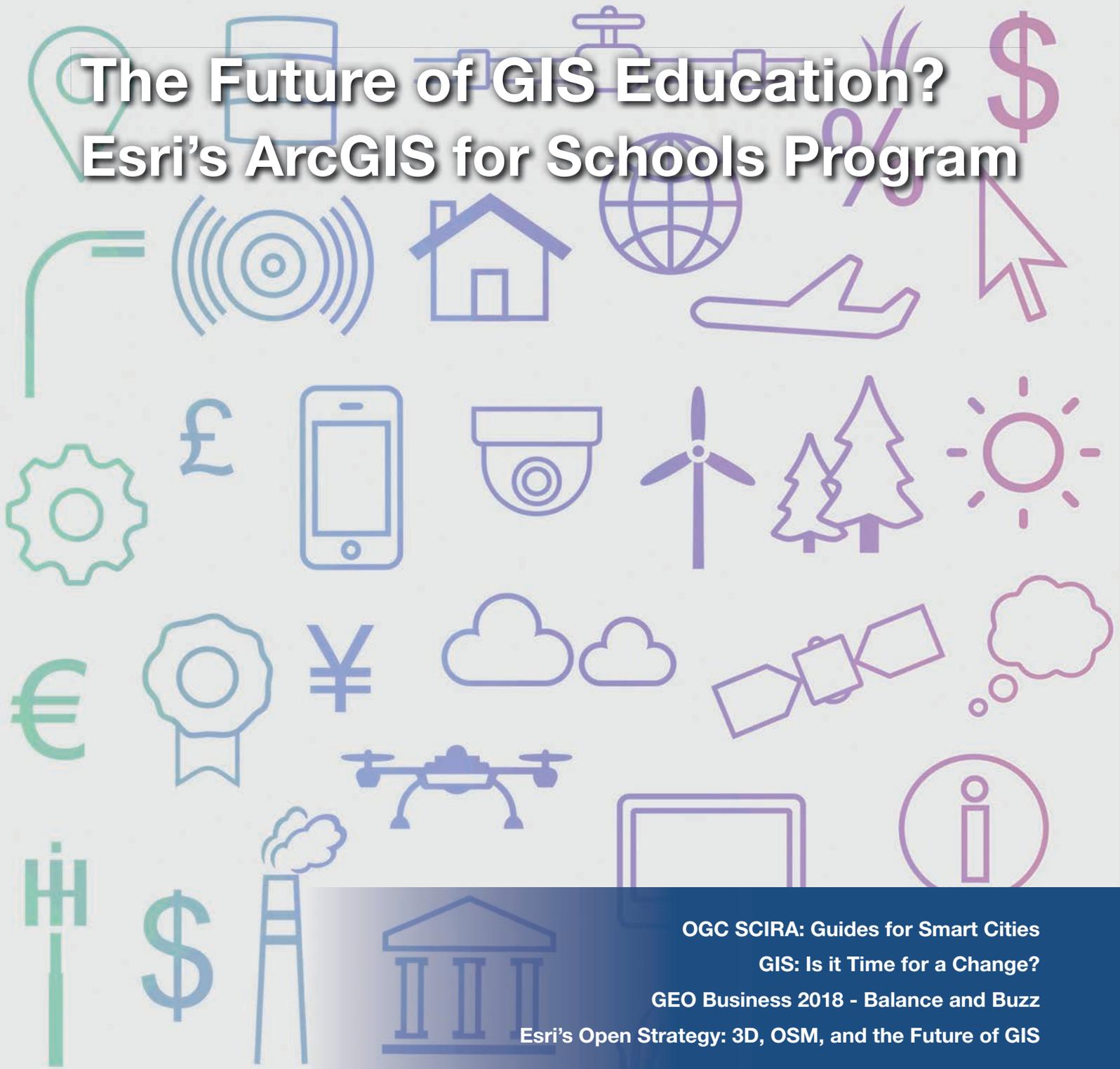


## Location Technology Insights

# The Future of GIS Education? Esri's ArcGIS for Schools Program



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Various images representing GIS. Image credits to Niall Conway.



**P. 10 GUIDES FOR SMARTER CITIES**

Josh Lieberman and Simon Chester explain how the OGC's SCIRA initiative will be used to future-proof Smart Cities using Internet of Things (IoT) technology and geospatial information.



**P. 13 ARCGIS FOR SCHOOLS**

Niall Conway reflects on his recent experience at the Esri UK Annual Conference and explains why awareness of GIS is likely to become more prevalent in years to come.



**P. 18 GIS: IS IT TIME FOR A CHANGE?**

Linda (Hecht) Stevens shares her insights into how disruptive start-ups and larger tech companies are changing what it means to be a geospatialist in today's world.



**P. 20 GEOBUSINESS 2018 REVIEW**

This year's GeoBusiness conference, held on 22-23 May in London, was, according to Geomatics World editors Ian Dowman and Richard Groom, the biggest and best yet.



**P. 24 3D, OPEN, AND THE FUTURE OF GIS**

Niall Conway speaks to Satish Sankaran and Chris Andrews about their work on Esri's 'Open Strategy' and about where the GIS industry is heading.



**P. 26 GENDER BALANCE - MY TWO CENTS**

Although the gender imbalance continues to exist in the geospatial industry, there are encouraging signs that this is beginning to change, writes Niall Conway.



P. 05	Editorial	P. 28	The View from Here
P. 06	News	P. 29	AGI Chair's Column
P. 16	Augmented Reality App	P. 30	Calendar

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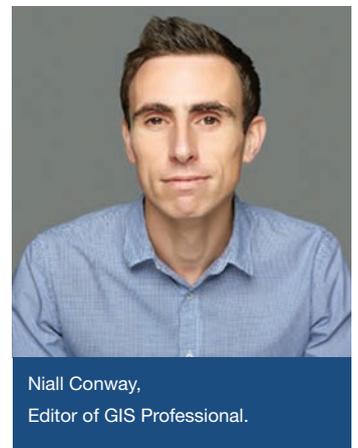
# GIS Education is Key to Our Future

**Last month, while travelling from Konstanz, a town in the south of Germany, to Memmingen airport, I engaged in a conversation with a fellow train passenger. After discussing the German football team's shock early exit from the World Cup, our conversation turned to a far more worrying subject - the condition of the rural landscape on the other side of the train window. "Our nature is in major trouble. And we don't know what to do about it", he said. The gentleman noted that over the past 20 years insect, bird and wildlife numbers, have in some parts of the country, plummeted by as much as 80% - an issue which he explained as a result of mono-cropping activity in the agricultural sector, combined with an over-use of pesticides.**

This conversation has stuck with me ever since, mainly because it instilled in me an even greater belief that skills for monitoring the condition of the planet are urgently needed. This sentiment was underscored by the fact that I had, just a few weeks beforehand, covered GIS educational developments while attending the Esri Annual Conference in the UK. You can read more about the excellent ArcGIS for Schools program in this edition of GIS Professional and learn about the Dangermond's vision for a world which is based on better-informed decision-making. As with every great initiative, change should always start at the grassroots level.

In addition to this article, we also have some excellent contributions from both regular and new authors. This includes an interview with Jack Dangermond's

California-based colleagues, Chris Andrews and Satish Sankaran, who discuss Esri's 'Open Strategy', along with its relationship with the OpenStreetMap project. We also have an article on the OGC's standards development activity in the field of Smart Cities, a review of the recent GeoBusiness 2018 conference in London, along with a piece on Aligned Asset's exciting innovations in the field of augmented reality to support government and emergency services.



If this was not enough, the August edition also includes some new perspectives on the topic of gender balance in the geospatial industry, an article by Linda (Hecht) Stevens on how GIS needs to reinvent itself by adopting the same AI and data analysis approach of Silicon Valley companies, as well as quality contributions from our regular columnists Abigail Page and Adena Schutzberg.

Once again, I'd like to thank all of our advertisers, industry supporters, readers, and contributors for making GIS Professional the leading publication which it is today. Finally, a special note for our UK readers to check out the AGI's upcoming GeoCom conference which will be held at the Royal Geographical Society (with IBG), in London on 8 November.

I hope that you enjoy this edition.

Niall Conway, Editor

## FAA Relaxes UAV Restrictions with Ten New Programs



In a move which will surely be welcomed by the US geospatial industry, the Federal Aviation Administration (FAA) has announced ten UAV programs

which will demonstrate the possibilities of the technologies for “worthy” purposes. The chosen projects, which will benefit from significantly relaxed restrictions on drone uses, will be used for experimental reasons only.

The FAA has so far taken a strict safety-focused approach to UAV operation due to public concern around unsightliness, potential collisions and noise pollution. Commercial operators are currently required to apply for permits (often a timely process), and are limited to day time operations and line-of-sight flights only.

The new Integration Pilot Program indicates that the FAA (and possibly other aviation authorities) are relaxing these restrictions and opening up the skies for the sake of both innovation and necessity. The ten drone programs will be based on extensive collaboration between multiple parties and stakeholders within jurisdictions such as Memphis, San Diego, Florida, Alaska, North Dakota, and Oklahoma.

Drone operators, builders, universities, state, local, or tribal governments will all collaborate with well-known companies such as PrecisionHawk, Intel and FedEx. Out of the 150 applicants, only “worthy” projects were chosen by the FAA - meaning that the consumer use of drones such as for package delivery will need to wait for now. Projects accepted under the program include those in industries such as health, environmental monitoring, and transportation (for vital supplies).

## Google Brand Damage Vs Business Opportunities



Following pressure from both inside and outside of the company, tech giant Google has decided to end its work on an artificial intelligence project with the US Pentagon when the contract expires in March 2019.

Project Maven is considered the first attempt by the US government to explore the possibility of outsourcing the use of lethal force by the US military to Google’s machine learning and AI skills and technology. The project would have undoubtedly relied on Google’s considerable resources and capabilities in the field of geospatial technology in order to carry out its work - presumably to locate and distinguish potential threats and targets from drone videos.

According to reports, employees and senior staff at the company were deeply conflicted on moral and ethical grounds, and the decision follows numerous resignations at the company and a protest petition signed by 4,000 Google employees.

## what3words Partners with TomTom

what3words, which uses a 3 word addressing system to help users find hard to reach locations, has partnered with mapping and navigation giant TomTom. The deal will integrate the former’s platform with TomTom’s consumer and business products later this year.

This deal represents the latest example of what3words’ efforts to license its technology to businesses. The partnership with TomTom, a company which provides GPS-enabled services and devices, as well as a powerful online mapping platform, represents the focus among location-driven companies to deliver easy to use solutions to the industry.

