

Location Technology Insights

Understanding the GIS Industry in 2018



Do GIS Professionals Understand their Own Industry Well Enough?
Deciding Between FOSSGIS and Proprietary Software for Enterprise
Career Expectations for the GIS Professional: Government
DGGs, Spatial Grids, and Spatial Data Models

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Various symbols representing the GIS industry in 2018. Image credits to Niall Conway.



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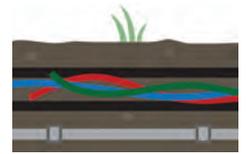
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Andrew Zolnai was recently asked "Are there better ways to quantify, model and predict geospatial data, which are growing exponentially?" He tries to answer that question.



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Challenges for the GIS Industry Going Forward

Welcome to the first edition of GIS Professional in 2018! Having contributed numerous articles over the past 12 months, I am now delighted to take on the editorial duties for this established and well respected publication.

Like many professionals who now work in the GIS field, I am a later convert to the industry, having initially focused on a career in Urban and Regional Planning prior to exploring the world of maps. Nevertheless, it is for this reason why I am fully convinced that geospatial technology is the most exciting that exists today, and I am optimistic that it can help decision-makers to both prepare for and overcome the major challenges which our planet faces.

Despite the obvious strengths and advantages of the GIS discipline, I also believe that it faces a number of challenges going forward. Although locational data has been popularised over the past decade thanks to the likes of Google Maps, Bing and apps such as Uber and Airbnb, the GIS technology which underpins these systems is largely misunderstood by the digital masses. For this reason the wide field which is GIS could, one day, be left by the wayside by a competition which is more specialised in its focus.

Another challenge to the industry, along with the profession, is the fact that the industry is changing at a significant pace, thanks especially to the growing prevalence of open data, cloud computing, and machine learning.

My efforts, therefore, as Editor of GIS Professional, is to help the industry to communicate its news, ideas and perspectives, to better understand itself and its

challenges, and to thereby redefine itself as and when it is required.

In terms of content in this edition, we have lots of quality writers from around the world involved, including the UK, USA, South Africa, and New Zealand. Article topics include: the relevance of FOSSGIS for enterprise, insights on GIS careers in government, and an analysis of opportunities in the emerging Agtech sector. We also have an interview with a professional who specialises

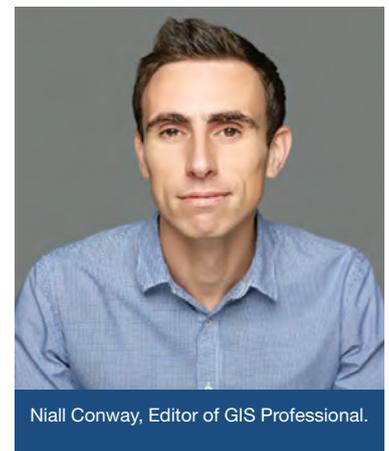
in mapping underground utilities, and the results of a survey on where the employment opportunities exist in today's GIS industry. As always, this edition includes quality perspectives from our regular columnists, Adena Schutzberg of Esri and Abigail Page of the AGI.

In terms of news and updates in the industry, we also have lots to mention, including: engineering firm Fugro's environmental award for its use of mapping technology, the generous donation to The Nature Conservancy by Esri's own Jack and Laura Dangermond, as well as updates on acquisitions, mergers (and shutdowns!) within the industry.

Before moving onto the content, I'd like to thank you all for your continued support and readership of GIS Professional. I look forward to sharing great news, updates, and ideas with you throughout 2018!

Best,

Niall Conway, Editor



Niall Conway, Editor of GIS Professional.

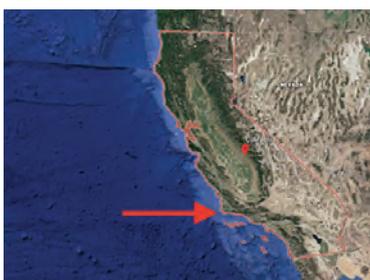
Mapzen Shuts Down Operations

Representing the first major mapping casualty of 2018, Mapzen has announced it has shut down operations, and turned off all hosted APIs and all related support and services from February 2018. Founded in 2013 by CEO, Randy Meech, Mapzen is a spin out of the Samsung Research America Accelerator, and is known to have hired mapping specialists from Apple since then. The company focussed on geo platforms, including search (geocoding), rendering (vector tiles), navigation/routing, and data.

Mapzen's well known product, Tangram, an opensource map renderer which allowed real-time map design, display, and interactivity in the web browser and on mobile devices was used to develop some of Mapzen's cutting edge map cartographic languages, including TRON 2.0 (which was based on the style of the movie).

Mapzen's components are used by a number of users and developers who will now need to consider other options - or to work with the opensource code which is available.

Jack and Laura Dangermond Donate US\$165 million to The Nature Conservancy



Jack and Laura Dangermond, founders of Esri and widely known as the parents of the digital mapping industry, have donated US\$165

million to the The Nature Conservancy. The money is to be used to purchase a 24,000-acre stretch of undeveloped coastline in California, which will help protect the 39+ wildlife species that are currently under threat, including whales, porpoises, mountain lions and Monarch butterflies.

The Dangermonds are also well known for their generosity in the tech world. They have given their mapping software away for free to thousands of non-governmental organisations, wildlife and conservation groups, as well as to the international Bill and Melinda Gates Foundation, which supports humanitarian and environmental efforts in Africa.

Egyptian Space and Satellite Plans Move Ahead



With a long-awaited law finally approved by the State Council after passing through parliament, Egypt's Space Agency is now in the process of formation.

Egypt has been developing a new space centre, with some 100 acres set aside for work on the Misr Sat 2 satellite project, and another 23 acres planned for other projects. Khaled Abdel-Ghaffar, Egypt's Minister of Higher Education and Scientific Research, showed MPs a model satellite and said its components will be built by Egyptians at the new space centre, just east of Cairo.

One of the other space-focused projects includes plans to launch a satellite with China in 2019. This technological collaboration with China follows on from a memorandum of understanding which was recently signed between the two countries. China's US\$45 million commitment to building the satellite follows a US\$23 million contribution towards Egypt's space program.

An additional benefit of the space agency will be keeping Egyptian scientists in the country. In recent years, over 100 scientists have left the country to pursue opportunities in their field elsewhere. This includes Akram Amin Abdellatif, an aerospace design doctoral student studying in Germany, who is the first Egyptian astronaut to be accepted into a NASA training program in the U.S.

Egypt's space program also has other research partnerships with the Canadian Space Agency, Japan, the European Space Agency, the European Union and the United States.

Pokémon Go Ditches Google Maps for OpenStreetMap

Pokémon Go, the location-based app which has reinvented the gaming world, has recently undergone a major overhaul by switching from Google Maps to OpenStreetMap (OSM) for its in-game display. The decision by its creator company, Niantic (which was previously an internal startup of Google), could possibly be motivated by efforts to save on API costs. Prior to this update, OSM was only used behind the scenes, in particular, to influence 'spawn points' within the game, while Google Maps was used for overworld landscaping.



OSM is a collaborative project to create a free editable map of the world, which was founded by Steve Coast in 2004. The project allows volunteers to edit the map based on their knowledge of the local geographical features around them. Each update is immediately visible to all other users and is version controlled. Other features of OSM include the fact that there are no corporate map cycle releases, approvals and KPIs which are typically associated with large commercial mapping products. Today, OSM is used and supported by many organisations, including Mapbox, Carto, Foursquare, Craigslist, and even Apple Maps.

thinkWhere Launches theMapCloud Platform

GIS company thinkWhere has launched a new cloud-based platform for GIS and geographic data called theMapCloud. The platform allows maps, open data and business records to be accessed through any web-connected device. Users can view, retrieve and share maps, geographic data and other open datasets and, as well as providing a platform for GIS and other web applications, theMapCloud can be used for a host of data services and Software as a Service (SaaS) applications.

theMapCloud is initially offered with fully managed datasets from publishers such as Ordnance Survey and OpenStreetMap. Designed using the latest technologies, the platform provides flexible, secure, scalable, resilient and high performance solution for serving geographic data and applications. thinkWhere also offers a range of software applications and services to help organisations successfully migrate to hosted solutions using theMapCloud.

The platform has been developed over the last two years in association with a number of key users in the UK and the USA. It has already been successfully implemented by the Scottish Government to provide access to mapping by around 100 members of the One Scotland Mapping Agreement (OSMA) and other adopters include the British Library, US-based Humanitarian OpenStreetMap Team (HOT) and the humanitarian NGO, People In Need.



BIM Market to Reach US\$18.8bn by 2024

The value of the global BIM market has been projected to reach US\$18.8 billion by 2024, up from a valuation of US\$3.6 billion in 2016. The 'Global Building Information Modelling Market' report, published by Esticast research and consulting, found that emerging countries in Southeast Asia and Europe will be major drivers of this projected expansion, with rapid growth propelled by infrastructure development to support rapidly growing populations in nations such as India and China.

The report divides the BIM market into application areas, defining commercial, residential, institutional, infrastructure and industrial segments. Geographically, the market is segmented into North America, Europe, Asia-Pacific, and LAMEA (Latin America, Middle East and Africa).

North America currently leads the BIM market with a revenue of US\$1.07 billion in 2015, and a market share of just under 35% in 2016. Europe and the Asia Pacific region are expected to surpass the US' revenue share in 2021.



UK Establishes Geospatial Data Commission

The UK Government is to set up a new Geospatial Data Commission to develop a strategy for using public sector location data to support economic growth. In an effort to make location data more freely available, it has also committed to working with national mapping agency Ordnance Survey (OS) on freeing up its OS MasterMap data to support small businesses.

Chancellor Phillip Hammond announced the news, adding £40 million will support the project over the next two years, designed to boost the development of digital technology and data driven business in the UK.

