such a remote part of the world?

You use technology

There are too many errors when you transfer data from paper-based surveys to electronic. We used an ESRI tool called Survey123 that allowed us to have the questions and submit the answers entirely on our phones. A big benefit of this tool is that it only shows relevant questions as you go through the survey – minimising the number of errors and reducing the time with each interviewee.

You use local people

Atkins and Acuity trained up 20 surveyors, all Kenyan engineering graduates. We developed a five-day training programme to help them understand not only the principles of engagement, but the importance of data and its quality and management. We also taught them how to find people – this seems strange, but in a country without settlement mapping, this isn't a simple task.

You geo-locate the data

When you don't know where people are, it's essential that you can tag the data back to a point on the map. With Survey123 each response is automatically tagged with where you collected it. This location data is aggregated so you protect anonymity.

You analyse your results in real time

The data our surveyors collected arrived to Atkins' Geographic Information Specialists (GIS) in the UK in minutes. It also saved us a significant amount of time compared to traditional paper-based survey methods, particularly in transferring data. We used a coding system on WhatsApp, so we could cross reference the data and ensure we didn't lose a single survey. Every day we were able to analyse and verify the data and issue a fresh batch of information to the project team, who were able to draw conclusions on a county level before they had all the data to do so regionally.

We could also see if our surveyors were over or under-rating the data, and feedback to them so biases were eradicated while the survey was still underway.

At this scale, data collection needs proper management and a structure so that we can use, and verify, it properly. It needs GIS and a structure so that it can be used and verified properly.

I feel very proud to have been a part of shaping Kenya's 2030 Vision "to create a globally competitive and prosperous nation with a high quality of life". The data we provided has helped them make informed policy decisions quickly and precisely.

Jenny Willbourn
GIS Consultant

Charlton Bland
Digital Survey Lead

The bigger picture

One of my favourite lines in Jurassic Park is Jeff Goldblum's classic: **"Just because you could, doesn't mean you should".** This line is just as applicable to the people who build the infrastructure around us as it is to the fictional scientists who created dinosaurs.

We have access to so much new technology today, but we shouldn't be using it just because we can – we should be using it knowledgeably and safely, and in situations where we know iit can improve the way we do things.

Drones are a great example of a technology that's becoming easier to access, but it shouldn't be usedjust because it's available.

Take for instance the use of drones for topographical surveys of long linear features (highways, rail corridors or pipeline routes) or large areas such as towns or cities. There is a lot of talk on social media and at trade shows about Beyond Visual Line of Sight (BVLOS) and how the affordability of drones will increasingly revolutionise large scale mapping. This excitement over new technology can create a costly problem, in which the wrong data capture tool is offered to a client.

Professional surveyors should consider both manned and unmanned aerial platforms as options for projects. Contrary to popular belief, drones aren't always the best option, and technological innovation has not stood still in the manned aircraft domain; even for relatively short linear distances of a only a few kilometres, manned aircraft have been the more affordable option, 'flying' in the face of current hype.

So, what are some of the characteristics of manned aircraft survey, and when do these traits become advantages?

Manned aircraft can carry big cameras

This is important because the larger, heavier cameras that manned aircraft carry are able to capture more ground per photo (Owing to their larger sensors and thus image footprint); fewer images require fewer ground control/ check points to coordinate and check the imagery and are faster to process and digitise (map) from; there's simply less images to control and work with. Meaning lower field surveying costs and lower processing costs. The larger image footprint for a given image resolution, also gives more freedom in placing ground control, meaning it can be placed in public areas, avoiding the costs and disruption involved in traffic management and attaining landowner permissions to access private land. Manned aircraft can capture imagery from as little as 3cm ground sample distance.

Manned aircraft are much faster at acquiring images

Whilst the cost of mobilising drones to site is certainly cheaper than mobilising manned aircraft, once they're in the air, the speed of survey is very different. The cost of having a drone crew in the

field for multiple days to complete a task must be weighed against the initial cost of mobilising a manned aircraft. For example, when mapping at 3cm ground resolution a manned aircraft typically maps at about 125mph (110kts), our fixed wing Wingtra drone maps at about 35mph (30kts); making it manned aviation much more productive for larger areas.

Manned aircraft have preapproval for most airspace

This reduces the admin costs involved in applying for special permissions to fly over critical infrastructure or urbanised environments and time needed for bespoke operational safety cases. The added height of manned aircraft also increases the separation and thus safety distance between ground objects and the platform for a given resolution.