## The World Bank Releases Spatial Agent App



The World Bank has released a free Android and iOS app, called Spatial Agent, for visualising open spatial and temporal data for developing an interactive mobile platform.

Spatial Agent collates thousands of public domain spatial datasets to provide a robust, comprehensive and on-demand visualisation solution to global developmental challenges (in areas such as poverty reduction, infrastructure development, flood mitigation, and sustainable agricultural practice.) Available datasets and analytical services come from over 300 diverse web sources, such as the UN, ESA, NASA, NOAA, along with numerous research institutions.

Using quick data analytics, Spatial Agent is designed to support planners, policy and decision-makers to make data-driven decisions which align with the principals of the UN’s Sustainable Development Goals, as well as with the 2030 Agenda for Sustainable Development.

## MapInfo Pro v17 Designed for Easy of Use

Pitney Bowes has become the latest GIS software provider to embrace the industry's preference for simplicity and 'easy to use' among government and business analysts. MapInfo Pro version 17 is being designed (based on testing) for a more simplified user interface within robust GIS software and for ensuring undeterred productivity. Key improvements in v17 include quick access tools for streamlined workflow, better integration with the Pitney Bowes Data Marketplace, integrated cloud services, and access to the Li360 customer collaboration community.

## Verizon Halts Data Sale

Verizon, an American telecommunications company, has recently promised to cease the sale of data that can be used to locate its mobile users to third-party intermediaries. The move comes in response to a revelation by a US senator, that his company had purchased real-time location-tracking data from users without their permission.

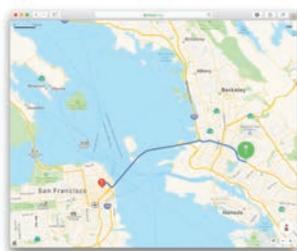
## Microsoft contributes to OpenStreetMap



Microsoft has made a major contribution to the OpenStreetMap project by releasing 125 million building footprints in the USA to the open source community. This adds significantly

to the 30.5 million US building footprints which were already available. The data is the result of significant efforts by the tech giant to use deep learning and artificial intelligence for the purpose of analysing satellite imagery. The footprints will be available to the public via Bing Maps and Github, which was recently acquired by Microsoft.

## MapKit JS Announced



MapKit JS, an online mapping platform, has been released to enable developers to embed interactive Apple maps. The Javascript library also allows developers to annotate points of

interest and to perform geo-related searches. MapKit JS requires authorisation via JSON Web Tokens (JWT) for initialisation and some API calls. The keys used to create the tokens can be acquired on setup of an Apple Developer account.

## UK Space Agency Works on Independent Satellite System

The UK Government has confirmed that the UK Space Agency will lead work to develop options for a British Global Satellite System that will provide both civilian and encrypted signals and be compatible with the GPS system.

The UK is already a world-leader in developing satellite technology, building 40% of the world's small satellites and one in four commercial telecommunications satellites. UK companies have made a critical contribution to the EU Galileo programme, building the payloads for the satellites and developing security systems. The taskforce will draw on this experience and expertise as it develops plans for an innovative system that could deliver on the UK's security needs and provide commercial services.

Business Secretary Greg Clark said "We have made our position clear to the European Commission and highlighted the importance of the UK to the Galileo programme. It is now right that we explore alternative options to ensure our security needs are met as we continue to take full advantage of the opportunities that exist in the global space sector, through our modern Industrial Strategy."

The Government has been clear there is a mutual benefit to the UK remaining involved in Galileo and is working hard to deliver this. Without the assurance that UK industry can collaborate on an equal basis and without continued access to the necessary security-related information, the UK could be obliged to end its participation in the project.

The recent Blackett review estimated that a failure of navigation satellite services could cost the UK economy £1 billion a day due to position, navigation and timing information being increasingly essential for defence, infrastructure and emergency response.

## Ordnance Survey Ireland Introduced Online Housing Data Tool

Ordnance Survey Ireland has collaborated with Maynooth University and Dublin City Council in order to promote data-driven decision and policy making relating to the country's housing and property market. The Dublin Housing Observatory (DHO) combines property and rental price data with local authority, tax and statistical datasets into a freely available online mapping resource. So far, the tool has helped highlight some interesting patterns across cities, including clusters of 'empty nest homes' in certain parts of Dublin - a city which is currently experiencing significant rent increases.

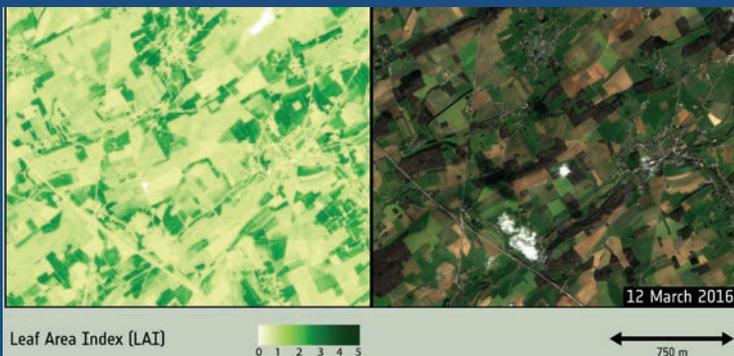
## ESA Announces Monitoring Approach for CAP

The European Space Agency (ESA) has announced an innovative monitoring approach for the European Common Agricultural Policy (CAP). The move follows a proposal by DG-Agri for the Sentinels for Common Agriculture Policy (Sen4CAP) project, in which data from the satellites and other Earth Observation missions can replace the physical visits to farms, including the checks that are necessary for the EU to issue payments to farmers.

ESA Copernicus program will demonstrate how the Sentinels can modernise and simplify agricultural policy and decision making. The announcement will be of particular relevance to EC bodies such as DG-Agri, DG-Grow and DG-JRC, as well as the 22 million farmers in the CAP program.

Phil Hogan, European Commissioner for Agriculture and Rural Development, said “This new satellite technology will significantly reduce the number of field inspections. It will also benefit public administrations, by reducing the costs of administering controls and checks.”

The modernised CAP monitoring program will rely on accurate data collected from Copernicus program satellite missions, as well as on powerful GIS-based machine learning algorithms for EO.



## Australian Government Backs New Space Station

Plans to develop the Australia Space station (along with the associated geospatial industry) is set to receive significant support from the Australian government. In the recent 2018 budget announcements, the federal government committed AU\$260 million funding to Geoscience Australia to complete this project, with some AU\$225 million being allocated to the task of redeveloping the country’s satellite-based positioning infrastructure.

Approximately AU\$160 million will be allocated to the development of a dedicated Australian SBAS (Satellite Based Augmentation System), which will aim to improve the accuracy of GPS coverage (up to 10cm). Meanwhile, the remaining AU\$65 million will be invested in the data provision services for Australian GNSS and spatial data users. The National Positioning Infrastructure Capability (NPIC) is expected to deliver 3m precision in areas with mobile coverage.

## Australia’s Open Data Cube Adopted by Africa



Global interest in Australia’s Open Data Cube technology seems to be gaining traction, as governments in numerous African countries have recently adopted the system for the purpose of

achieving their respective development goals. This is according to updates from the Africa Regional Data Cube (ARDC) workshop in Nairobi, Kenya, which took place in May, where countries and organisations announced the world’s first regional Data Cube.

The African Data Cube, which allows users to inspect changes to any geographic area over the past 35 years, will help support the development priorities of the participating countries of Kenya, Senegal, Sierra Leone, Ghana and Tanzania - particularly in areas such as urban expansion, disaster and security management. The Data Cube has also been designed to align with the objectives of the Group on Earth Observations (GEO) and the United Nations Sustainable Development Goals.

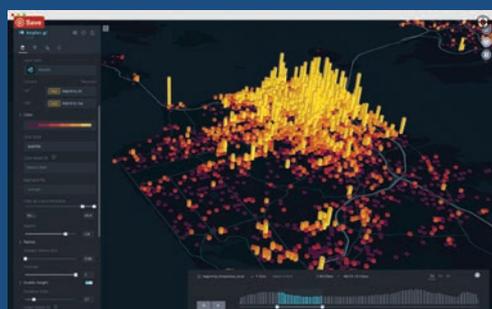
Data Cube technology originated in 2013, following Australia’s strategic decision to make use of its high performance computing facility and advances in software development, machine processing and information infrastructure to reduce the barriers to analysing satellite data. In Australia, Data Cube technology is currently used to support sustainable decision-making in fields such as environmental protection, and agricultural and flood monitoring. The technology is also credited with creating significant government savings.

## FOSS4G Asia Taking Shape



According to reports, preparations are well underway for the annual FOSS4G Asia conference which will be held 2-5 December 2018 at the University of Moratuwa, Sri Lanka. The theme of the conference will be ‘Open Source for Sustainable Development’. In standard FOSS4GIS format, the event will include workshops, keynote talks, social events, and coding sessions. Topics for papers include Geo-IoT, GeoBIM, standards, Business Innovation, Urban and Regional Planning, and more.

## Uber Switches Gears to Provide GIS Tools



Uber is continuing to establish itself as a provider of powerful analytical and visualisation tools to businesses, governments and the public. This should also be of interest to the GIS community, who are

looking for cloud based tools for so called 'data science' purposes.

The latest addition to Uber's non-ride share offering is Kepler.gl - a powerful open source geospatial toolset for analysing large-scale datasets, such as routes and locations. The tool offers developers a customisable and high performance geospatial toolbox which is built with Deck.gl, a WebGL-powered framework for visual exploratory data analysis of large datasets.

Kepler.gl allows for a rich interactive experience in which users can drag and drop a dataset (such as a CSV or GeoJSON) file into the browser, add filters, apply scales, and do aggregation on the fly. Kepler.gl is built on React and Redux, meaning that it can be embedded inside a developers mapping application. The tool also supports XYZ coordinates, which enable 3D mapping and visualisation.

## Câmara Replaces Ryan as GEO Secretariat Director



Gilberto Câmara has replaced Barbara J. Ryan as GEO Secretariat Director of Group on Earth Observations (GEO), who had been in the role for a second three-year-term.

Gilberto Câmara, is a leading researcher in Geoinformatics, GIS, and Land Use Change with Brazil's National Institute for Space Research (INPE). He has been recognised internationally for promoting free access and open source software for Earth Observation data, as well as for his early involvement with GEO and GEOSS. Under his guidance as Director for Earth observation and Director General, INPE made significant advances in land change monitoring using remote sensing, which contributed to Brazil achieving 80% decrease in deforestation in the Amazon rainforest.