The establishment of the commission reflects a commitment in the Conservative Party's general election manifesto, which identified for a new body to bring together the relevant parts of HM Land Registry, OS, the Valuation Office Agency, the Hydrographic Office and Geological Survey.

Freeing up the MasterMap data for re-use is likely to involve making it available under an Open Government Licence or an alternative mechanism.

The announcement won the praise of the Open Data Institute (ODI), whose chair and co-founder Sir Nigel Shadbolt said "I'm delighted that the UK government is carrying through on the commitment to open up geospatial data. The data community has been pressing for this for many years."

Jeni Tennison, the ODI's chief executive, said: "This is great progress. Open access to OS Master Map isn't just useful on its own: it will remove current legal barriers that limit the availability of other data – from the foreign ownership of land to the locations of parking spaces – which is essential to understand and tackle housing and transport challenges."

Bosch to Acquire Stake in HERE

Bosch, a German engineering and electronics company, are buying a 5% stake in mapping company HERE Technologies for an undisclosed price. HERE is already owned by a consortium of companies including Audi, BMW, and Mercedes-Benz.

The acquisition is part of Bosch's efforts to develop its data-based service capabilities beyond the automotive industries (e.g. for Industry 4.0, IoT, smart homes, and smart cities).

Bosch operates its own IoT cloud and offers its IoT Suite, a dedicated software platform, for these types of solutions. These capabilities, combined with HERE's high-definition indoor navigation maps, could be used for a range of different purposes, such as for automating and streamlining the flow of goods and services throughout the production line.

Likewise, they could be used to direct maintenance personnel, who may be unfamiliar with a facility, to equipment which is in need of repair. The companies are exploring further opportunities where their services could be utilised in innovative ways.



OGC Announces European Space Agency Invitation to Tender for Testbed 14

The Open Geospatial Consortium (OGC) has invited interested organisations to respond to Part 2 of the OGC Testbed 14 Call for Participation. Part 2 concerns the European Space Agency's Exploitation Platforms, which is part of the Testbed 14 Earth Observations & Cloud (EOC) Thread.

Organisations selected to participate in Testbed 14 will develop prototype solutions based on the sponsors' use cases, requirements, and scenarios. Participants' prototype solutions will implement existing OGC standards as well as new prototype interface and encoding specifications introduced or developed in Testbed 14. Prototype specifications may ultimately become official, member approved standards, revisions to existing standards, or best practices for using standards.

Microsoft Integrates Azure Location Based Services into the Cloud

Microsoft has announced the public preview of Azure Location Based Services, a new cloud offering to power the "Location of Things". This will improve connectivity between geographical data, smart cities, infrastructure and IoT solutions; and empower a range of industrial transformations.

Azure Location Based Services provides an enterprise-ready location service for customers to build mobility, asset tracking, and other geospatial applications that provide useful insights through one dashboard and one subscription.

The service allows enterprises to connect their assets to the cloud and give them significant insights into how their data can be utilised further when combined with location-based data. Examples of benefits include: a department of transportation using Azure to analyse and improve traffic in congested cities, freight companies providing improved fleet management and logistics, and businesses which can track the location of assets and be notified when their location changes.

Azure Location Based Services allows users to create maps directly, so that they can be included in a JavaScript Map Control API or a Render API. It also includes the ability to search, display traffic data, and perform routing and geocoding. The service works alongside Bing Maps, Azure Search, Cosmos DB, Azure Stream Analytics, SQL Server, AI for Earth, and Universal Windows Platform.

Microsoft is building digital infrastructure on its cloud with hundreds of thousands of partners from the automotive, smart city and location industries, including TomTom, Cubic Telecom, Fathym and ICONIQ, BrightBox, Cubic Transportation, Delphi, and Otonomo.

Esri also intends to join Azure in order to provide business customers with a complete set of location data management, digital mapping and geographic analytics (provided through Esri's ArcGIS suite and developer APIs).



OGC Calls for Sponsors for Augmented Reality Pilot Project



The Open Geospatial Consortium (OGC), and the World Wide Web Consortium (W3C), are calling for sponsors for an upcoming

Augmented Reality (AR) Pilot Project that seeks to advance W3C and OGC standards related to Augmented Reality. Models, interfaces, and the architecture will be advanced to help enable the seamless integration of 'real world' geospatial and web data.

While the data can be provided using OGC standards and displayed using W3C ones, ensuring the two can be combined in real-time live AR experiences - whether on latest-gen head-mounted devices or smartphones held at arm's length - remains to be seen.

An open architecture needs to be advanced to not only allow AR systems to access and merge data from a specific location, but also for them to be able to send data (e.g. capturing pictures and videos) to a server and to subscribe and be notified of events related to that location. The OGC and W3C AR Pilot Project aims to help solve these problems.

The Pilot will run as an Initiative of the OGC Innovation Program, co-branded with W3C. The program provides a fast-paced setting for geospatial technology users and providers to work collaboratively in an agile environment to develop, evolve, test, demonstrate, and validate standards under marketplace conditions. A video about the benefits of the OGC Innovation Program is available [here](#).

Benefits to Sponsors of the W3C OGC AR Pilot include:

- Assess and affect market direction based on your and other sponsor organisations' needs.
- Improved visibility as a global leader in information technology critical to Augmented Reality.
- Amplified funding of solutions by working with multiple sponsors with common/similar problems.
- Accelerated process for workable interface specifications, with results delivered in 4-6 months. Follow-on procurements using proven standards-based architecture then lead to more robust AR solutions.

For more information, visit <http://bit.ly/2FMKBNz>. To submit your interest as a sponsor, please respond to the form located at <http://bit.ly/ar-sponsor> by 5 February 2018.

LocationTech Open Source Community Opens Geospatial Projects

LocationTech, an Eclipse Foundation Working Group and a community that builds software for geospatial technology, has announced the release of five open source projects that provide core technology used to build geospatial big data analytics solutions.

LocationTech is an open source community that provides technology for the US\$500 billion worldwide geospatial industry. For instance, the projects can be used to efficiently process satellite images, analyse maps for the agriculture industry, visualise smart city sensor data, and in many other geospatial use cases. The LocationTech community has grown to include nine open source projects, 18 member organisations, and over 100 developers.

The five new project releases are as follows:

- **GeoWave** is a software library that connects the scalability of distributed computing frameworks and key-value stores with modern geospatial software to store, retrieve, and analyse massive geospatial datasets.
- **GeoGig 2** is a tool for geospatial data versioning. It enables users to leverage versioning of their geospatial data and to enable replication and synchronisation workflows, in addition to supporting end-to-end data management workflows.
- **GeoTrellis 2** is a geographic data processing Scala library designed to work with large geospatial raster datasets. The tool provides developers with a set of utilities to help create useful, high performing web services that load and manipulate raster data (data normally used to represent satellite or aerial images).
- **GeoMesa 3.5** is a distributed, spatio-temporal database built on a number of distributed cloud data storage systems, including Apache Accumulo, Apache HBase, Apache Cassandra, and Apache Kafka.
- **Java Topology Suite (JTS) 1.15** is a Java library for vector geometry providing spatial data types, spatial relationships and spatial operations.

Additional information is available at www.locationtech.org/



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Fugro's Oil Seepage Mapping Collaboration Wins Environmental Award

Fugro has been honoured with an Environmental Leadership Award from The Maritime Alliance, a California-based non-profit organisation that promotes sustainable, science-based ocean and water industries.

The project identifies and maps oil seepage from abandoned offshore well sites in Santa Barbara County and was performed for long-time customer Aqueos Corporation under contract to the non-profit environmental group Heal the Ocean.

The award was presented by Craig McLean, assistant administrator and acting chief scientist for the National Oceanic and Atmospheric Administration (NOAA) during the organisation's BlueTech Week, an international gathering of over 485 marine professionals. Sharing the award with Fugro is Planck Aerosystems, a drone intelligence company specialising in highly autonomous unmanned aerial systems, which they collaborated with on the project. "We are grateful to be recognised by The Maritime Alliance for this collaboration," said Todd Mitchell, remote sensing manager for Fugro.

Results from the project prompted the California State Assembly to pass recent legislation SB-44, which funds a legacy oil and gas well removal and remediation programme through 2028. In addition to the Environmental Leadership Award, Fugro received a Certificate of Special Congressional Recognition, signed by Representative Duncan Hunter.

Luminous Group Software to Revolutionise Fire Safety

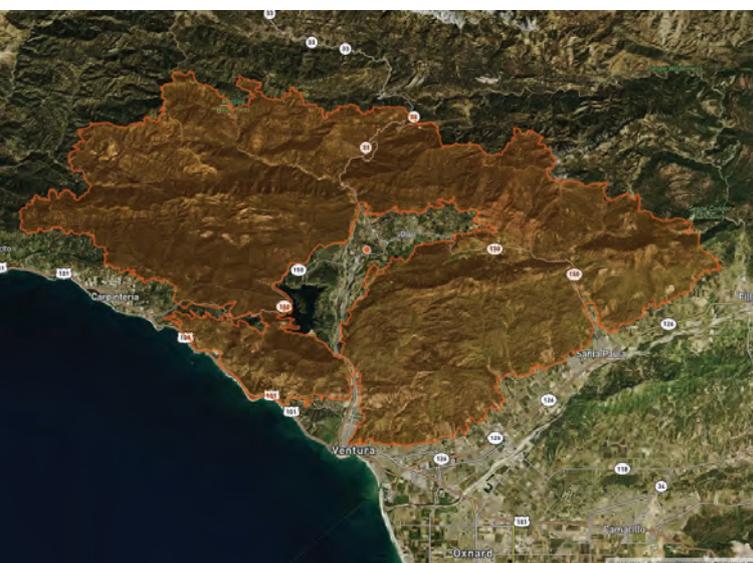
Luminous Group, the 3D technology specialists, has launched its new RIVO software using mixed reality solutions to transform asset mapping for the oil and gas, facilities management and construction industries. The system can also be applied to enhance fire safety by drawing up critical information in real time, be it emergency evacuation points or fire routes.