Now don't get me wrong, drones are a potent tool and certainly have their place – they permit aerial data capture at smaller scales and are excellent for targeted inspection work; they offer versatility and availability that manned aircraft simply can't match. Indeed, last year, Atkins won a Brownfield Briefing Award for the *'Best use of digital technology'* for our drone work with National Grid. This project showcased the power of drones, as we were able to map the site, visually inspect the gas-holders and create a site video all using drones. We did this for eight sites in five days; traditionally using ground techniques this would have taken around six weeks and involved working at height.

Technology is progressing at an exponential rate and we need to constantly challenge ourselves to leverage new tools and techniques to bring value to our projects. With changing regulations, direct image georeferencing, computer vision, automatic change detection, machine learning and automated feature extraction, I have no doubt that drones will continue to expand their realm of influence. But the spotlight on drones can't blind-side us to the innovations and value-adds of other technologies. It comes down to using the right tool, at the right time, in the right way.

This article first appeared in Building magazine.

Unlocking data to save time and money

WHAT WE FOUND WAS ASTOUNDING

Delivering capital infrastructure upgrades can be expensive. Delivering them in London can be extraordinarily expensive, as well as disruptive to the millions of people who live and work there. There's nothing more frustrating for customers than seeing a road dug up once, then dug up again by a different team.

This is particularly true for water companies who need to maintain a reliable service for customers whilst upgrading or replacing their ageing networks to meet rising demand. Coordinating and planning these projects is a huge challenge. But keeping teams informed and coordinated presents a real opportunity to make cost savings, reduce disruption and improve services to all customers.

These asset management programmes have been around for decades; what's new is the vast amount of data we now have, as well as the technology to interrogate and visualise it in new ways.

Our geospatial experts and engineers teamed up with our innovation partners, Fluxx, to help Thames Water look at new ways of using their data to reduce costs and disruption through a project called ThamesConnect.

A simple solution to a big problem

We started with an ideas workshop with Thames Water, the Infrastructure Alliance and eight2o to come up with different ways of how we could save time and money when delivering capital infrastructure upgrades. The overarching consensus was that sharing data would deliver real benefit.

To test this hypothesis, we started experimenting with data. We took a 'think big, start small' approach so we could understand at a micro level which data would deliver the most value.

We undertook several build, measure and learn cycles to build a simple tool on top of an existing Thames Water GIS platform.

The rapid development helped people to focus on building a simple, working system that would prove the hypothesis — that better data sharing would help Thames Water provide a better service for customers, and to deliver major cost efficiencies throughout the asset life cycle.

We quickly began to discover coincident investment needs between two major programmes of work. Having started this investigation in a small area of North London, we scaled the approach across the whole of Greater London.

What we found was astounding. By overlaying the data and facilitating the dialogue to integrate these two programmes of work, Thames Water could create **over £7.7M in efficiencies** and avoid **3,900 days of disruption** to their customers.

Powered by data, realised by people

Since validating our hypothesis, we've been working closely with teams, providing training and understanding user needs and journeys to develop a tool that truly delivers on its purpose to identify opportunities to save time and money.

Now, when a project is being planned, a quick look at ThamesConnect will reveal other planned projects in the area.

A phone call to the relevant project leader means the work can be coordinated.

Sometimes, work is brought forward. At other times, a project may be redesigned to consider future development plans, significantly reducing duplication of effort.

From idea to action

The forward-planning web map we developed, which is compatible with systems used by Transport for London and the Greater London Authority (GLA), sparked the opportunity to collaborate between Thames Water and the London Borough of Croydon an initiative recently hailed as an example of best practice by the GLA.

By using the ThamesConnect approach, Croydon, Thames Water and SGN have coordinated infrastructure upgrade timings to prevent nearly 100 days of disruption – an estimated saving to the local economy of £678,000. This approach not only reduces the normal disruption associated with roadworks, such as noise, lorry movements and traffic delays, but also cuts air pollution and saves money.

This innovative way of working is now set to be rolled out across other London boroughs through the Mayor of London's Infrastructure and Development Coordination Team. It is a scenario where everyone wins: the utilities, the councils and most of all residents, businesses and road users.

Jack Metcalfe
GIS and Innovation Consultant

Can we unlock the value of ‘free’ data?

In a world where companies are hugely concerned with efficiency and productivity, there is one opportunity too many are overlooking; spatial data.

Making good decisions on a project requires a complete understanding of the environment in which you're operating, including a full range of features from heritage constraints, to ecological designations or underground utilities. Often, the only common feature between such dissimilar features is location; that's where spatial data comes in.