GEO is a Geneva-based voluntary partnership of governments and organisations that envisions "a future wherein decisions and actions for the benefit of humankind are informed by coordinated, comprehensive and sustained Earth observations and information." Its membership includes 92 nations and the European Commission, in addition to 77 Participating Organisations comprised of international bodies with a mandate in Earth observations. GEO's primary focus is to create a Global Earth Observation System of Systems (GEOSS) to address environmental and societal challenges facing decision-makers and individual citizens.

## Geoscience Australia Receives Esri SAG Award

Esri has recognised the painstaking efforts of Geoscience Australia in using its GIS technology to search for the Malaysian Airlines MH370 plane with the Esri Special Achievement in GIS (SAG) Award. The Australian agency was selected from over 100,000 organisations worldwide to receive the award for its work in mapping the deep-seabed in search of the missing plane.

The search for MH370, which disappeared on 8 March 2014 while flying from Kuala Lumpur, Malaysia to Beijing, China, led to discoveries including underwater volcanoes, mountains and trenches, and improved the accuracy in ocean depths by up to 2,000m. These insights are expected to benefit industry, and government cooperation for future marine search.

Geoscience Australia's Chief Scientist Dr Adam Lewis, who accepted the award, said "A key requirement from the outset of the search was to create a detailed and accurate picture of the ocean floor, so that we could begin to determine what may have happened to the debris. The project itself relied on analysis of over 278,000 square kilometres of shipboard bathymetry data, and another 432,000 square kilometres of data collected on the journey to and from the search zone."

## Microsoft Acquires Github

In a move that has caught the attention of the geospatial community, Microsoft has announced its intention to acquire the world's largest web-based host of source code, Github Inc., for US\$7.5 billion. The company, which uses Git technology for distributed version control and source code management functionality, is mainly used for computer code. It is, however, also popular among developers for open-source projects such as OpenStreet-Map, QGIS, and geo-enabled javascript libraries such as Leaflet, D3, and Openlayers.

Unconfirmed reports suggest that the news was followed by a flood of account migrations to rival companies including Bitbucket and GitLab. However, loyal supporters are hoping that Github's clean interface and developer-centric approach will be prioritised over ad placement and other commercial opportunism.

GitHub reportedly hosts 57 million 'repos' or code repositories owned by an estimated 28 million users - half of these are public repositories. It also currently provides a rich range of access control and collaboration features to users, including bug tracking, feature requests, task management, and wikis for every project.

# SCIRA: Guides for Smarter Cities

The **Open Geospatial Consortium** (OGC), with support from the US Department of Homeland Security (DHS), is currently leading a process to create a Smart City Interoperability Reference Architecture (SCIRA). SCIRA will provide free deployment guides and reusable patterns that municipalities can use to plan, acquire, and implement standards-based, cost-effective, vendor-agnostic, and future-proof smart city IT systems and networks using technologies such as Internet of Things (IoT), Sensor Webs, and Geospatial Information.

SCIRA defines interoperability requirements based on a system-of-systems approach, meaning that municipalities are able to build up smart cities one project at a time, safe in the knowledge that future expansions will work with, build upon, and gain value from the systems that they're implementing.

The SCIRA Deployment Guides aim to provide plain-language guidance on implementing the architecture,

and will address a range of smart city functional areas, such as transportation and connectivity. Crucially, the guides will come in different forms for the different audiences relevant to smart city capability development, including City Managers, City IT Managers, City Innovators, DevOps Facilitators, and Commercial Providers.

A key emphasis of SCIRA will be to enhance community resilience in the face of human- or nature-caused emergencies and catastrophes, and to aid in the DHS First Responders Group's mission to "identify, validate, and facilitate the fulfilment of (first responders') needs through the use of existing and emerging technologies, knowledge products, and standards."

## OPEN STANDARDS, OPEN OPTIONS

Crucial to creating 'future proof' smart cities will be the incorporation of open interface and content standards in its solutions. When a solution is implemented

using open standards, all it takes for any future project to be compatible is for it to be designed around open standards, too - which is a requirement achievable by any reputable vendor. By using open standards, even competing technology providers can create solutions that 'just work' with each other. This means that municipalities using open standards in their IT infrastructure are free to choose the most appropriate solution to derive value from their existing systems, rather than having to return to a single provider every time, commission potentially expensive data transformation systems, or at worst, start anew and render an old system obsolete.

OGC has decades of expertise in creating, maintaining, and guiding implementation of freely available open standards through its formal consensus-based Standards Program. Further, OGC's Innovation Program has run over 100 rapid, agile, collaborative prototyping and research initiatives that 'stress test' and refine new and evolving standards in real-world scenarios, making sure they continue to develop alongside changing technologies.

One recent example of an OGC Innovation Program initiative in the smart cities space is its successful Future Cities Pilot (FCP) Project. Phase 1 of FCP demonstrated how the use of geospatial and 3D building information data together can provide stakeholders with information, knowledge, and insight that enhance financial, environmental, and social outcomes for citizens. Phase 2 of FCP, currently underway, is aimed at improving the automation in the



flow of data, as well as addressing a number of related interoperability challenges.

OGC also successfully completed an Incident Management Information Sharing Internet of Things Pilot Project (IMIS IoT Pilot) in 2016. The IMIS IoT Pilot produced initial specifications, profiles, best practices, and demonstration designs for connecting sensors and response information systems in a just-in-time fashion to aid in the management of a range of different incidents.

Additionally, the OGC Innovation Program is currently running an Underground Project that will lead to improved public safety, project delivery, and urban resilience from a secure 3D repository of urban underground infrastructure. An Underground Concept Development Study (CDS) paved the way for an Underground Pilot with a data content model known as the Model for Underground Data Definition and Integration (MUDDI). The MUDDI is the starting point for a Workshop and Pilot, and will lead to verified, standards-based interoperability for 'smarter' underground projects in cities around the world.

Of course, there are many other organisations developing IT architecture guidance and standards for use in smart city deployments. As part of the SCIRA project, OGC is closely monitoring these developments and participating in the most promising ones. Part of the work of SCIRA will be to reconcile all of the many existing standards relevant to smart cities.

#### STEPS TO SCIRA

The first step to developing the Smart City Interoperability Reference Architecture began with an OGC Concept Development Study (CDS) that involved a



*Smart City technologies, such as on-body sensors worn by first responders, can help make cities safer.*

Stakeholder Concerns Workshop which was held on 1-2 May 2018, at the Center for Innovative Technology (CIT) in Herndon, VA. The event was jointly organised by OGC's SCIRA initiative and The Smart City IoT Innovation (SCITI) lab of the Center for Innovative Technology (CIT).

The workshop was key to understanding municipal needs and constraints and was organised as a series of conversations to both 'teach and learn' from each other. Participants, including City

repeatable innovation, deployment, and operations. Summaries of the findings and breakout sessions will be used to inform the next phases of SCIRA development.

An Architecture Viewpoints Workshop will also be held involving municipal leaders, first responders, and select stakeholders. This workshop will serve to gather input from participants on the draft SCIRA architecture, including initial contents of each viewpoint as well as its value to municipal planning

### **Crucial to creating 'future proof' smart cities will be the incorporation of open interface and content standards in its solutions.**

Managers, City IT Managers, DevOps teams, and Municipal Innovation Leaders, were invited to share their experiences with smart city deployments, including successes and lessons learned. Through a combination of presentations and breakout sessions, the workshop identified the requirements, constraints, and measures of success for smart city innovation that were most important to city stakeholders - particularly from a perspective of

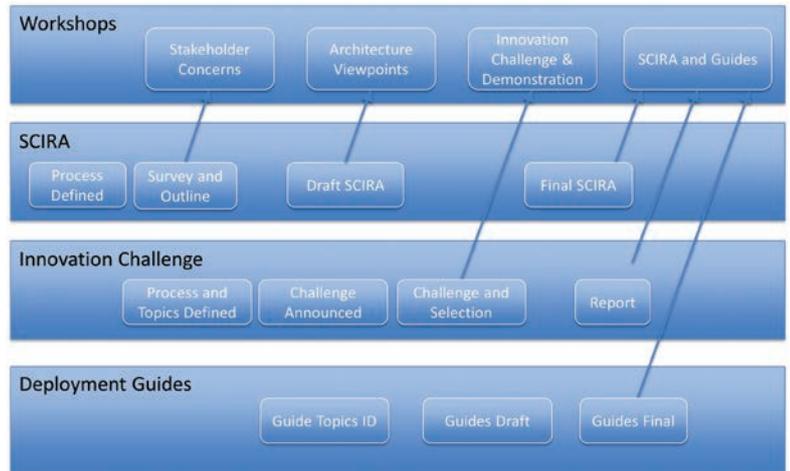
for Smart City development. As with the Stakeholder Concerns Workshops, the Architecture Viewpoints Workshops shall seek to gather any lessons learned by people involved in existing smart city deployments.

Beginning Q3 2018, the SCIRA CDS will conduct an Innovation Challenge where participants will be challenged to find creative uses for municipal datasets that would make cities smarter and/or safer.

>

The idea behind the Innovation Challenges is to have a fresh set of eyes create some innovative uses of data that weren't considered by the architects of SCIRA. The ideas generated will be used to update the SCIRA.

After the Innovation Challenges have run, a Deployment Guides Workshop will create the first versions of the deployment guides, consistent with the architecture up to that point in time. The guides will then be made available for immediate use by municipal IT decision-makers and DevOps staff. To remain in-step with technology trends, and to make sure that the guides are as beneficial as possible, they will continue to be refined over time. The Deployment Guides Workshop will occur in October 2018.



The SCIRA process will work closely with stakeholders throughout the process to ensure that it's proven useful and effective.

**Refining SCIRA through Pilots**  
To best test and refine the architecture and deployment guides, OGC's Innovation Program will run a SCIRA Pilot. Starting from Q4 2018, the OGC Pilot will run across multiple cities and will refine elements of the architecture through implementation and testing in functional, 'real world' smart city applications.

This process of iterative refinement and interactive development will result in a reference architecture that is both feasible and effective for smaller municipalities to adopt. Further, the Pilots and deployment guides will reduce the risk that the reference architecture becomes

simply 'shelf ware.' The Pilots will create prototype applications that help reduce risks and illuminate opportunities for key parts of the architecture, while the deployment guides will provide for key Smart City staff useful, practical, and actionable direction that is consistent with the reference architecture.

Smart city technology has the potential to simultaneously create efficiencies in governance while providing benefits in infrastructure resilience, public safety, and quality of life for all residents. But while implementing new technology always comes with risks, OGC's SCIRA aims to minimise those risks, and further the spread of beneficial technologies, by providing a freely usable, easily accessible, and proven-working model that will help municipalities of almost any size develop their strategies to achieve a future-proof and budget-friendly smart city implementation.