Their newly branded RIVO package utilises Microsoft's Inside Out tracking and is accessed using a Microsoft HoloLens headset for the user. The device, which is currently being utilised by the likes of NASA and Jaguar Land Rover, can remember real world locations and scan its surroundings and project holographic images into that location.

RIVO uses this mixed reality technology to allow rapid 3D mapping of assets by tagging 3D objects into real-world locations in real time, which will be accessible via an app. After an item is tagged, the user is then able to access the database and assign rich intelligent data in the form of voice notes, videos or images.



DigitalGlobe Releases Satellite Imagery of California Wildfires



DigitalGlobe's map of the wildfires in California.

DigitalGlobe has released satellite imagery and data of the wildfires in California through their Open Data Program.

The publicly released imagery is for Ventura, California, and the surrounding communities and will expand coverage based on the fire's activity. DigitalGlobe partnered with Mapbox to update their fire tracking map with the latest imagery. This map allows users to search addresses and zoom in on specific areas in or near the fire zones, and it includes the latest fire perimeters provided by first responders on the ground. View the map at www.mapbox.com/labs/norcal-fire-2017

Also available for publication are several JPEGs taken by DigitalGlobe's WorldView-3 satellite, which has a Shortwave Infrared (SWIR) sensor that can pierce through the smoke and show where the fires are burning on the ground. The images show fires burning in the mountains east of San Fernando, both in natural colour, with smoke visible, and SWIR, which is smoke-free.

Career Expectations for the GIS Professional: Government

When deciding on where to focus one's GIS career, it is important to consider the advice from people who have already established themselves in the industry. In the following article, which is the first in a series, Tim Hayes shares some insights on GIS careers in government. As a GIS manager at City of San Jose local authority in California, Tim, together with his colleagues, serve over one million residents on a daily basis, and thereby help ensure that Silicon Valley remains the innovation powerhouse that it is.



This is the first in a series of three articles pertaining to what you can expect as a GIS Professional on a chosen career path. Part one focuses on what a geospatialist can expect if they choose a career in government, while parts two and three refer specifically to the private and utility sectors.

WHAT CAN I EXPECT AS A GIS PROFESSIONAL IF I CHOOSE A CAREER IN GOVERNMENT?

Most people who choose to work in government do so because

they are civic-minded in nature and because they appreciate the relatively high level of job security, salary, and pension benefits which

to do something, expect the same thing to take a week, or longer, in government. This is simply because a certain organisational

... the government can provide you with the greatest variety of career opportunities.

is on offer. Furthermore, for the GIS professional, the government can provide you with the greatest variety of career opportunities.

However, there are four additional aspects to consider when deciding on a career in government. These four facets, which play a critical role in determining the career satisfaction of the GIS professional include: motivation, funding, people, and innovation. Let's explore these in more detail.

1. MOTIVATION

It is important to understand that it takes a long time to get things done in government. If, in the case of the private sector, it takes a day

inertia exists across all levels of government. Since, in my opinion, few people in government are as intrinsically motivated like the GIS professional, he/she must be sure to temper enthusiasm with a healthy dose of reality about the nature of a government department.

2. FUNDING

As early as possible, when considering a career as a government GIS professional, the first bit of research one needs to do is to find out how the GIS position is funded. Is there a budget for the GIS program, and if so, how much is it? Is it funded through property/sales taxes, grants, or special fees? This funding of the position



is the key. If it is funded using property/sales taxes then it will be subject to economic volatility, with the risk of layoff higher relative to other positions which do not use this fund source. If the position is funded by grants then you should be prepared for even more risk since the position may only last for a few months or years. If, however, the position is funded by special fees, including utility fees (e.g. water, sewer, electric, gas, parking, etc.), then odds are it is safe and secure, with enough money for GIS to flourish.

3. PEOPLE

This is where the GIS professional can expect to find varying levels of frustration and satisfaction. Remember that most of the people you will work with in government have no plans to leave unless they retire. This means that, unlike in the private sector which emphasises the importance of being a 'team player', you may be forced to get along with people whom you would normally not get along with. Just as with a roommate whom you may not like, you must find a way to live with one another.

In government, it is nearly impossible to fire anyone for reasons of incompetence or indolence, and, even in the case of breaking the law, dismissal can be very difficult. Given this circumstance, you should be prepared to encounter many poorly motivated people. If you do a good job, expect nothing more than a handshake for a job well done. In addition, managers are generally promoted based on patronage, not their abilities or skills. This will result in the not uncommon situation of you being supervised by someone who may neither understand your capabilities, nor be interested in them. In government, despite the ubiquity of GIS, oddly enough, if

you are supervised by someone who knows about GIS and its potential, then you should consider yourself lucky.

4. INNOVATION

For better or worse, in government, the status quo is the order of the day. Status quo is about working in silos and about avoiding risk. It is best demonstrated by the tendency of managers to hire private consultants to tell them what you may already know. Ultimately, it is about doing things the way they have always been done. This is counter to the philosophy of GIS, a discipline which thrives on innovation, sharing, and being led by people who relish change. Therefore, GIS

... professionals should expect to deal with the pushback on anything that disrupts the status quo.

professionals who are considering a career in government should expect to deal with the pushback on anything that disrupts the status quo. This is not necessarily a bad thing - it is simply reality. As the GIS professional, it will be up to you to develop anti-status quo and pro-innovation agendas that will affect positive change in the organisation.

THE POSITIVES

Despite the abovementioned dichotomies, a GIS career in government can be a very rewarding one. Most of the people will greatly appreciate what you are able to do for them, and they will be sure to let you know. Due of the low employee turnover, you will build positive relationships that will span your entire career and will prove extremely useful to your endeavors in the GIS realm. GIS in government offers excellent growth potential from the professional



and technical aspect; there is a good chance you will be involved in improving business processes, working with large Enterprise GIS databases, participating in

web mapping development, and everything else GIS can offer. The greatest benefits are intangible; working as a government geospatialist provides career stability, time to learn/experiment, and, most importantly (thanks to its relatively forgiving environment), an opportunity to learn from mistakes.

ABOUT THE AUTHOR

Tim Hayes, MSc is a GIS professional with 25 years experience. He is currently a GIS manager at the City of San Jose in California, where he supervises a team of three GIS professionals at a municipal utility authority. Tim holds a Bachelor's and Master's Degree in Geography, as well as a Certificate in GIS, and his career has spanned the private, government, and utilities sectors.



Do **GIS Professionals** Understand their Own Industry Well Enough?

As the power of locational data starts to dawn on a wider range of industries, the GIS profession needs to ensure that it understands the fast-changing world within which it operates. This very challenge, of redefining itself for the 21st century, is explored in the following article by New Zealander, Nathan Heazlewood. Thought-provoking, to say the least.

Many people employed in the GIS Industry are interested in what is happening to our field; for example, trends in changing technology, usage patterns, profitability, and employment prospects. However, getting an accurate picture is problematic in such a multi-faceted industry. Setting criteria and measurement processes is difficult because of constant change and new 'disruptive' elements. There are many online opinions on this topic, but often these cannot be trusted because they are tainted by marketing spin and a lack of solid evidence.

In my view, it is important that the industry improves analysis of how it is growing and changing. This is important for the next generations of graduates (or professionals planning their careers). Training should be targeted so that the workforce fits the employment market.

Although I have read many articles which suggest that "artificial intelligence will soon replace most GIS analyst jobs", I'm not convinced this is will happen soon. While many of these perspectives are somewhat 'clickbait'-focused, it is nevertheless important to understand, based on evidence and metrics, what is happening to the GIS industry and to the employment opportunities within it.

To this end, I have conducted research which has yielded some interesting results, such as the fact that 68% of GIS jobs are within 'Enterprise' GIS roles. Whether or not the training sector is doing enough to develop skills for those jobs is a question which will need to be asked.

WHAT EXACTLY IS THE GIS INDUSTRY?

It was the American game show contestant and author, Ken Jennings, who perhaps best summed up the difficulty in defining our industry. He once reasoned that the decline in geography in academia is due to the demand for increased specialisation, something which the generalist subject of geography is certainly not: "Imagine the poor geographer trying to explain to someone at a campus cocktail party (or even to an unsympathetic administrator) exactly what it is

they study..." Jennings's humorous anecdotal conversation consists of the geographer's futile attempt to answer the other guest's questions about his profession. His explanation weaves between the diverse physical geography fields of geology, oceanography, climatology, and meteorology, as well as the human geography fields of sociology, economics, cultural studies, and political science. By the end of the conversation, the baffled dinner guest simply asks "So, uh, what is it that you study then?"

Further to this, distinctions between employment sectors are pedantic. Some people set boundaries between the GIS industry and geomatics or photogrammetry or web-development. Other people want to say that there is no such thing as the GIS Industry, and say that what we do is simply disparate parts of other larger industries. In my view, the GIS industry should be defined as any area of technology that utilises measurements of geography.

Some roles are strongly associated with GIS, such as spatial analysts, cartographers, and photogrammetrists, and some people use these roles to set boundaries. However, there are other roles which are not as strongly associated with GIS technology, but use it very often. This leads to the question 'are geologists, market analysts or environmental scientists part of the industry or not?' In my view, all of these jobs are part of the GIS industry as long as they are using GIS.



To aid understanding of the employment market, a good method is to group together jobs that share similarities. In this regard, the GIS industry can be segmented into four distinguishable 'tribes'. These include: 'Measurers' (the people that collect and do the 'upstream' processing of data); 'Gists' (the branches of science that use the 'downstream' geospatial data to apply to many scientific and business disciplines; biologists, geologists, archeologists etc.); 'Graphers' (professionals who focus on the visual presentation of 'downstream' geographic data; such as cartographers, hydrographers etc.); and the 'Techies' (the professionals who specialise in coding, integrating and/or networking).