In laymen's terms, spatial data is information that is located and displayed on a map. For large companies, it means an internal interactive digital map that can be used to find where their capability is, where their people are and where issues, like Health & Safety, are located. Most companies store this information in spreadsheets. But while Excel has its place, it's hard to use it to identify where regional or site-based issues might be.

At Atkins, we've created a tool called Atkins Go! that helps us view our data spatially. It supports business processes as well as individual projects. It gives everyone access to open geo data, like Ordnance Surveys and utilities, so that people can save time finding it themselves and see how it impacts their site or region.

What a spatial tool like Atkins Go! does is twofold:

First, it helps you display open source data on maps so you can better manage your projects.

From one spatial tool, you can see all of the challenges and constraints on a site, and more importantly communicate this to your clients. Before you even put a proposal together for a client, you know the complexities of their site and can reduce risk and assumptions. At Atkins, we're using it especially on small projects where cost and time are limited.

Second, it helps you map your internal corporate data so you can better manage your business.

Imagine if you could see where the hot spots are for Health and Safety incidents. Or where the highest concentration of skills are in your business. A spatial tool can help you do this by taking all the data you store in various places and putting it into one place with a simple front-end map that anyone in the business can use.

The idea here is to improve the way your business operates so that you are more efficient **and** provide a better service to your clients. This is where we've seen real value in doing things differently at Atkins.

Spatial data is one of our most underused resources, both from a project and a business point of view. And if we're serious about improving efficiency and productivity, we can't be afraid of doing things differently.

Harriet McQuade
Senior Geospatial Consultant

Seven ways GIS adds critical project value

Geoff Waite
Associate Director

I used to call GIS (Geographic Information Systems) the infrastructure sector's 'best kept secret'. But I can't really say that anymore. At Atkins, GIS is now involved in almost every infrastructure project, from nuclear to transport to buildings and renewable energy – in the UK and around the world.

GIS is still very much 'behind the scenes' though, and if you ask people what we do I'm not sure many would give you a correct response (hint: it's not just maps). Geospatial experts are now data analysts, BIM experts, software programmers and land surveyors – we use the latest technology to help you and your clients understand and share information better and more accurately.

There are so many examples of where GIS has added real value to projects, without project teams even realising it. Below are just seven of the times GIS has made a difference to infrastructure.

1. Going digital with Environmental Impact Assessments (EIA)

This one seems incredibly simple but has been hugely impactful on the way we approach environmental assessments for our clients. EIAs collect and analyse a huge amount of information on the natural environment – this data is usually put together by separate teams and collated in a large, unwieldy printed report. Our GIS team brought all of this data together into a single web platform that is intuitive, easy to use and readily accessible for the project team, contractors and the client – saving time, money and creating a data baseline that can be reused in the future.

2. Improving M25 journey times using data analysis

GIS was the backbone of this fantastic project with EE to improve traffic on the M25. Bringing together an innovative team of data scientists, geospatial experts and transport modelling specialists in this partnership provided a holistic solution to a complex spatial issue. Spatial software was used to process Big Data from various sources, integrating spatial analysis with statistical algorithms to understand near real-time traffic flow.

We have now fully automated this process to allow the client to continually monitor journey time performance around the M25, saving the client money and improving journeys for the public.

3. Using data innovatively to save 3,900 days of road disruption

Our GIS team paired up with our innovation team to help Thames Water look at new ways of using their data to reduce costs and disruption through a project called ThamesConnect. Our guiding principle was that better data sharing would help Thames Water provide a better service for customers and deliver real asset life-cycle efficiencies. By combining the data of two major programmes of work, we found that Thames Water could create over £7.7M in efficiencies and avoid 3,900 days of disruption to their customers.

4. Making the most of BIM on HS2

Data has played an integral part in HS2 since the project's inception. Our GIS team supported HS2 in its phase 1 parliamentary enquiry, creating the maps that showed where the lines would run and how they would impact the local environment, carrying out spatial analytics to help ensure that there isn't a loss of biodiversity. Since then we've had our geospatial people working alongside HS2 in their BIM team, including a BIM implementation manager and CAD/spatial data coordinators, to help them realise their ambitious aim to develop and deliver a world-class BIM implementation, and recognise the potential to drive industry towards 'Digital Built Britain' through innovation and open data standards. This is a brilliant example of how GIS has moved on from maps – we are the BIM experts of the future.

5. Improved survey efficiency and safety using drones

The technology we use to collect data is just as important as the technology we use to analyse and understand it. Last year, Atkins won a Brownfield Briefing Award for the 'Best use of digital technology' for our drone work with National Grid. This project showcased the power of drones, as we were able to map the site, visually inspect the gasholders and create a site video all using drones. We did this for eight sites in five days; traditionally this would have taken around six weeks and involved working at height. Drones are providing us new and safer ways to map sites and collect data, so much so that Atkins has invested in its own drone.