*If you're interested in contributing to any SCIRA activities, please let OGC know how and what you wish to contribute by contacting [jlieberman@opengeospatial.org](mailto:jlieberman@opengeospatial.org). More information on SCIRA, including the ability to sign up to a regular newsletter, is available on the SCIRA webpage.*

**ABOUT THE AUTHORS**

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# The Age of Geo-Literacy

## ArcGIS for Schools

**Esri have big plans for the next phase of GIS, and it all starts in the classroom. In the following article, Niall Conway reflects on his recent experience at the Esri UK Annual Conference in May and explains why understanding of GIS is likely to increase in years to come.**

Over the last 10 years, I've developed an interest in GIS education, particularly in terms of how the subject is taught and how the imagination of students is captured and maintained. This interest began while undertaking a postgraduate in Urban Planning in 2007, where only two of my fifty or so classmates joined me in the GIS major module. This was largely due to, I expect, the fact that GIS was, at the time at least, considered as an unappealing and less-relevant career skill set - especially for the more theoretical-minded aspiring planners. What, after all, do concepts such as projections, vertexes, spatial queries have to do with urban planning?

Recognising that it could be a subject of the future, I decided to, somewhat stubbornly, tackle the GIS learning curve in the years since then. This culminated in my recent attendance at the annual conference of the company behind the software which I first used. The Esri UK AC was held at QEII Conference Centre in London on 22 May, in the leafy and historic surroundings of London's Westminster. During the conference, I had the fortune of meeting some of the committed team-members behind the ArcGIS for Schools program who are working to increase the appeal of GIS among young adults at the grassroots level,

as well as to bridge the knowledge gap which currently exists across a range of industries.

The conference is one of the largest gatherings of GIS Professionals outside of the United States. Despite coinciding with the GeoBusiness conference in the nearby district of Islington, it attracted a large attendance from both Esri and non-Esri representatives, including from industry influencers such as Ordnance Survey, DigitalGlobe, Harris, Trimble Geospatial and the Royal Geographical Society. The presentations, which were delivered in rooms by the names of Cambridge, Windsor, and Victoria were structured under the distinct themes of 'Enterprise GIS', 'Data in Action', 'Analytical Insights', 'Collaborative Working', 'Smart

Infrastructure' as well as ones titled 'Technical' and 'Developers Forum'. Presentations, which were delivered by the likes of Transport for London, Homes England and the Environment Agency, covered topics such as NSDI development in Afghanistan, reporting methodologies by the ONS, reclaiming dark skies, and the use of open-sourced data for real-time traffic incident detection. They also included presentations by Esri on the new ArcGIS Pro, as well as wider platform integrations using JavaScript, Jupyter Notebooks, runtime SDKs, and REST APIs. Among the most memorable keynotes included the use of Esri City Engine for building expansive 3D cities for a Disney animated movie, a presentation on how GIS could be used by authorities to respond to a global medical epidemic scenario, as well as a fascinating glimpse into Esri's new AI-driven virtual urban planning assistant. Think Alexa guiding you through the steps for mapping a house extension in ArcGIS Online and you may get the idea.



**BREAKING NEW GROUND**

In addition to the mentioned presentations, a key focus of the day's events was on the topic of GIS education. The ArcGIS for Schools program is an initiative by Esri to make its software freely available to schools, with the aim of helping students to develop valuable skills for solving complex and often interrelated social, economic and environmental challenges. The UK program focuses on both GCSE Geography students and A Level students - it has over 1,500 schools signed up and this number is increasing by an average of 40 per week. The program, which currently has some 60,000 registered pupils, makes Esri technology freely available to the classroom and acts as a gateway for exploring data from a wide range of free sources. These include data from Ordnance Survey

over the past four years alone. Closer to the UK, meanwhile, Esri Ireland is preparing for a September rollout of its ArcGIS for Schools program to up to 5,000 primary and secondary schools across the island. According to Aideen Croasdell, the program Lead for Esri Ireland, the all-island programme will, just like the equivalent US and UK programs, focus on supporting curriculum based teaching, and in particular the computer science and other STEM subjects.

According to Rob Sharpe, Head of Education for Esri UK, the ArcGIS for School program is less about teaching GIS to students (which is not currently in the UK education curriculum) and more about enhancing the quality of existing teaching practice in the classroom. The reason why it is possible

a wide range of basemaps and reference information in order to build up a comprehensive picture of the world. Students and teachers can, for example, upload a CSV file or a shapefile into ArcGIS Online, and use ArcGIS Community Analyst in order to build personalised infographic-rich dashboards. During one workshop which I attended, participants were learning how to combine and visualise statistical datasets, such as demographics, house-prices, and income levels in order to create a rich profile of their community.

The grassroots-level ArcGIS for Schools program is focused on changing the broader industry in years to come. First and foremost, this will be felt in the third level education system, where this year alone some 30,000 UK students have moved into non-geography related university courses. Since many future 'fresher' students will already have a basic knowledge of GIS, some educational content in the introductory modules will inevitably be supplanted. Although this may require an adjustment by the academic community, it is a minor inconvenience considering the future benefits which it will bring. Sharpe, for example, believes that the learning opportunities for future third level students will be enhanced considerably thanks to the program, and that GIS will be introduced to a much broader range of industries in years to come. Just as 'geo-literate' graduates enter STEM-focused workplaces, less-technically inclined students are likely to introduce a range of new visualisation and analytical skills to their future chosen workplaces. Just imagine what maps, combined with the power of social media tools such as Facebook and Snapchat, could bring to industries such as tourism, retail

## ***The committed ArcGIS for Schools team are working at the grassroots level in order to increase the appeal of GIS among young adults...***

MasterMap, the National Library of Scotland, as well from the reasonably priced EDINA resources (i.e. a part of Edinburgh University which delivers the Digimap data service to UK-based higher and further education institutes).

In terms of its background, the ArcGIS for Schools initiative in the UK follows on from the company's involvement in the US government's Connect-ED programme for K12s, which was launched by the Obama administration. According to Esri MOOC Manager Adena Schutzberg, some 6,000 schools have signed up since the programme was launched in 2013, while some 133,000 people have completed her own online courses

to do this today, as opposed to in previous years, is, he notes, because much of Esri's software currently exists as a cloud-based service. Since classrooms are no longer constrained by the lack of IT infrastructure (such as powerful PCs onto which GIS can be installed and configured), students and teachers simply need a reasonable internet connection speed and a browser in order to use ArcGIS Online, Esri's online version of ArcGIS desktop software. Similarly, for field based studies, students simply require a smartphone installed with the Survey123 app in order to capture field data which can subsequently be displayed in a Storymap. Combined with the readily available ArcGIS Living Atlas data resources - students can use



and advertising. In order to “spread the GIS message” even further, Sharpe notes the value which GIS volunteers or ‘Geomentors’, such as those within the Esri customer-base, bring to students. For him, getting more teachers mentored will greatly influence the success of GIS education in the UK and will help students to acquire jobs in the increasingly geo-focused UK landscape.

## REFLECTIONS

In the days that followed the Esri AC, there were two other seemingly unrelated experiences with technology which made me reflect on the conference. In particular, it concerned the depth of education around GIS in the ArcGIS for School program, which currently relies on the more lightweight ArcGIS platform. The first experience occurred while spending time with my young niece, who at one point unsuccessfully asked Alexa to play one of her favourite songs, ‘Ten Green Bottles’. The next experience was while landing into Dublin airport the following morning. Just after the plane touched down, the pilot accelerated the engine again, took off, and subsequently attempted, for whatever technical reason, another landing. What both of these experiences made me realise is that while technology is becoming both more simplified and ‘intelligent’ at the same time, there

will always remain a need for human intervention on certain occasions. While Alexa’s inability to understand the word ‘bottles’ may not be such a big deal, the failure of a plane’s sensors to detect and locate the presence of some debris on the runway is anything but. Considering this, just as children will one day learn the subtleties of language, GIS professionals of the future will still need to have a comprehensive understanding of the geospatial concepts upon which the technology is based, including those mentioned at the beginning of this article.

In response to this analogy, Rob Sharpe reiterated the point that ArcGIS for Schools is not about simplifying GIS, but rather rather simplifying the job of teachers who can, for example, drag and drop a CSV file into a browser in order to display points, instead of using the more complex techniques required in earlier software versions. Learning about concepts like layers and cartographic aspects such as styles, annotation, and basemaps should instead be considered as an added benefit of this approach - as should the ability to easily demonstrate the distortions which occur from the use of certain projection systems. The more technically-inclined students will, meanwhile, notes Sharpe, be provided with the resources to ‘dive as deep as they want to’ into

the technology. Esri’s provision of access to the many ArcGIS platform developer resources, including the iOS and Android developer toolkits, will, no doubt, appeal to the ‘take apart/re-build’ hacker instincts of children.

Although Esri’s drive to get its technology into the hands of users at the grassroots level will inevitably be interpreted by some as a means to establishing its foothold in future markets, I believe that this and the equivalent government-supported initiatives are being delivered for all the right reasons. The programme is a reflection of the Dangermond’s strong commitment to geographic education, and it is focussed on enabling tomorrow’s leaders to use geographic data for the purpose of solving complex and often interrelated real world problems. In any case, it is also worth remembering that Esri is perhaps the only GIS company with the resources and capacity to roll out its technology on such a wide scale. Opensource, despite its large community and the free availability of its software, cannot, after all, currently provide the same degree of support and online resources that a proprietary vendor such as Esri can.

Perhaps it is no coincidence therefore that during one of the final coffee breaks at the Esri AC, I noticed the British Conservative politician, William Hague, walking past the conference centre in the direction of the nearby House of Parliament. ‘Maybe he’s on his way back from the conference’, I joked to myself. Or maybe not, I then decided. After all, considering that many of the current challenges which exist could be attributed to the lack of GIS education in previous years, perhaps his possible attendance was instead motivated by a political interest in the ArcGIS for Schools program.