Using techniques like these makes it easier to analyse what is really happening in the industry; for

... these techniques make it easier to analyse what is really happening in the industry...

example, the 'measurer' tribe has been heavily impacted by changes in technology such as photogrammetry. In contrast, it is worth comparing this to what is happening to the Techie side of GIS, which has started to embrace powerful tools and systems such as cloud computing and mobile technology.

CLASSIFYING GIS JOB ADVERTS?

The main point of this article is that the GIS community needs to have scientific measurements of what is happening to its industry, rather than relying on biased or narrowly focussed opinions. Although there are basic scientific tools which attempt to do this, such as URISA's salary surveys or Gartner's Hype Cycle, both have their limitations.

Last year I conducted a survey which analysed GIS job advertisements in New Zealand. Some interesting results emerged when I distinguished the jobs according to different classes. The first class is the 'Solo map person' which accounted for 17% of advertised roles. This refers to roles where there is only one GIS person within an organisation. Typically this person uses desktop GIS to produce maps or reports. Worryingly, it is worth noting that in this field there is no integration with other systems.

Another class is the GIS Process Chain, which accounts for some 8% of all advertisements. In this class, multiple specialists work in a 'production line' environment, such as where a LiDAR specialist captures some data, which is then passed onto a data editor, who converts it to vector data, which is finally used by a cartographer, who

produces a finished product. In this 'production line environment', each of these specialists very often uses different desktop software to carry out their duties, and very often files are imported and exported into different formats.

Based on my survey findings, 68% of jobs are in Enterprise GIS roles. This grouping utilise 'Enterprise' implementations of GIS software. Characteristics of this group include the use of industrial strength databases to share data, and feature integrations with other IT systems. Organisations in this category include utilities and telecommunications companies and local/city government organisations.

The third class identified was Disruptive GIS roles, which



account for a mere 7% of all advertisements. This is a new and exciting branch of the industry, whereby the GIS data is applied in ways that haven't previously been thought of before. This group, which includes the likes of UBER and Airbnb, is generally coming up with new uses for GIS via the internet, often targeting consumers.

CONCLUSION

The vast majority of jobs are in the Enterprise grouping, which means that many job-seekers should develop skills for those types of jobs. For this reason, database skills or general IT literacy and skills will be extremely valuable. After all, many GIS professionals don't understand that when IT Techies talk about 'pen-testing' they don't mean checking the ink in the plotter!

While there is a lot of hype and published articles about Disruptive GIS, it appears as if there are not actually that many jobs advertised in these areas, or at least not yet. It would, therefore, be interesting to repeat this analysis over coming years, so that GIS professionals can have a better understanding of how the industry is evolving.

ABOUT THE AUTHOR

Nathan Heazlewood is a GIS Programme Manager from Auckland, New Zealand.

Opinions are his own and do not necessarily reflect the views of his employer or associates.



Deciding Between **FOSSGIS** and **Proprietary Software** in the **Enterprise**

FOSSGIS (Free and Open Source Geographic Information Systems) is an umbrella term for Open Source GIS projects. In the following article, Tim Sutton (QGIS project chair and director at Kartoza Pty Ltd.), explains how and why FOSSGIS makes its way into an enterprise environment.

IS FOSSGIS READY FOR THE ENTERPRISE ENVIRONMENT OR IS PROPRIETARY SOFTWARE BETTER?

Let's start with the hypothesis that, as a GIS professional, you wish to 'tool up' with the optimal set of software and hardware needed to carry out your duties. Having good instrumentation to measure what is the 'best' software is thus critical. In my mind, there are two main considerations at play when measuring optimality. The first is cost. This encompasses both the 'sticker price' of a given product and the attendant costs of using and deploying a product in a production environment. Hardware, training, overheads in deployment/provisioning within the enterprise, the efficiency of the toolset (as relates to worker hours needed) for carrying out tasks, and so on,

all contribute to the costs of your deployment.

The second consideration for measuring optimality of FOSSGIS is functionality. This relates to the tooling that a particular software package or suite of software packages provide. From a GIS

offerings, whilst focussing on the rich functionality, including auxiliary functions such as the provision of support and maintenance releases etc. In contrast, FOSSGIS emphasises often, as demonstrated in Figure 1, their cost saving advantages over that of proprietary enterprise vendors. The opposite extremes also exist; proprietary software that is cheap or even free; Open Source software that is costly; proprietary software that has a limited feature set; and Open Source software

Having good instrumentation to measure what is the 'best' software is thus critical.

professional's perspective, the toolset should cover aspects of their workflow. This includes functional requirements such as: spatial data storage, data editing and creation tools, cartography and visualisation capabilities, print production, and the ability to publish to mobile devices and the web.

that has an extremely broad feature set.

The discourse around FOSSGIS for enterprise is, unfortunately, often characterised by both sides with a sentiment of Fear, Uncertainty, and Doubt (FUD). As a result, it is easy for the GIS professional to get enmeshed in a kind of 'software zealotry' or mindset of attachment which limits 'followers' from exploring alternatives. Proponents of open source will often promote the use of FOSSGIS and try to dissuade others from using proprietary alternatives. Despite the good intentions, this 'zealotry' is an unhealthy approach which merely serves to polarise the GIS communities at a time when it is beginning to serve the requirements of existing and new enterprise users. Rather, it is better to formulate a response based on

Generally, cost and functionality, which we shall discuss in more detail below, are organisational constraints when selecting a toolset. These constraints often operate in tandem to drive the choice for the software stack used in production. They tend to be the dividing lines in the debate around which solution (proprietary or FOSSGIS) is better for an organisation. It is often the case that proprietary vendors will downplay the costs of their

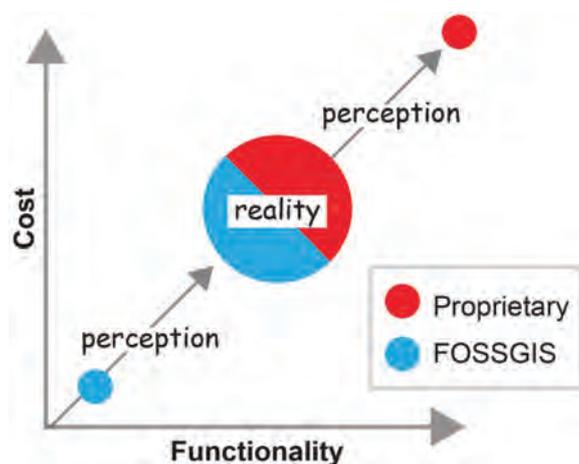


Figure 1: The FOSSGIS / Proprietary Software Misnomer.

the merits of a situation instead of using a predefined response.

In this regard, it is time to propose a more pragmatic approach to the consideration of FOSSGIS to meet enterprise requirements. This new approach, which is based on fitness for purpose, looks at problems and solutions holistically, and does not predetermine a solution based on organisational preferences for a particular software development model. Thus, deciding if a FOSS offering is 'better' becomes a more clinical process of reviewing your requirements and your budget, and evaluating the competing GIS product offerings based on the sum of value each brings to your organisation. Although this may sound like an entirely logical approach, very often important decisions are made which defy this logic.

COST OF FOSSGIS

The 'Free' in Free and Open Source Software does not refer to financial cost. Rather it refers to 'freedom' - in particular, the freedom to procure, provision, modify and redistribute the software both in binary and source code forms. Proponents of FOSS

The 'Free' in Free and Open Source Software does not refer to financial cost.

often view this 'freedom' as a critical factor in the selection of a software toolset. Rather, 'Free' should be considered as part of the functionality set of a software product - it provides opportunities to extend the software based on one's needs, and, therefore, it manages the distribution of that software under a different model to that provided by proprietary software. This is in contrast to the approach of proprietary vendors

who promote the superiority of their product (i.e. drawing on their support networks, their proprietary tools, and their extensive knowledge bases etc.)

Consider a scenario where the functional requirements for an organisation are equally serviced by both FOSS and Proprietary Software, and the differentiator for a decision comes down to cost alone. In this case, it would be unrealistic to describe the FOSS offering as free since one will need to consider the whole cost of deploying software in an organisation. If we consider the following matrix which compares both models (including factors such as training, licensing, hardware, installation/provisioning, support and customisation), we will see that, generally, there is only one area where FOSSGIS offers a zero cost advantage: licensing.

Among other considerations, it should also be noted that most Open Source licenses do not preclude the sale of the software. Rather, the license mandates that the software source code is provided together with the binary software (or in an easily accessible manner); for example, QGIS is

available as an official download for free from the QGIS website. It is also available from commercial support providers in the QGIS community who make their own (unofficial from the perspective of the QGIS project) builds available to their paying customers.

Considering the above-mentioned costs associated with FOSSGIS, it becomes evident that a review would be needed across the



different outlay areas when comparing a FOSSGIS offering with that of a proprietary vendor to identify what the expected costs will be. Proprietary vendors are at an advantage in offering pricing, since they can generally offer a 'one stop shop' for all the core services around their product. In the FOSS world, on the other hand, customers may need to either approach different vendors for different aspects of the required services, or to search for a vendor who offers the somewhat elusive 'all in one' solution. This can, however, also be seen as an advantage, especially since one can 'go to market' to find an optimally priced support company.

FUNCTIONALITY OF FOSSGIS

Making a list of the required functionality will provide a much better entry point for a comparison between two competing solutions. In my own business, I frequently encounter organisations that have taken the feature set of a proprietary vendor and then requested Open Source projects to replicate them. This is the wrong approach. It would be better to compile a list of the critical features, and then poll Open Source projects on the availability of those features. There is another key, but often overlooked, aspect of feature comparisons. In the Open Source world, it is often relatively trivial to introduce missing features into the

product. If, for example, nine out of ten of your critical features are available and the last is missing it is often still more cost effective and efficient to pay a developer to implement the missing feature for you.