6. Saving time and money using Spatial Common Data Environments (SCDEs)

Common Data Environments (CDEs) are becoming increasingly, shall we say, common. These help us bring together all of the information we hold on our assets into a single place and one source of truth. When we add a spatial element to this – so viewing this data on maps – we can look beyond a single asset to what's around them and their inter-relationships and learn so much more. In the long-term, it's about being able to operate and maintain our projects at asset, rather than building, level.

7. Award winning asset management in transportation

ORBIS (Offering Rail Better Information Services) is Network Rail's transformation programme to improve their approach to acquiring, storing and using asset information. We created the geospatial front-end that brought all of the asset information together in a way that was easy to access and use for the thousands of people who work for Network Rail and their supply chain. This was a fundamental enabler for ORBIS as it allowed everyone to access the same information, wherever they were in the country. The fact that it won an ESRI Award is a testament to the role GIS played.

These examples show the important role GIS plays in digital transformation. If we want a more digital future, we need to start with data – and GIS is where that expertise lies. I have no doubt we will see GIS play more of a role, perhaps even a starring one, on infrastructure projects in future.

This article was originally published in Infrastructure Intelligence.

Showcase

1.

1. Drone

Our new top spec drone (DJI M600 Pro) has the capability to cover 14 hectares of land in 20 minutes on one battery and is fitted with high resolution cameras to achieve centimetre level accuracy. Coupled with a transmission range of 5km, and the ability to operate near large metallic structures safely, the drone is a magnificent piece of equipment for efficient surveying in a variety of environments.

2. A14 spatial data management

Our spatial information management experts coordinated and integrated data to provide a user-friendly, intuitive view of this complex project. Working in close collaboration with contractors, we ensured reliable asset information was maintained and supplied in a coordinated, audit-able manner as construction happened.

3. East West Rail Phase 2 (EWR2) spatial data management

Our team developed version 2.0 of our Spatial Common Data Environment (sCDE) to meet the needs of EWR, across all disciplines that require GIS spatial data. The sCDE is an Open-Source PostGIS database working as a managed data environment and can hold all types of GIS data, as well as non-spatial tabular data.

4. Nuclear site selection tool

We supported the criteria for development and assessment of suitability and risk for future site selection of nuclear power stations. Criteria were mapped out using geographic information systems to help assess potential sites for new installations.

5. GIS for Crossrail bored tunnels

Our GIS experts collaborated with Arup to support the project tunnelling team, with the primary role of updating and maintaining the building and infrastructure assets database, containing over 17,000 assets along the route.

6. Transport for London aerial surveys

TfL required high-resolution aerial imagery and topographic mapping to assist with planning and to inform its upgrades to the network. We carried out the work on several deep Tube lines, providing accurate imagery at 2cm resolution.

7. Digital Mapping Database, The Netherlands

Our team delivered high-resolution aerial surveys and mobile scanning along with our partner, Kragten. We also developed innovative software solutions to convert and supply large volumes of data to the client.

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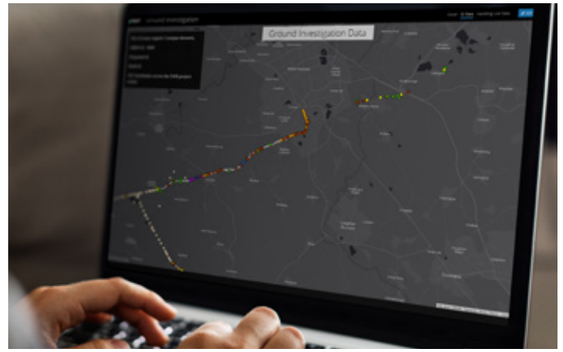

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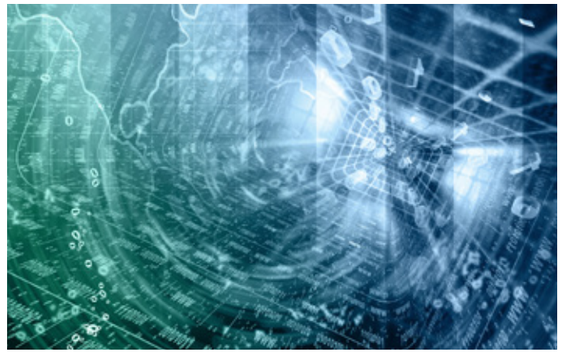

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