# UK Mapping Festival

## Uses Augmented Reality to Peer into the Future

**During the upcoming UK Mapping Festival Conference and Exhibition, which will be held at the ILEC Centre in London on 4-6 September, Aligned Assets will showcase their augmented reality capability through an app designed to enhance the visitor's experience of the Festival both in present time and into the future.**

*Using augmented reality markers to rapidly assess risk.*

Initiated by Aligned Assets' presentation on augmented reality at GeoData 2018, Geo Information Group's MD, Sepe Cassetari, invited the software innovator to develop an AR app specifically for the UK Mapping Festival. The app, which will be available for Android and Apple smartphones from 20 August, will, prior to the Festival, allow users to zoom in

and pan around a 3D model of the exhibition hall in augmented reality, and with a tap on the screen, view a futuristic version of the model, complete with eco-animations. During the Festival, visitors will also be able to participate in an augmented reality treasure hunt by pointing their smartphones around the exhibition space and collecting the eco-animations that appear. In addition, users will be able to view conference timetables and click on various AR images in order to view exhibitors' websites.

While this app has been developed in order to inject some hi-tech fun into the Festival, Aligned Assets has, meanwhile, positioned itself at the forefront of cutting edge 3D technology through its augmented reality product. **Symphony AR** was primarily designed for the use of the Emergency Services and Local Authorities to translate a plethora of risk, geospatial and social demographic information, in an easy-to-process visual format.

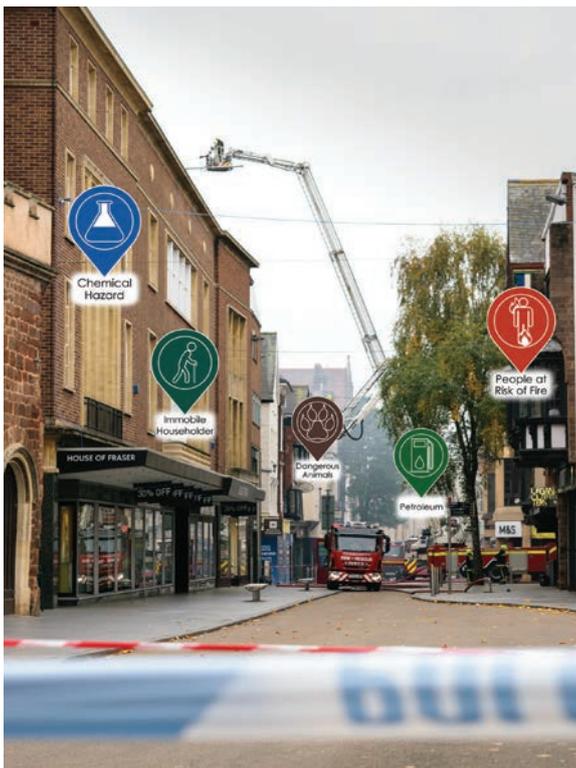
This practical application of gaming technology provides Emergency Services with fast and efficient processing capabilities for the purpose of coordinating resources onsite. By providing accurate, real-time data in a visual, 3D

context, emergency crews can assess the scene quicker, make better informed decisions and therefore improve the safeguarding of staff and the public. This visual description of the location would include augmented reality markers highlighting risks, 3D layouts of buildings and 2D maps of the wider scene.

Smart technology is also becoming increasingly relevant for Local Authorities. The application's visual capabilities can be used to benefit all departments from highlighting potential risks for social workers on home visits, to overlaying tourist attraction markers in towns or depicting specific planning information such as Tree Preservation Orders.

Although much of this information is already available through IT systems, the accuracy of its translation relies heavily on human interpretation and communication. The Symphony AR app acts as a common reference point whereby all staff can communicate using the same consistent information. With one click, staff can gain further insight about locations and spatial boundaries, while 3D models of complex buildings can be viewed from any angle, with the ability to zoom into specific areas.

Augmented reality presents significant opportunities for the Public Sector in terms of enabling more accurate, efficient and consistent communication



of complex information across multiple departments. In particular, this is because Public Sector address data systems, such as Local Land & Property Gazetteer (LLPG) and Ordnance Survey AddressBase (used by the Emergency Services), tag a location identifier, known as the UPRN (Unique Property Reference Number) to every address.

For Local Authorities, any geospatial or risk information can be recorded against the UPRN, which can be used to provide an accurate description and history of an address that can be shared across multiple divisions - such as council tax, planning, environmental health, and social welfare. Augmented reality presents an opportunity for staff and the public to access relevant information in a visual manner. In addition to enhancing efficiency and reducing risk, it can also be utilised to provide the public with a range of enhanced services, such as depicting tourist attractions, GPs, or even Food Standards Ratings for restaurants on maps.

Similarly, the Emergency Services can overlay risk or socio-demographic information on top of their AddressBase data using the UPRN, which can subsequently be visualised using AR. This includes types of information such as risk information associated to a particular property, chemical storage sites, the location of dangerous dogs, as well as the location of vulnerable residents in a residential block.

Using Aligned Assets' Symphony Location Manager, Local Authorities and Emergency Services can load and configure the data they want to be shown in augmented reality themselves. In doing so, they can display their own spatial data in AR without the need of specialist

software developers. Furthermore, by configuring a link to LLPG or AddressBase, that data can then be formatted for display as AR markers.

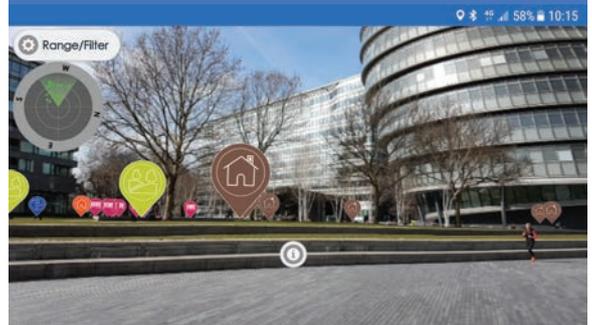
Aligned Assets MD, Andy Hird, told us, 'The future for augmented reality within the Public Sector is not only a natural step, but one which has been greatly facilitated due to the significant groundwork laid down by both the UPRN and the associated geographic location against each property. Whatever data your organisation holds, it's likely it relates to a location and that means you could be displaying that information in an augmented fashion to help deliver tangible benefits to staff and your customers. In 2013, it was projected that augmented reality would reach 1 billion people by 2020\*. With AR set to be that mainstream, we should all be looking to embrace it.'

If you're planning to attend the UK Mapping Festival, be sure to download the Symphony AR app featuring the UK Mapping Festival in Google Play or the Apple Store to experience it for yourself. If you'd like to find out more about the **Symphony AR** app and Symphony Location Manager, call Aligned Assets on 01483 717950 to organise a demo, or go to [www.aligned-assets.co.uk](http://www.aligned-assets.co.uk)

#### REFERENCES

\*Mobile analyst Tomi Ahonen - [www.impactlab.net/2013/06/11/augmented-reality-will-reach-1-billion-people-by-2020](http://www.impactlab.net/2013/06/11/augmented-reality-will-reach-1-billion-people-by-2020)

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# GIS: Is it Time for a Change?

In the following republished piece, **Linda (Hecht) Stevens** of global marketing and technology firm, 51by1, shares her insights from the tech-capital of the world, San Francisco. In particular, she explains how disruptive start-ups and larger tech companies are changing what it means to be a geospatialist. Regardless of whether or not you agree with Linda's strong views and predictions, they are nevertheless important ones to consider.

I am extremely excited about the growth of geospatial in the non-GIS world. In some cases, technologists are reinventing geospatial analysis with a fresh perspective and better algorithms. In other cases, open source is allowing technologists to build geospatial capabilities into solutions without the overhead burden of a back-office GIS.

With all the exciting innovations in geospatial and location intelligence, what will happen to GIS? Touted by large vendors as a platform, GIS has become an expensive, bloated and complex set of tools bundled in an even more complex business model. But, there are some bright spots. New, forward-thinking companies are building geospatial

capabilities into their products, not building applications on top of a big backend system. These solutions are designed for a particular market or problem and are faster, less expensive and reliable.

## SIGNS OF GIS DECLINE

Many GIS projects were implemented to build and maintain

- **Tableau** - Adding spatial joins in the next version release, which also includes a focus on geospatial analysis.
- **Amazon** - Hiring a Geospatial Intelligence Engineer for their logistics team, which, I predict, will make their inhouse systems available for others once they perfect it for their own use.

**... it just makes sense that traditional GIS back office tools will be replaced in modern solutions and architectures.**

geographic data. These datasets are becoming readily available for analysis, mapping, etc. For example, **Koordinates** focuses on publishing geospatial data. These datasets will fuel the growth of new/modern geospatial tools. Maintaining these datasets will be integrated into workflows that take advantage of new architectures and devices. As an example, **Microsoft and Mapbox** are working on HD maps that will be updated in real-time using machine learning technology. Meanwhile, other organisations such as **MapD** include geospatial analytics as part of the analysis engine for big data.

With satellite, drone, LiDAR and imagery data now readily available to the world, companies are starting to build applications to utilise this vast amount of data that is not just plentiful, but current.

## GEOSPATIAL ANALYSIS IS NOT JUST FOR SPECIALISTS

Large and well-known companies are also integrating geospatial analysis and mapping right into their own products. Consider the following examples:

- **Uber** - Recently released open source geospatial visualisation and analysis tools, [kepler.gl](#), [deck.gl](#), as well as a geospatial indexing system called H3.
- **Foam** - Building geospatial right into new technology frontiers of Blockchain (in particular something called 'crypto-coordinates').
- **Carto** - Building geospatial solutions with ease-of-use in mind to leverage all the geospatial data available.
- **Microsoft** is making a big push with Azure Maps. Keep an eye on their efforts including partnerships (like Mapbox) and hires.

## OPEN SOURCE CONTINUES TO EVOLVE

In addition to the above companies, I must mention open source as a continuing trend. Bodies such as the **Open Source Geospatial (OSGeo)** community continues to grow and get more energy from both government organisations like **NGA** and technology companies like **Uber**. Similarly, GIS organisations like **Boundlessgeo** continue to support and expand on



this dynamic market. Perhaps worth a mention, I highly recommend **FOSS4G events** - they are consistently interesting and you get to meet the folks pushing the geospatial technology boundaries!

### LOOKING FORWARD

In my view, it just makes sense that traditional GIS back office tools will be replaced in modern solutions and architectures. With the wealth of data and applications growing in the location/geospatial space, it is just a matter of time until the traditional GIS platform model becomes a chapter in the history of geography textbooks. Fear not, I say. This is a good thing! Geospatial technology should, after all, be part of any modern analytics solution, not just an add on.

To conclude, I'd like to share with you just one takeaway from a recent podcast discussion on this same topic which I had with Chris and Mark from Geoadorable. I hope my answer sums this up...