In measuring the optimality of FOSSGIS for enterprise purposes for functionality, it is also important to review the ecosystem of tools surrounding a project. In QGIS, for example, there is a rich ecosystem of plugins that extend the functionality of the software. These plugins also often address specific vertical market requirements that you would not find supported in the core project. Proprietary vendors often edge out FOSS projects in terms of the vertical market add-ons that they provide. Decision-makers should, therefore, investigate the availability of these industry-specific functionality requirements first. In general vertical applications (e.g. specific

to the mining sector, military etc.) tend to be better provided for by proprietary vendors. This is a symptom of the fact that projects like QGIS rely on an interested community with the appropriate technical knowledge to build the

developers who have been funded by an organisation to implement a specific feature needed to support that organisation's work. Thankfully, in most cases at least, the time periods between initial development funding, seeing the feature or bug

... decision-makers should also consider the ability to go to the market...

software. Therefore, the more generic the functionality, the more likely that volunteers will be enticed to contribute to it.

Nevertheless, in relation to the QGIS project at least, there appears to be a trend towards the formation and funding of interest groups which are focused on developing a specific functionality (e.g. for wastewater management, cadastral management etc.) As well as including application features in a functional requirements matrix, decision-makers should also consider factors such as the ease of deployment, the ability to work without license managers and other encumbering technologies. Furthermore, decision-makers should also consider the ability to go to the market, the ability to hire a developer of your choice to support feature development, and the availability of resources for training, developer documentation, how-to's, and so on.

The support of feature development is one of the big advantages of working with Open Source projects since users are able to 'upstream' new features and bug fixes directly themselves. Although many consumers shy away from this idea initially, the ability to deploy software which is malleable to an organisation's needs and productivity gains is one of the key functional areas that should be included in an enterprise GIS decision matrix. QGIS, for example, regularly receives contributions from

fix in the code base, and then made available to the organisation to use is generally very short. Bug fixes and trivial changes can be landed within the upstream project within hours or days and can be made available to the tester the following day if one makes use of nightly builds. Even in the more conservative cases, where reliance is made on long-term supported versions of QGIS, bug fixes can be made available to official QGIS installers within a month.

A MATURE AND PRAGMATIC SELECTION APPROACH FOR 2018

As mentioned earlier in this article, in 2018, a more pragmatic and mature approach to the selection of a GIS toolset for an enterprise is required. Hardline rhetoric and sales patter, something which was pervasive in the earlier years of the 'Open Source vs proprietary software' debate, needs to be put aside. Instead, decision-makers need to address technology choices from the point of view of cost and functionality at a much deeper level (i.e. beyond simply the sticker price and feature list provided by a particular software product).

What I would like to show in future articles is that FOSSGIS can be a cost-effective alternative, with a very rich feature set that can address an organisation's needs. It simply requires that decision-makers approach the selection process in a broad and open-minded way.

ABOUT THE AUTHOR

Tim Sutton is QGIS project chair and director at Kartoza Pty Ltd (www.floodhack.org). This article represents his personal views and opinions and not those of his employer (Kartoza Pty Ltd.) or the QGIS Project (<http://qgis.org>).



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Addressing Solution, Meet your Problem

I love to listen to tech podcasts that cover new gadgets or services. I'm not a big gadget person, but I love to think through the problem that a new product or service solves.

I heard about some new offerings announced at CES, the big consumer tech show held each January in Las Vegas, NV. Razer announced Project Linda, a hardware dock for its phone. When plugged into the dock, which is basically a brainless laptop, the phone serves as both brain and touchpad. What problem does that solve? One that very few people have. I'd describe Project Linda as a solution in search of a problem. On the other hand, a new service powered by Robomart solves an actual problem. Consumers are fine having Amazon or the local grocery chain deliver packaged goods, but not produce. Robomart's solution is a self-driving produce aisle that visits the home, allowing the consumer to select and easily pay for the apples and kale.

We face the 'solutions in search of a problem' issue in the geospatial industry too. Sometimes, however, it's more of a solution ahead of its time. That's what's happening with what3words, which I wrote about in 2015. I argued that the 3m x 3m grid of the world, with each square named with three words, had limited appeal because it didn't solve a widespread problem. I was specifically concerned because the scheme removes and replaces the social constructs of addresses that people use all the time! Street addresses with meaning (8 Main Street, Cambridge, MA) or relative location (70 N Wabash, Chicago, IL) are gone. Trade.circle.rings, the Cambridge address, and loans.legend.garage, the Chicago location, remove the "main-ness" of Main Street and the relationship between two addresses on the same street. I argued that people would miss such important geographic clues, limiting the appeal of the addressing service.



What I didn't foresee in 2015 was that in 2018, what3words would solve a problem not for people, but for machines. As we start 2018, what3words is in the CES spotlight with Project Linda and Robomart. The news: Daimler AG, the automotive company, enhanced its relationship with what3words by acquiring about 10% share. Daimler had already committed to adding what3words to its Mercedes-Benz navigation system last fall.

What problem is Daimler investing in what3words to solve? It solves the problem of identifying for the navigation systems (or in time, for the self-driving car) a precise destination address. Like other map related data required by the fast evolving self-driving car industry, the address triplets are for use not by humans, but by machines.

What3words has not yet shared exactly how its addressing system will be integrated into cars. A promo video shows a driver looking at an in-car map on a console and reading off the what3words destination aloud. How did the driver find the correct three words? I suspect the driver would start by either scrolling around a map of their current location or by saying or typing an old fashioned address. When the map appears, the driver would zero in on the target on the map. Only then, would the driver click on or speak the three word name of the target 3m x 3m square. The human in this scenario identifies or confirms the three world location, but the underlying technology "makes sense" of it and uses it to determine the route to the high resolution target location. The three word address is used then discarded, rather like an intermediary geospatial data format.

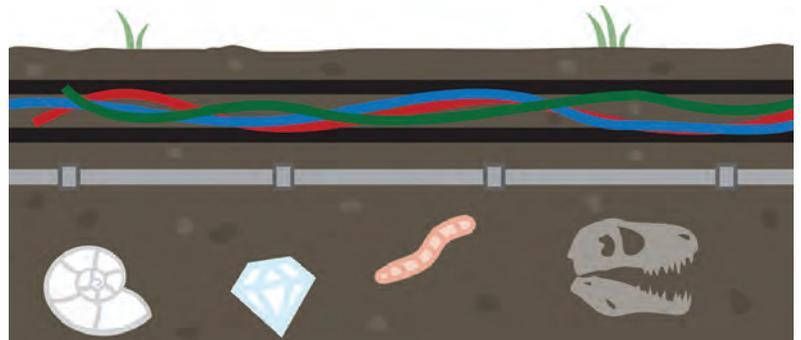
This use of what3words makes sense to me; it solves a problem. But, do not expect people to be using addresses like trade.circle.rings anytime soon when communicating with your friends and colleagues. Instead, keep an eye out for some kind of "what3words enabled" badging or logos on Mercedes-Benz vehicles in the coming months.



Adena Schutzberg has worked in geospatial technologies for more than 25 years. She is a member of the Esri Education Team.

Interview with Neil Brammall - What Lies Beneath.... Utilities and GIS

Last month Niall Conway, editor of GIS Professional, spoke to Neil Brammall of Utility Information Services Ltd., a UK-based consultancy and services business which focuses on mapping buried utilities. In the following interview, Neil shares his thoughts on the potential of geospatial solutions and services for the purposes of keeping these valuable assets (and the people around them) safe and secure.



GIS PROFESSIONAL: WELCOME TO GIS PROFESSIONAL, NEIL. HOW DID YOU GET INTO THE WORLD OF GIS?

Neil Brammall: My background is in academia where I specialised in cognitive computing (Natural Language specifically), and the start of my career outside academia was in applying this knowledge in the medical sector. In 2001, I joined Advantica, which was previously the British Gas Research Centre. That's when

the-shelf products (ArcView 3.1 back then!)

Since then, I've worked almost exclusively in the geospatial sector, specialising in buried utility mapping and particularly applied to safety and damage prevention.

GIS PRO: WHAT EXCITES YOU ABOUT THE GEOSPATIAL INDUSTRY?

NB: I think the "democratisation" of the industry via cloud delivery

opening up of an industry, but it pays to get over that and embrace the opportunities arising from the broader uptake.

As the tools get easier to use and more widely adopted, the focus is less on "making things work" and more on innovation and applications of the technology. This carries dangers as well, and it is important that the "specialists" ensure that good practice and fundamental principles are still applied.

... the "democratisation" of the industry via cloud delivery and open data is very exciting.

I started working on geospatial software - both developing mapping software and using off-

and open data is very exciting. As a "specialist", it can be easy to become defensive about the

GIS PRO: THE SUBSURFACE UTILITY SECTOR IS GAINING MORE AND MORE ATTENTION NOWADAYS. COULD YOU TELL US ABOUT THE TYPE OF WORK YOU DO?

NB: As above, I specialise in the field of underground asset mapping, particularly in the service of safe working and damage prevention. I am heavily involved in inter-utility records exchange, curating and processing asset location data from various sources, at various frequencies in various formats, and making that available in a consistent and easily-accessible way to those who need



it to remain safe (particularly in emergency situations).

Via Utility Survey Exchange, I'm also very much concerned with data quality, and how to make the transition from relative positions to high-accuracy absolute coordinates in the world of underground assets. There is a focus currently on greater sharing of data. This is a good thing, but we mustn't lose sight of the fact that the data that is shared needs to be complete and accurate (or at least of known completeness and accuracy). We are trying to start this journey from relative to absolute, and to known accuracy by making the best quality survey data available to asset owners.

GIS PRO: IN TERMS OF PROFESSIONAL DEVELOPMENT AND TRAINING IN THE INDUSTRY, DO YOU THINK THAT NEWCOMERS ARE LEARNING THE RIGHT SKILLS?

NB: I don't have great personal insight on this, but I come back to my statements above about the democratisation of geospatial. We need to make sure that the simplicity of geospatial tools and systems do not obscure the fact that some fundamental understanding of geospatial principles is still required if we're going to represent geospatial data in an accurate manner.