**Chris and Mark:** *With the mainstream emergence of business intelligence/data science, as well as commoditised digital mapping, are location specialists being marginalised?*

**Linda:** Not at all. Individual GIS specialists will be if they keep looking back. The spatial skills that they master are not being marginalised. The particular GIS technology they use at their job will be commoditised, but how they think about solving problems



will be in even more demand. Technology comes and goes, but spatial problem-solving skills don't. I've talked to a number of Data Scientists in Silicon Valley who are just now understanding the complexities of a spatial analysis. BUT once they get it, they solve it in ways never thought of before! That is exciting. Teaming geospatial experts with AI/IoT/Machine learners, etc. will change how we approach many of our most pressing problems.

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# GEO Business 2018 - Balance and Buzz

This year's GEO Business conference, held on 22-23 May in London's Islington, was, according to Geomatics World editors **Ian Dowman** and **Richard Groom**, the biggest and best yet. The following is a summary of their report on the event which hosted 203 exhibitors from 25 countries, 100 exhibitor workshops, as well as many high profile speakers and seminars. It should provide a taste of the type of topics which were discussed during this excellent annual event.

## DIGITAL TRANSFORMATION

**Mark Enzer**, Chief Technical Officer of Mott MacDonald, presented on the topic of digital transformation in economic infrastructure, with a particular focus on the built environment, which he says is falling behind other industries. Enzer also highlighted recommendations for ongoing support of the UK's Digital framework, the National Digital Twin, and a Digital Framework Task Group

for the nation's mature infrastructure network.

## POWERING THE 4TH INDUSTRIAL REVOLUTION

Presentations, including one by **David Wood**, Head of Geography in the Government Science and Engineering group, demonstrated how geospatial is transforming government and benefiting both society and business.

## GEOSPATIAL COMMISSION

**William Priest** discussed some of the technical and data related challenges which he faces in his role as Director of the Geospatial Commission. The body has been set up to deliver economic growth, improve productivity, drive investment to foster innovation, and protect and enhance the quality of the UK's world class data assets.

## GROWING THE ECONOMY

The conference included a panel debate on how geospatial will

enable the growth of the economy. Among the topics discussed was one by **Andrew Trigg** on the efficient use of data by the Land Registry. Meanwhile, Chief Geographer at Google, **Ed Parsons**, discussed the potential of geospatial and AI in terms of tackling the under-utilisation of privately-owned cars across the developed world.

## TRANSFORMING SOCIETY

A session, which was chaired by **James Kavanagh**, Director of Land, RICS, included a presentation by **Alan Mills**, Preparedness Coordinator at MapAction, on the use of imagery which has been captured by UAVs in disaster relief situations. **Zulf Choudhary**, MD, Sparta Digital, spoke on AR and geo-location impacts, including how work done with CityVerve in Manchester supports tourism and benefits from crowd-sourced data.

## GEOSPATIAL INNOVATION

The third conference session included a talk by **Laura Alderson** of the Geovation Hub, which focused on the mutually beneficial relationship between more-nimble start-ups and the larger, and often less-flexible, corporations. Corporates need to stay relevant, and to do that, they need insight into new markets which can come from engaging with start-ups. Start-ups on the other hand can benefit from industry expertise and mentors from the corporate, its networks and resources. Another presentation, by **Tim Olliver** from Geovation Hub, discussed the topic of real-time flight risk for



*Cues forming at the Business Design Centre entrance for GEO Business 2018.*

drones and the problem which insurers face in terms of developing risk scores when calculating premiums.

### GROWING THE CAKE

**John Remedios** of the National Centre for Earth Observation described some of the work being carried out using EO in connection with ice pack thinning, global biomass and sea temperature.

**James Bruegger**, Seraphim Capital, explained how, thanks to lowered cost for entry into the industry, space is at a 'PC moment' which is rich with opportunity.

The final presentation of the session was by **David Norris**, Technical Director of Plowman Craven, who discussed topics of

## ... thanks to lowered cost for entry into the industry, space is at a 'PC moment' which is rich with opportunity.

business development, new market entry and the need for geospatial skills. In particular, he noted the resurgence in photogrammetry which allows a range of users to develop 3D models using aerial photography captured from drones. Plowman Craven are now looking at scanning for construction verification of buildings during construction, component-based functional models, digital twins and augmented reality.

### THE SEMINARS

GEO Business 2018 included seminars on a wide range of topics.



*Dr Vanessa Lawrence speaking at GEO Business 2018 before Hans Viehmann, Product Manager Oracle EMEA.*

The **Smart Cities** seminar, for example, included a presentation by **Richard Wooding**, Ordnance Survey, on the need to avoid silos and to build partnerships within this innovative field. **Philip McAleese** of See.Sense, a company which makes cycle lamps, explained how a range of road, traffic and behavioural data was collected

from in-built IoT sensors during a trial held under the CityVerve project in Manchester.

The seminar on **Visualisation, AR and VR** included a message which explained that the field is hampered by the cost and awkwardness of the helmet/viewer. The emphasis of the presentations was on the visualisation side of the topic and on efficient data capture, but without any concentration on locational accuracy.

Meanwhile, the popular **Earth Observation** seminar included

the theme of 'analysis ready' data, which was discussed by **Pascal Coulon** from Defra. Other topics included the use of Interferometric SAR (InSAR) for deformation and subsidence.

The **floods** seminar session featured three wide-ranging talks. **Paul Drury** of Ambiental described how his company is using modelling to predict how flood risk will change as a result of climate change - including the production of rainfall maps which are based on the analysis of 54 environmental datasets. Other than the 'low' scenario, the effect in terms of numbers is quite alarming. The mid projection would result in a 25% increase in properties affected by flooding and the 'high' scenario sees a 34% increase. Just as alarming is the predicted 105% increase in river flow, so they have also looked at the risk to bridges and the potential for increased river erosion, which could cause the pattern of meanders to change.

**Dan Culli** of Critigen and **Gary Nel** of Geocurve discussed their asset management work on the Environment Agency's TEAM2100 project through the framework

>

consultant Jacobs - including the use of laser scanning and imagery to survey London's and the Thames Estuary's tidal defences. They have been using aerial photography from drones for surveys and 4K video to inspect the tidal embankments and walls. Their tools included a Leica Pegasus:Two Ultimate and a Leica Backpack which have been used for land and estuarine survey, and which resulted in the collection of some 200TB of data.

In addition, **Richard Groom** spoke about the Environment Agency's standard format for river channel surveys – EACSD. He noted the fact that an increasing amount of survey work is now being procured by framework consultants. Surveyors should look out for the new framework due next year and cultivate their consultants, he advised.

During the **Utilities** seminar, **Ian Bush** of Black and Veatch discussed the process of producing a PAS128 standard document, which should be

reviewed every two years. He pointed out that the PAS is aimed specifically at practitioners, not clients.

Meanwhile, **Dr Neil Brammell** of Utility Information Solutions made the point that while a lot of work is being done to the PAS128 standard, very little of it is finding its way back to the records of the

which takes data from Augview projects with the aim of better understanding underground utilities whilst on site.

The **Heritage** Seminar session on Day 2 opened with a talk from **David Andrews**, Geospatial Imaging Analyst at Historic England (HE), who discussed the surveyor's toolbox in 2018. According to David, complete

### ***The time and cost needed to gain permission and to establish prisms when installing total station monitoring systems is significant...***

utility companies. His company aims to close that circle by providing utilities with validated data and a proper estimate of uncertainty. He is establishing a "community of benign self-interest" with this purpose in mind.

Finally in the utilities sessions, **Nathan Ward**, Select Surveys, spoke about augmented reality. It is all done with the Augview app

models can generally only be made by combining technologies (e.g. terrestrial photography of a building will not record upper storey window sills).

During the **Instrumentation and Monitoring** Seminar, **John Brewster** of Imetrum Ltd. described a monitoring system developed by his company which uses a total station equipped with a coaxial camera, and image matching algorithms to detect the movement of image patterns in the field of view. If there is no image pattern, it will not work. The time and cost needed to gain permission and to establish prisms when installing total station monitoring systems is significant, so a system which does not need prisms is good news.

**Marco Di Mauro** from Leica looked at the effect of faster digital communication, innovations and cloud computing on monitoring, including the benefits of 5G in terms of latency compared with 3G and 4G. He also discussed the use of automated scanning for measuring surfaces and apps



A visitor at the Leica stand being shown a total station.

which can compare two sets of data and calculate orthogonal offset between monitoring points. It is now possible to integrate data from any type of sensor and have the full workflow on the cloud.

In addition to the above, there was a special session on **apprenticeships** during which **Christina Hirst** and **Mark Lawton** discussed the national providers signed up to deliver industry-relevant courses (including distance learning).

#### THE EXHIBITION

In terms of exhibitions, the wider industry, including national and overseas companies – and start-ups were well represented. There was an education zone, a start-up zone and a drone zone and many exhibitors demonstrated equipment and mobile mapping systems (including total stations, scanners, sensors, and GNSS receivers for mobile devices) outside the building. Among the demonstrating companies included Clearedge, Terrasolid and many smaller companies as well as several hydro companies. Techniques for scanning included trolleys and backpacks, and software companies offering automatic scan data recognition such as Vercator, which presented results at the RICS in the autumn were also present. Robotics, virtual reality and augmented reality were also present.

#### IN A WORD

This year there were 2,602 visitors from 53 countries. That is a 9% increase on last year and a rise of 61% since the event was launched in 2014. And so, the event goes from strength to strength. GEO Business will return to the Business Design Centre next year on 21-22 May.



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# Esri's Open Strategy - 3D, OSM, and the Future of GIS

In the following interview with GIS Professional, **Satish Sankaran** and **Chris Andrews** speak to Niall Conway about their work on Esri's 'Open Strategy' and about where the GIS industry is heading.

## **GIS PROFESSIONAL: WHAT IS THE ESRI OPEN STRATEGY? HOW DOES ESRI EMBRACE OPEN SOURCE, OPEN STANDARDS, AND OPEN DATA?**

**Satish Sankaran:** It is imperative for companies pursuing a platform strategy to support the many facets of open. To us the purpose of a platform boils down to three things - accommodating varied user workflows, providing multiple avenues to configure and customise solutions, and offering support for innovation. The platform needs to be fundamentally "open" to do all these

Geoportal Server used around the world to catalog metadata.

A recent article in InfoWorld showed the high level of contributions of commercial companies, such as Esri, to open source projects and that open source contribution and proprietary companies have a positive relationship. Open source is not a zero-sum game in the IT industry and Esri is onboard with the push towards open in many patterns.

We have more than 500 projects on GitHub and more than 8,500 project forks. We opened our application programming interface (API) to developers so that they can create custom applications. We continue to share our research with standards bodies such as the Open Geospatial Consortium (OGC) - most notably,

Over the years, we have chaired and participated in many OGC working groups dealing with such topics as web services and metadata.

We represent our customer's interests in interoperable solutions and work to ground the standards community in pragmatism. Our goal is to share knowledge with standards organisations so that standards foster interoperability and consider some of the lessons we have learned about reliability, performance, and scalability. We support OGC's recently adopted Community Standards approach to simplify the process to bring successful industry protocols into the open standards space.

## **GIS PRO: WE'RE HEARING A LOT ABOUT 3D THESE DAYS. HOW IS OPEN PART OF THE ESRI 3D STRATEGY?**

**Chris Andrews:** Open is a central part of Esri's 3D strategy, especially with respect to data exchange and distribution. We have adopted existing open data formats, when available, and suggested new open specifications when we needed to extend beyond existing technology.

We have put more efforts into handling common 3D interchange formats such as KML/KMZ, OBJ, COLLADA, and FBX. We have also continued to invest in development around OGC's LAS point cloud format. Recently, we released the ability to convert directly from compressed point cloud data to I3S using either Esri's zLAS format or the popular LAZ format.

## **GIS PRO: RECENTLY, WE HEARD THERE ARE**

## **... open is not as much a strategy as a fundamental foundation of the ArcGIS platform.**

in a manner that allows users to seek their own business efficiencies. So, open is not as much a strategy as it is a fundamental foundation of the ArcGIS platform. To many IT companies, open has come to mean open source, but our definition supports open data, open APIs, open specifications, and industry standards as well as open source.

## **GIS PRO: WHAT ARE SOME EXAMPLES OF ESRI OPEN CONTRIBUTIONS?**

**Satish:** Esri's open source contributions include add-ons to our platform and extensions to non-Esri open source projects. We also build fully open source solutions such as the Esri

Esri's shapefile format, which has been an open standard for many years. We have taken the initiative to open our file geodatabase API, the Limited Error Raster Compression (LERC) algorithm, the Indexed 3D Scene Layer (I3S) standard, and our GeoServices REST specification. Esri also sponsors many initiatives that find their way into open source libraries, such as GDAL.

## **GIS PRO: HOW CLOSELY DOES ESRI WORK WITH STANDARDS ORGANISATIONS SUCH AS THE OGC?**

**Satish:** We are active participants in multiple standards organisations. Esri has been a principal member of the OGC from the very beginning.

## LIMITATIONS ON USING OPENSTREETMAP DATA WITH ARCGIS. CAN YOU TELL US MORE ABOUT THIS AND DO THEY ONLY APPLY TO ARCGIS?

**Chris:** In 2018, one of the biggest gaps in many enterprise GIS workflows is the ready availability of global data sets for content, such as buildings and streets. We have partners who offer curated, high quality data for different parts of the world, but we still recognise that there's a gap when it comes to global content. Many of our customers and staff have suggested that we look to OpenStreetMap (OSM) data. OSM offers the promise of free, community validated content that could be used as context for smart cities, planning, and many commercial GIS use cases.

After looking at the OSM licensing, some companies, including Esri, have found potential risks when combining proprietary data with content licensed under the Open Data Commons Open Database License (ODbL), used by OSM. In the past, we have avoided using OSM content in applications that would mix data with Esri or partner content except to offer pass-through access to OSM tiled map services. Users can download OSM content and use it in ArcGIS applications and

## ... some companies, including Esri, have found potential risks when combining proprietary data with content licensed under the Open Data Commons Open Database License...

they then assume responsibility for complying with the ODbL licensing.

We are currently taking another look at OSM data usage and ODbL. At the 2018 Esri International User Conference, we announced a new OpenStreetMap Vector Basemap.



The map will be built using OSM data exclusively. It will be freely available to all ArcGIS users and to any user or developer that would like to use an OSM vector basemap in their map or application.

We'd love to use OSM data more, especially for 3D use cases, such as generating 3D buildings from the great new building footprint dataset that Microsoft just contributed to OSM. If the licensing can be interpreted to protect uses with content that contains proprietary or sensitive data, then we would like to take advantage of that.

## GIS PRO: HOW IMPORTANT IS COMMUNITY EMBRACE OF OPEN TO MOVE GIS INTO THE FUTURE?

**Chris:** Whether looking at this question from the perspective of the expanding technology domain of 3D in GIS or considering my

models and offerings are possible. Customer and public-facing entities need to know that their content is accessible through open standards.

**Satish:** The role of open technologies is quite integral to the GIS domain. It has always been and it's accelerating with AI/machine learning, Big Data, and IoT trends all happening in an open environment. While geospatial may not lay claim to these developments, these technologies will enrich geospatial technologies and will benefit from their interaction with it. These interactions will take place in an open platform (technologically) and in an open community (socially). The embrace of open and GIS will only get tighter in the coming years.

### ABOUT THE INTERVIEWEES

**Satish Sankaran** works at Esri as a product manager and has been involved in topics related to standards and compliance for more than 15 years. He is active in standards organisations within the geospatial domain and believes that Open presents a great forum for academia, vendors, organisations and integrators to seek improved and pragmatic ways to achieve interoperability across hybrid architectures.

**Chris Andrews** is an experienced product management and technology leader who thrives on solving problems, establishing high performance teams, and connecting people and businesses in positive collaborations. He currently is the senior product manager for 3D across the ArcGIS platform at Esri, based in Southern California.

# Geospatial Gender Balance

## - my two cents

**The gender imbalance in the STEM world is, according to Niall Conway, no secret; we only need to look at the industry's past to try understand why this is the case.**

The geospatial industry, is to a certain degree, tied to its traditional male-dominated roots. From the early exploration and conquering days, to the resources, utilities, and military industries, maps were created and used for the purposes of acquiring and maintaining power. This perhaps explains why the technical subject which is map-making appears to have, before now at least, neither appealed to, nor been as accessible to women as it has to men.

While I'm not an expert on the workplace gender balance issue, I do feel optimistic that, based on some research results, the geospatial industry could be in for some positive change. Following on from the April edition's 'Women in GIS Leadership' article by Josie Hawkey, now seems like a good time to reflect on some additional gender considerations.

### SPATIAL TASKS VS SOCIAL TASKS

In 2016, research from the University of California, Santa Barbara revealed

some interesting insights into the relationship between maps, gender and spatial cognition abilities. During the investigations, test participants were presented with two specific tasks. In the first, participants were shown a picture of a scene which included various different objects. They were subsequently asked to imagine themselves standing in the scene - at a certain landmark facing a certain object - and to create a mark on the diagram indicating the relative direction to another object. For example, this might involve drawing directions to a stop-sign while facing a cat. In another task, participants were presented with a map of a route, and, in a similar manner, asked to imagine themselves navigating it and marking the direction (i.e. right or left) at each of the turns which they made. What both results revealed was that by framing the tests as 'social tests' rather than 'spatial tests' the performance gap in spatial tasks between women and men was eliminated. As an example, by placing a known human figure in the scene of objects or at a route corner rather than say a generic postbox, women were better able to imagine navigating that environment.

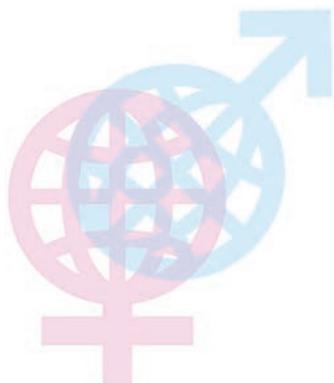
### WHAT THIS MEANS

Essentially, what the above results prove is that most men and women think differently about landmarks and routes, and that 'socialised', as opposed to purely logical, spatial approaches are better suited to females. The above research findings could also help to explain why the consumer mapping market is beginning to embrace more personalised maps such as Snapchat's 'Snapmap'

- a map which is designed to be more relevant to the specific user - such as the location of friends and contacts. Although the personalised aspect of mapping (through location-sharing) is one which is subject to significant data-privacy regulatory scrutiny, what is certain is that, in 2018, mapping is undergoing a process of re-conceptualisation and socialisation. If this isn't a powerful enough motivation for changing the industry then consider the possibility that women may actually make better geospatial professionals than men...

An article entitled "Men are better at map reading, but women are superior at remembering routes" refers to research conducted in 2010 by the National Autonomous University of Mexico. In the study, a group of men and women (all fitted with GPS and heart rate monitors) were tracked while sent to gather mushrooms in a rural area. While both genders returned with roughly the same amount of mushrooms, the women had used some 70% less energy than the men in doing so. According to the study, the women were better at remembering productive patches of land than their male counterparts, which resulted in them making more stops but travelling less distance. Interestingly, as many will agree, this is a trait which women are said to possess and use to great effect in urban settings.

What the above studies seem to indicate is that in an increasingly complex, data-driven, and urbanised social world, the mapping of our environment, along with the design of it, requires an approach which



can be considered more feminine than masculine. Thankfully, this thinking is also being championed by the likes of the voluntary and mapping project OpenStreetMap, which is challenging the fact that maps all too often reflect the world from a male perspective rather than from a female perspective. In a more democratic manner, OSM is attempting to ensure that, by increasing awareness of unconscious gender worldview bias among its contributors the free and open map will include features which are relevant to both males and females. Perhaps with the help of 'personalised mapping algorithms', in the future, female map users will no longer have to navigate landmarks such as sports stadiums or bars, when what they really need to see prioritised are features such



as childcare facilities and women's health clinics.

**CONCLUSION**

If the geospatial industry is to meet the needs of a growing market, then it needs to attract top female talent. While obviously there are a number of factors (i.e. cultural, legislative, corporate governance) which will determine the industry's future gender balance, maybe the first step is to recognise that women have distinct spatial-thinking abilities

which are, based on the research findings mentioned above, best engaged through less abstract, more humanised approaches. Advances in the industry will require that it encourages a less-restrained, more creative thinking approach by all professionals. This approach will need to be grounded in a deep understanding of how maps are designed and interpreted, as well as an appreciation of the idea that the female way of thinking is more in tune with the rhythm of the world.



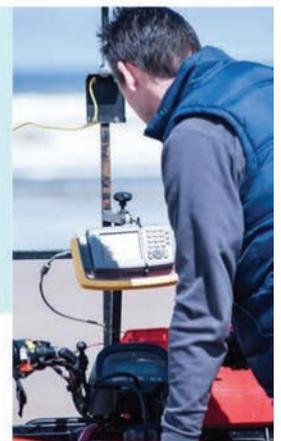
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# Is it time for Competency-based GIS Education?