GIS PRO: IS GIS A TOOL OR A MINDSET?

NB: What starts as a tool becomes a mindset over time, as you realise that location is central to pretty much every aspect of our lives. The transition from "user" to "practitioner" is difficult to formalise, but it is a critical pre-requisite to becoming an innovator in the world

of geospatial - seeing beyond the tools to get to the possibilities they open up.

GIS PRO: THE GEOSPATIAL INDUSTRY IS AROUND WITH LOTS OF NEW BUZZWORDS AND THE UK IS NO EXCEPTION. COULD YOU TELL US A LITTLE BIT ABOUT WHAT IS HAPPENING IN YOUR PART OF THE WORLD AT THE MOMENT?

NB: This is a very exciting time in the UK in our sector, and the Geospatial Commission announced in the budget, plus the

and low quality regardless of how it is presented and visualised. My focus is on getting this right so that the "sexier" projects can deliver their full potential!

GIS PRO: MAPPING AND SURVEYING ARE BEING REVOLUTIONISED BY TECHNOLOGY. WHAT ARE YOUR OWN THOUGHTS ON THE WHOLE AI AND MACHINE LEARNING FIELDS?

NB: There is huge potential for innovation in this area. The areas of image recognition and machine learning could be very powerful in

... the development of 5G will be critical to geospatial in the field...

report released by the National Infrastructure Commission ("Data for the Public Good") create great possibilities for innovation.

Ordnance Survey has implemented some great innovations in terms of data services, virtually under the radar of most people, and I think their position as a quasi-governmental body is important. This allows them to "do the right thing" (which may not be the most commercially viable thing), and I see them as a "trusted broker" in the short to medium term where we are likely to see increased openness and sharing of data.

I think the development of 5G will be critical to geospatial in the field - where safety-critical data is involved, there can be no risk of losing access because of dead spots etc.

As for Digital Twins and Smart Cities - these are very exciting areas, but I keep coming back to data quality. Incomplete and low quality data will still be incomplete

the damage prevention context for identifying risks.

I also see a role for AI in rule-based risk analysis of excavations with adaptive learning based on incorporation of incident data and root cause analyses.

Automated excavation is an exciting area, again with elements of machine learning incorporated in order to avoid accidental damages.

GIS PRO: FINALLY, AND NO GEOSPATIAL INTERVIEW IS COMPLETE WITHOUT A TECHIE QUESTION, WHAT'S YOUR FAVOURITE GIS SOFTWARE?

NB: Primarily Esri (from ArcView 3.1 through to ArcGIS Online) and also FME. I also write many of my own tools and utilities on top of the Esri stack to carry out specialised activities in data processing and transformation, which keeps things interesting!

Neil Brammall of Utility Information Services Ltd.



Understanding... Wavelengths for Remote Sensing

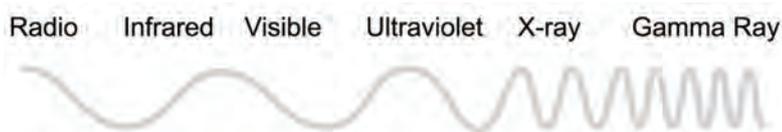
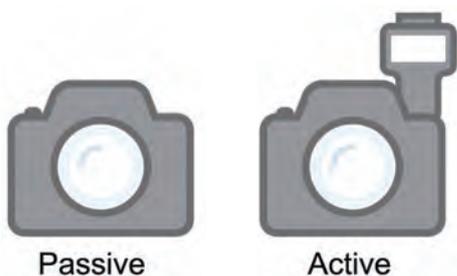
At a time when satellite imagery is in abundance, it is important for geospatialists to have a deeper understanding of the data which they are working with. In the following article, Niall Conway examines, in a light hearted manner, some of the important concepts behind light wavelengths, and how they relate to remote sensing activities.

Writing about stuff like remote sensing, satellites, and real-time imagery is all great fun up to a point. It's when the experts of these fields start to discuss the more technical aspects that things can

A wavelength refers to the means by which light is measured.

get uncomfortable - like colour bands, Normalised Difference Vegetation Index, or 'false' colour images. The following article will attempt to explain one of the main concepts which geospatialists may need to understand if they are ever to get stuck in an elevator with a group of physicists, wavelengths.

Imagery is captured using either active sensors or passive sensors. These sensors record the wavelengths of visible light which



are emitted from their point of focus.

A wavelength refers to the means by which light is measured. One wavelength refers to the distance between two successive wave troughs or crests. As such,

infrared waves. These are somewhat smaller than radio waves (about the width of a pinhead) and they emit heat. A good example of infrared light is the type of kitchen lights used to keep food warm in a restaurant.

After infrared waves, we're at the point when waves start to get really, really, really small... as in the size of molecules, atoms and nuclei.

First come the type of waves which keep map-makers in employment - **visible waves.** As the name implies, these are the only waves in the electromagnetic spectrum which humans can actually see,

light is categorised into different types within the electromagnetic spectrum - with each type depending on the distance between the emitted wavelengths.



The largest types of waves are called **radio waves.** These are used to transmit television and radio programmes. They can either be very big or very small (i.e between several hundred feet and the size of a coin.)

After radio waves, we get into the waves for optical communications. The first optical waves are called

and each colour in the spectrum appears in the same sequence as it would in a rainbow. Red has the longest wavelength (followed by blue and green), and violet has the shortest wavelength.

A blink of the eye later, we're back into the invisible wavelengths territory! First up, and moving on from the final colour in the visible



obvious ones. If, however, you want to learn more about X-Rays just ask your local doctor - I'm sure he or she will be delighted to discuss the electromagnetic spectrum. Especially if it's on the clock!

The final and smallest wave which we know of is the **Gamma Ray**.

The key thing to remember when it comes to the electromagnetic spectrum is that, although visible waves are the only ones which humans can see, the other categories of waves are, thanks to more sophisticated sensor technology, being captured and put to greater use by remote sensing experts.

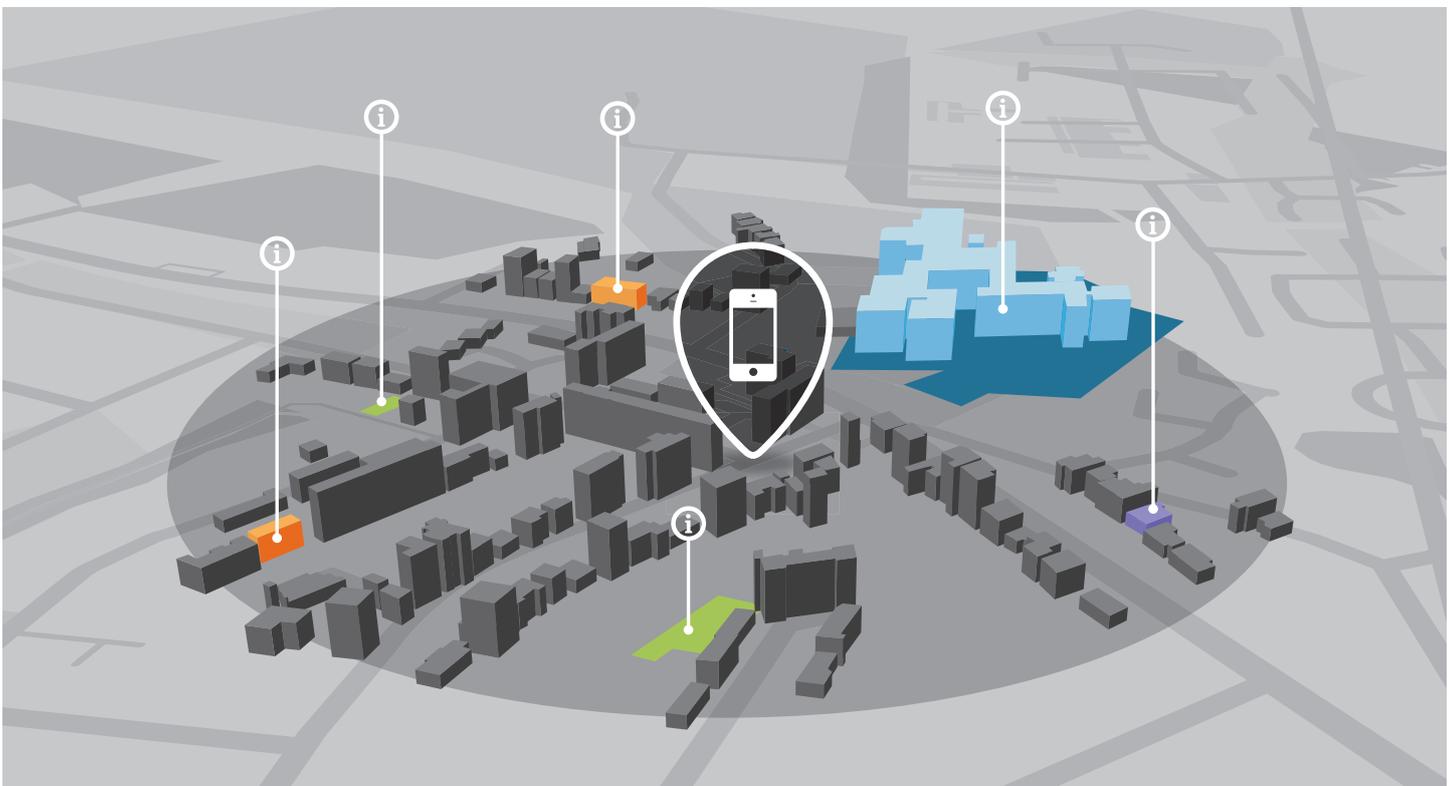
spectrum, is **ultraviolet**, or UV waves. These type of waves come from things like the sun or high power welding machines. Due to the radiation emitted, UV waves can be very dangerous if over-exposed to them!

After ultraviolet, we're into the world of **X-Rays**. These are pretty

... the other categories of waves are... being captured and put to greater use by remote sensing experts.

However, unless you are working in the advanced medical sciences or spend your time fighting aliens, you probably have little use for these rays!

Ultimately, this will help us to build up a more comprehensive understanding of what is going on with our planet. Exciting times ahead.



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Development of Spatial Grids and the Structure of Spatial Data Models

During the AGI's Annual Conference, GeoCom2017, on 25 November 2017 at the Royal Geographical Society in London, I was asked about our journey so far toward a 'smarter way of mapping the world'. I was also asked by the convenor, Rollo Home, about the challenges which face us in the fast changing climate and economy. The question: "Are there better ways to quantify, model and predict geospatial data, which are growing exponentially?"

In the current context of Big (Geo) Data, in general, and Smart Cities, in particular, accurate positioning is increasingly important. In addition, remote sensing and ground surveying offer centimetre and millimetre accuracy respectively, these techniques typically still rely on the legacy WGS84 coordinate system. As a trained geologist, however, I'm keenly aware of the dynamic nature of the earth's crust, in the same way that I, as a GIS professional, am aware of the inherent complexities of projections and datums.

"So what's the fuss", you may ask? Well, I'd like to draw attention to

the fact that Australia's CSIRO just proposed an entirely new datum update in response to a tectonic challenge which has, I should add, displaced some locations by as

Are there better ways to quantify, model and predict geospatial data...

much as 1.5m on the old global datum, WGS84. This applies to the northern hemisphere as well, I should add.

As a career proponent of standards, I once discussed at an ESRI meeting how, in the North

American (geologic) Data Model (NADM), the spatial object model carries the notion of "concept vs. occurrence". Details of lithology can vary over time as field work progresses, but the location of map units typically will not. In other words, in distinguishing the metadata from geolocation, one can create an abstraction of spatial objects separate from geodetics that can vary over time. Considering this, the 2002 NCGIA Second International Conference

on Discrete Global Grids should be considered as an excellent introduction to discrete grids as a global mapping reference, recently popularised by what3words.

Data models are, however, in my opinion, more effective, when proposed by a community as a standard. Open Geospatial Consortium (OGC), for example, proposed just last November such a standard for a Discrete Global Grid System (DGGS). As per the OGC's announcement "The goal of DGGS is to enable rapid assembly of spatial data without the difficulties of working with projected coordinate reference systems. The OGC DGGS Abstract Specification standard defines the conceptual model and a set of rules for building highly efficient architectures for spatial



Panel of speakers at GeoCom17.

data storage, integration and analytics.” It concludes: “One of the core contributions of a DGGS is geospatial data fusion on demand. In a multiple provider environment, fusion is only possible with an information system architecture

implementations.” In this context, the efforts by the Australian DGGS co-sponsor, CSIRO, is illustrated.

Meanwhile, back at AGI GeoCom17, delegates were intentionally “challenged to think

- Do robotics ‘think’ or work in Cartesian coordinate space?
- Are base 2 or 10 the best calculation primitives there are?
- How about “good enough” or “close enough” computation?

One of the core contributions of a DGGS is geospatial data fusion on demand.

based upon open standards. The OGC DGGS Abstract Specification provides a platform to enable interoperability within and between different DGGS implementations, while promoting reusability, knowledge exchange, and choices in the design of individual DGGS

about the developments of spatial grids and the structure of spatial data models”. Questions which I presented included:

- Are coordinates, projection, datum etc. always à-propos?
- Are there better frameworks for real-time crowd-mapping?

To conclude this reflection on the state of grid reference systems in 2017, it is both a challenge and an opportunity for GIS professionals to provide the best underpinning for geodata to an industry which is beginning to embrace the complex worlds of IoT, robotics, autonomous vehicles etc. Therefore, just like a swarm of starlings in flight, is the ultimate challenge in geo-robotics instead not to automate geo-location in real-time?

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My Adventures in the Agtech Start-up Space

In the following article, which is an adaptation of an earlier blog post, Todd Barr, an experienced geospatialist who is based in Fort Collins, Colorado shares his thoughts on the emerging Agtech industry; one which is embracing modern technology and skills in order to increase both efficiencies and bottom lines. The following is what geospatialists should, according to Todd, know about Agtech before deciding to pursue a career in the industry.

Agtech and AgData start-ups seem to be all the rage right now. While searching on the job market recently (having finished an earlier contract), I decided to engage with and learn more about the opportunities within this emerging community. I reached out to a number of people, inside and outside my network, responded to job adverts, and received more than a dozen interviews, some with firms dedicated to agriculture, and some Ag-adjacent.

Of those interviews, 10 of them were informative ones, while the rest were formal HR interviews. During this time, I also spoke with CEOs, CDOs, senior tech people, as well as with so-called 'Spatial Argonomists'. It's worth mentioning that this is a report on my own experiences - therefore, it's all qualitative. Since, it was not mentioned that I would subsequently write about my experiences from the interviews, names and company details have been withheld.

STARTUP DEMOGRAPHICS

Most of the firms I spoke to were less than 30 people; one or two were slightly above 50 people. They were geographically dispersed across the United States, and only a quarter was based in Silicon Valley. The companies were mainly VC-backed start-ups that stood separate from larger firms. The rest were mostly in the midwest, in either college towns, or the local major city.

Apart from the Silicon Valley-based firms, most of the firms would not provide a relocation package, and remote work was only an option for one of the 17 firms, meaning that attracting talent from the major tech centres was, apparently, not a priority. Relative to the required skillset, salaries tended to be on the low side for the region, and the senior position salaries were in the mid-range.

Although the firms offered typical insurance packages, few of them offered any equity or profit sharing

incentives, nor did they offer any continuing education packages. This suggests that the companies were more focused on employing local talent with limited experience than they were on acquiring more diverse and experienced skills which would help to develop their product.

Over the course of my engagement with these companies, I asked a number of questions. I have been in this game for a long time, and therefore know that it is a good idea to ask tough industry-specific questions during an interview.

Firstly, I asked about the current 'burn rate' of these firms, including their forecast on how much longer their current funding round would last. Excluding those who had recently received funding, the answers fell within six months to a year. Some were very sure they would get the next round of funding before they would run out. Others weren't so optimistic; with some indicating that they were increasing sales teams in order to either break even or generate a profit.

My second question focused on who the firms saw as their major competition. Most of the respondents indicated either major equipment manufacturers, seed producers, or local partners to these large firms, who are beginning to expand their services to include Agtech offerings. The reason for this is because those larger firms have the capital backing to build those groups, without the pressure to become profitable immediately.



My third question sought to understand the five to ten year ambitions of these firms. Some indicated an intent to sell as soon as possible, others indicated that by 2020 they would still be seeking funding (which isn't unusual for a startup), while many others, including CEOs, indicated that 2025 was beyond their current focus.

My final question concerned their own motivation, and what keeps the owners awake at night. Oddly, perhaps due to the difficulty of the question or the broad nature of it, this question did not evoke much of an answer. Some mentioned failing employees, while others feared the difficulties of partnerships (i.e. a major seed producer partnering with a large Business Intelligence software provider).

ANALYSIS

On reflecting upon some the questions, my feeling about the Agtech startup industry is somewhat ambiguous. Many of the firms seem to have only a year or so on solid ground, meaning that any position with these firms would either be constantly at risk or short term.

Coupled with the lack of incentive to relocate, successful applicants could be forced to move, at personal expense, to a somewhat insecure position, in an area which may have little in terms of alternatives in case that job is lost. It is, after all, worth remembering that more rounds of funding can very often increase the likelihood of a firm being sold off by its VC backers.

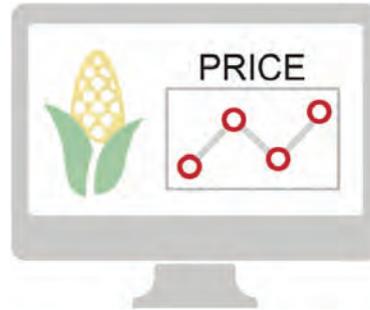
The answers to my question about competition in the industry were, for the most part, concerning. Farmers are already getting many of these services through a pre-existing, trusted provider as part

of their equipment budget. Many respondents seemed unaware of the actual added-value of their product or service, and, more importantly, why customers should swap over. Coupled with the current low commodity prices and the risk adverse tendency of farmers, the career opportunity which this industry presents to geospatial professional is questionable. Considering this, it seems as if the only businesses which will be able to profit from the industry are the large Agri-businesses which can sustain inevitable losses. For this reason, it is difficult to see how Agtech startups will be able to compete with the more resilient and capital-rich corporate model.

Some responses suggested that there is a lack of vision within the Agtech industry. Although it is less difficult to see three years out, ten-year business plans require a commitment and understanding of how a firm and its staff members should evolve and grow. In other words, staff members should not be treated as a dispensable commodity.

I found the answers regarding motivation from the owners to be the most perplexing. Lots of considerations should, after all, play on the mind of a business founder. Few respondents, for example, seemed to fully understand what was happening outside of their field and business. Although founders need a certain amount of "tunnel vision" in order to succeed, data-driven Agtech companies need at least a basic knowledge of commodity trends if they are to do so.

Based on the above experience, my impression is that most Agtech startups will not survive beyond a few years. With low commodity prices making the mid to large-



sized farms less profitable, Agtech companies will face a tough battle for customers of their technology, especially while current profit margins remain razor thin. Therefore, my prediction is that much of the talent and tech of these smaller companies will, eventually, be scooped up at a rock bottom price.

FINAL THOUGHTS

Agtech startups are bringing unique views and concepts, which are helping to advance the agricultural field. The community contains an amazing mix of ideas around data capture and processing, as well as ideas around big data, geospatial data, unstructured data, and real-time data. Despite the culture of innovation which surrounds it, the current state of the commodities market means that most of the startups may not survive until the market rebounds. Meanwhile, the established agricultural firms, which will undoubtedly benefit from an influx of technology from these startups, will, thanks to their sizable advantage, become smarter, more efficient, and more dominant.