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

**Educational institutions have been exploring and implementing competency-based education (CBE) since World War II. This approach to teaching and learning breaks down topics into discrete skills known as competencies. Students must show mastery of each competency (or a group of competencies) before moving on to learn the next one. The U.S. armed services used CBE to train soldiers to quickly master the hands-on skills needed to support the war effort. Later, the approach was used to train staff in manufacturing and construction skills. In the past few decades educational institutions adopted CBE for certificates and degrees in academic topics.**

Exactly how CBE teaching and learning proceed is up to the institutions. In medical schools, CBE tends to be face to face, but other programs are hybrid (face to face and online) or fully online. In the United States, Capella University, Western Governors University and Southern New Hampshire University are the best known fully online degree granting institutions.

Students are drawn to these programs because they can “test out” competencies they’ve learned in school or through experience, potentially lowering the needed credits toward a credential (degree or certificate). Schools and companies like the model because they can offer an “all you can eat” business model with a flat fee per month or year for all the courses a student can complete. In the U.S., the federal government encouraged the growth of these programs as a quicker,

cheaper way to increase the number of college graduates and grow job-ready certificate holders.

I’ve been curious about how this approach to teaching and learning would work for GIS. And, there is now at least one institution offering credentials via competency-

based education: Austin Community College (ACC) in Texas.

The curriculum does not look all that different from other GIS programs as the course names for the Level 1 Certificate confirm:

- Introduction to GIS
- Intermediate GIS
- Intro to Map Design and Use
- Introduction to Database: Access
- GIS Data Acquisition and Analysis
- GIS Capstone

The student and instructor experiences at ACC differ from a traditional program in several ways. Students can start the program whenever they like. They are not working with a cohort that tackles a topic or lesson together each week. Students are required to achieve 80% on summative evaluations before moving on to the next set of material. Students work at their own pace, but are expected to meet deadlines. Students have up to one year to complete the Level 1 Certificate, for example, but may be able to complete it within three months. Instructors monitor exams, keeping an eye on up to four students at a time. Instructors serve as both proctor and assessor. In the latter role, they may provide feedback on how a student tackled a particular task.

The program launched, only to Texas residents, in 2017. The employers who have hired graduates (both degreed and with certificates) is quite impressive. My sense is that students who learn well on their own will find competency-based programs appealing for their speed and potential lower cost. Students with experience in traditional college courses that focus on “seat time” and “passing grades” may find CBE quite a stretch.

Will hiring organisations be seeing more applicants with credentials in GIS from competency-based programs? Will hiring managers know or care about the different kind of educational experience students? Will students be drawn to CBE GIS programs over traditional programs? It’s too early to say. For now, universities like for-profit Capella University and non-profit Western Governors and Southern New Hampshire University are leading the way in educating potential employers and students about CBE. It will be up to Austin Community College and others who follow its path with GIS teaching and learning to help evaluate if the approach works in geospatial technology.



# Solving the Productivity Puzzle and GeoCom 2018

**As the UK struggles to keep up with our neighbours in improving our productivity, our government is increasingly turning its eye to the role of data. Nothing can emphasise this further than the discussion paper “The Economic Value of Data” published by HM Treasury in July\*. This follows a number of announcements in recent months – from the opening up of OS MasterMap (which readers may have spotted and indeed was the topic of a well-received AGI webinar) to investments in AI. But what is the role of geospatial data in making the UK more productive?**

Productivity at an economic level is driven by complex factors, but as a concept it's fairly simple – the amount of output per hour worked. Our “Productivity Puzzle” - the gap between our productivity trend rate and actual performance - is larger for the UK than the rest of the G7\*\*.

In simple terms, there are two sets of opportunities to improve productivity. The first is to “sharpen the saw”. That is, making efficiency improvements through investment in our tools. We know that use of geospatial data, well applied, has the potential to support many businesses across the UK and internationally. HM Treasury note that data has the ability to support new products and processes; international trade; and new business models – amongst others.

In an environment to support effective use of geospatial information, this requires investment in ensuring maximum efficiency through having in place a world class infrastructure, skills and knowledge to achieve more with less. These are all areas where AGI welcomes a focus from government to support the activities that many of our members have been driving. There are opportunities to build on current progress, enhancing this through greater co-ordination and investment. What could realising the currently untapped potential of a world class geospatial infrastructure deliver for the UK?

The second strand is innovation. Productivity can be achieved through using geographic information in more efficient and productive ways – in new ways which did not previously exist. We've seen the emergence of the Innovation Catapults in the UK and Geovation, but how could this go further? It feels as if we are still hitting only the tip of the iceberg in supporting innovation in the use of geographic information.

There is an urgent need for both investing in the foundations for a strong geospatial sector and supporting innovation to best use the assets we have within the UK, if we are to maintain a world class position in our expertise in geospatial, data science and the wider digital economy. The Economic Value of Data discussion paper comments on five challenges which must be addressed to do so – addressing ownership and control of data; maintaining protection of personal data; openness in public sector data; driving interoperability and standards; and enable safe, legal data sharing. None of these will be unfamiliar to our community and indeed we see many of these such as accessibility, ownership and standards as persistent themes.

It can be all too easy to assume that answers to address these challenges can be left to entrepreneurs, but let's not forget that GPS began as a US military funded programme in the 1970s, and the innovation which makes the iPhone a smart phone was also publically funded. Within geospatial, we see many promising activities which are beginning to build a new momentum and an opportunity with the advent of the Geospatial Commission to tackle these through a new channel. This leads us back to the question, I posed at the opening of our Breakfast Briefing on the role of the Geospatial Commission in February 2018 - if government can intervene to grow the value of geospatial information in the UK, what should this look like?

This year, our annual conference, GeoCom, focuses on the Productivity Puzzle. We'll be examining the opportunities where a strong and thriving geospatial ecosystem can support the UK. We'll be hearing from both policy makers and leading private sector innovators on their perspectives, on how we can realise this. I hope you'll join us on 8 November in London to bring your own views on how we can solve the puzzle.



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](http://www.agi.org.uk)

## REFERENCES

\* <https://bit.ly/2KBGwgs>

\*\* <https://bit.ly/2vpv03a>

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17-19 September 2018, Johannesburg, South Africa  
<https://africageo.org.za/>

### **INSPIRE CONFERENCE 2018**

18-21 September 2018, Antwerp, Belgium  
<http://inspire.ec.europa.eu/conference2018>

### **ESRI GIS CONFERENTIE**

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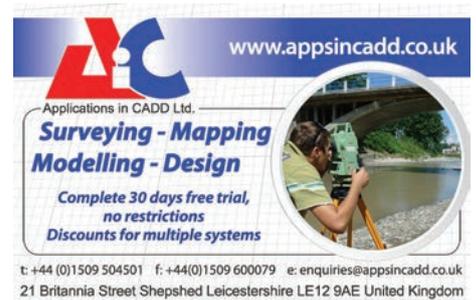
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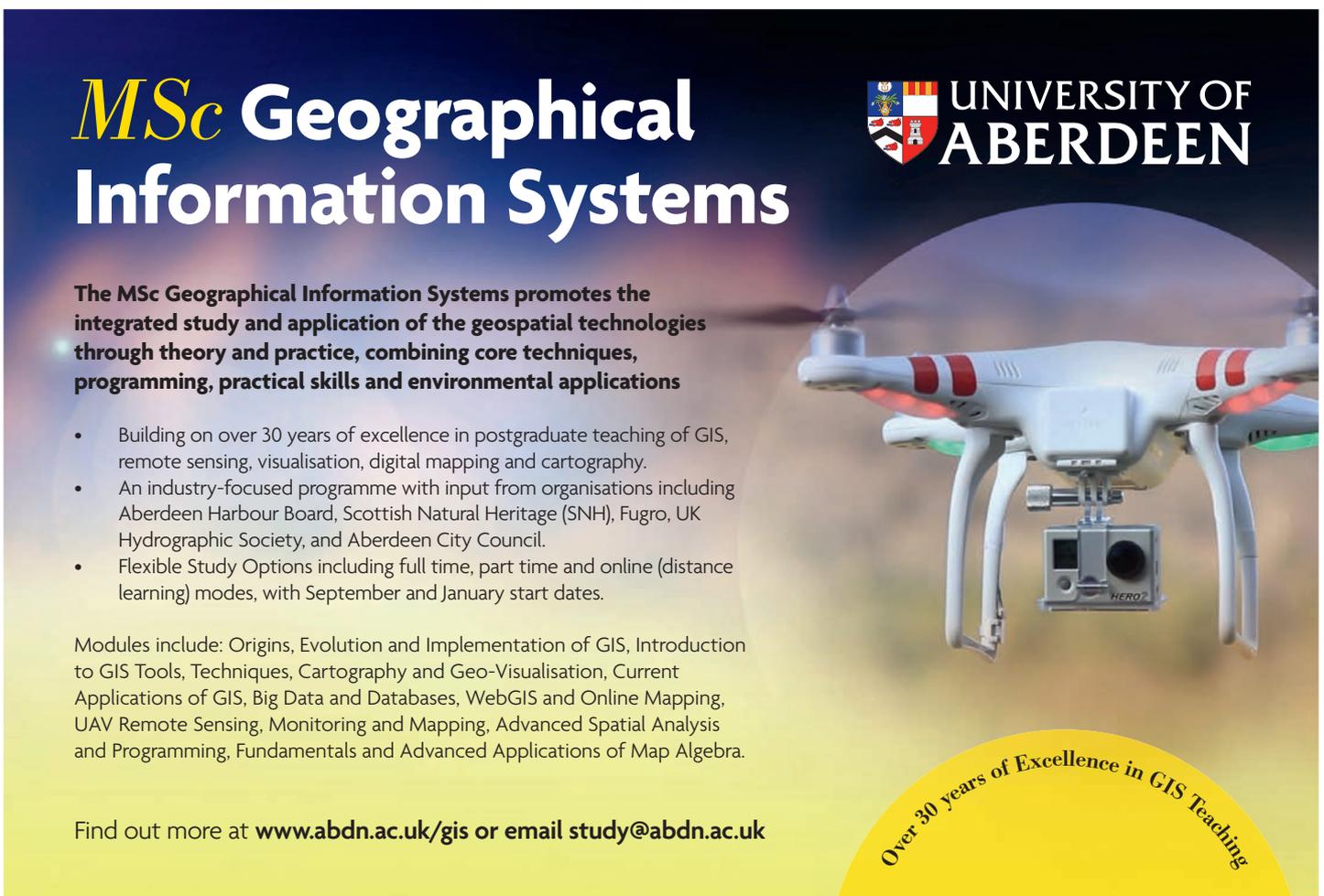


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