ABOUT THE AUTHOR

Todd Barr is an adjunct instructor at Northeastern University and has over 20 years of experience in GIS/Data analysis and is currently focused on the field of Precision Agriculture/General Remote Sensing, working with both large agri-business as well as smaller independent farms.



Leveraging Social Media Platforms

“These portable batteries came in handy! Lol #poweroutage.” When power outages happen, customers talk about them on social media. DataCapable has created a solution for utilities to use social media as an outage reporting tool and to engage their customers.

DataCapable delivers nontraditional data to electric utilities and telecommunications providers via its customer engagement platform UtiliSocial. The platform integrates with the Esri ArcGIS Online collaborative platform to share maps, scenes, apps, and other content. UtiliSocial locates and aggregates social media

commentary and maps outage reports in real time so that utilities know where events are happening and where to send crews to get the lights back on #powerrestored.

Utilities can use GIS tools to query and display social

media event data, analyse consumer demographics and behaviour, and better understand their customer's lifestyles. Bringing GIS analytics into the social media sphere gives companies a platform for two-way engagement with their customers. They can see where their services are in demand, and get insight about people's perceptions on their services. Social media intelligence and GIS helps companies know where to target services and know if people are ranting or raving about them. They can then act.

Using DataCapable software, companies extend their outreach and better engage their customers via popular social media platforms. EventCast is DataCapable's newest module in its UtiliSocial platform. EventsCast is an ArcGIS Online adapter for Facebook. When a company creates a map, EventsCast automatically pushes the map to the company's Facebook page. Companies can easily update maps with shared sensor data, imagery, weather, outages, and other GIS datasets.

Leveraging the power of Esri's ArcGIS, DataCapable's clients see the situation faster and have more rewarding interaction with customers via the platforms they prefer. DataCapable will continue to help forward thinking businesses improve operations.



During Hurricane Irma, DataCapable helped utilities map and analyse damage and power outage related imagery, as shared from social media networks.

ABOUT THE AUTHOR



Katie Decker is the Community Manager for the Esri Startup Program, a free three-year program that gives emerging businesses the tools to build

mapping and spatial analytics capabilities into their products.

As Community Manager, Katie enables hundreds of startups to successfully leverage Esri's technology and global business network. She also helps to foster their collaboration with a wide array of organisations and industries such as - local, regional and national governments, utilities, transportation, natural resources companies, commercial organisations and more.
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Recognised as the 1st ArcGIS adapter for Facebook, EventCast allows customers to engage with their utilities on the social media network they prefer.

The AGI – It's all about Collaboration

If there's one thing the geographic information industry is good at, it's creating tools that get us from A to B. In other words, we're brilliant at delivering a great strategy. While speculation is only to be expected from the community, we've been told that the new Geospatial Commission does have a very firm and specific strategic remit – to derive greater value for UK plc from the many agencies which are creating or using geographic information in government.

If we cast our minds back, the AGI was created in 1989 as one of the outcomes from the long-awaited Chorley Report. The report examined all information on the future handling of geographic information in the UK, and took into account developments in information technology and of market needs at the time.

If you, like I was at the time of its release, are not familiar with the Chorley Report, then please be assured that it is not the most exciting of reports. What it does best, however, is remind us of how far we've come, and how much further we still have to go. Pulling together feedback and evidence from over 400 organisations, there were some significant findings, which, almost 40 years later, sound a little familiar. This includes points about the inherent misunderstanding of our work, as well as the enduring struggle by the industry to communicate the significance and potential of its products and services. Thankfully though, some things are very different.

In 1989, Lord Chorley's team was given a wide-ranging remit for their work. They were asked to question the value of geographic information; what it would be used for; the difficulties in handling spatial data, and how they could be overcome. They were also asked about the benefits which could be derived from sharing data sets, and how that could be achieved, with integrity and confidence, for the data users. They were even asked about the lessons which could be learned from studying related overseas developments. Today's Geospatial Commission will focus on bringing together the 'cousins' of government in order to maximise the value of the UK government's locational data, and, as an outcome, to help create jobs, and stimulate a vibrant and innovative economy.

Against the backdrop of such an ambition, the Commission will also be discovering that what we're experiencing, generally, is a slow but sure change in

the way location data is being used, both inside government and outside. Sector-wide, we're all moving away from project-based professional silos towards more integrated outcomes that have greater social and economic impacts.

The problem with any system is that the more of them we develop, the more we need to accelerate that development. This makes getting ahead of the curve quite difficult. What the Geospatial Commission will be doing, to some extent, is trying to avoid a scramble at the top of that 'Law of Acceleration' curve within government. It will focus on delivering a positive outcome which both supports innovation and enables the momentum which is yet to come. Considering the above, the good news is that the AGI organisation exists for the purpose of delivering benefits across, and for, the UK's geospatial community which can help the Commission to achieve its objectives.

The AGI's National Groups commercial interests will be impacted positively by the outcomes of the Commission's work; and we are uniquely and ideally placed to source independent views that can help shape the future of GI in this country. Furthermore, one of the government-mandated responsibilities that we have as an organisation, is to deliver and maintain a suite of geospatial standards in the UK. This is a key factor in bringing the same government's data and organisations together effectively!

Over the coming weeks, we will deliver a programme of activities that engage our members' views, especially in relation to the forthcoming Geospatial Commission. We will start with a special AGI Breakfast Briefing, so please follow all of the latest news by following @geocommunity on Twitter or via our member newsletter. There will also be a Briefing report made available shortly after the event, which will start to bring our members' views on the Commission's work together. On a personal note, in 2018 and beyond, I look forward to the exciting pace and momentum of change in our industry. I also look forward to meeting with as many of our members as possible, and to learn about their views on the future of the UK's GI industry.



Abigail Page is Chair of the AGI's Council, which is formed from elected members of the AGI. Its main role is to set the strategic direction for the organisation. www.agi.org.uk

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- How will the Commission's work affect you?
- Which challenges can we address, together?
- What do we hope the Commission will achieve?
- What will support the GC's plans for sustainable success, not just for our industry but for the UK as a whole?

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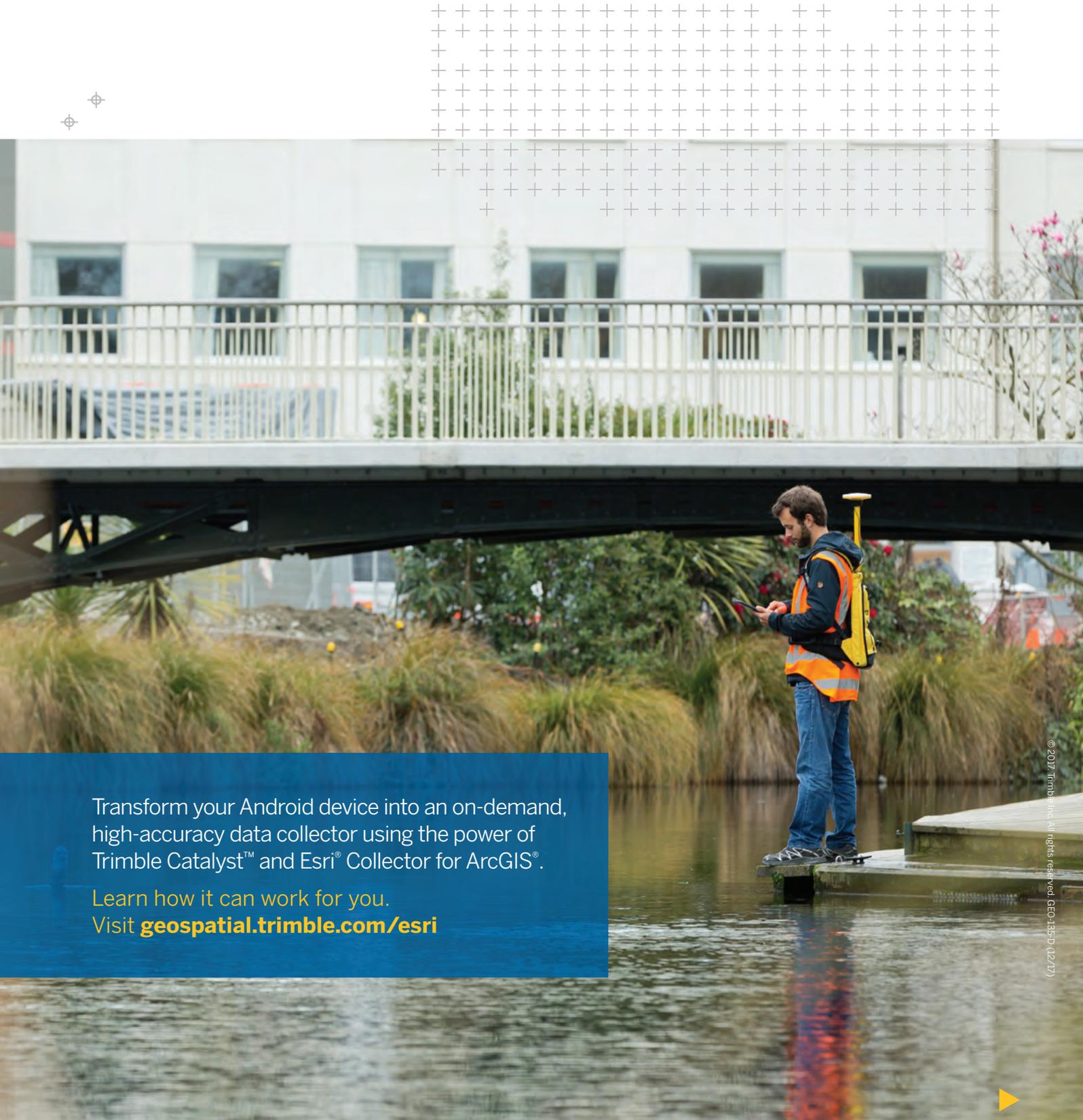
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