Investment

The best way to find out what's really going on in the business is to ask. So that's exactly what we did! Once again, we sent a survey to all our readers to ask them about the state of the industry, how they think it will develop and which trends they foresee for 2020. As in previous years, the response was good; we received more than 400 completed questionnaires, representing a fair cross-section of our readers. Moreover, just like the industry and all the professionals in it, there was a broad geographical spread. You can read full details of the findings on page 7 of this *GIM International* Business Guide, but I'd like to highlight a few interesting insights here. For instance, there is considerable optimism about the future of our business in 2020: more than 40% of the respondents are expecting this year to be better than last, and a further 20% even expect it to be much better than 2019! The question regarding where these improvements will come from generated many different answers, but UAVs/drones were definitely mentioned the most. More than 65% of the respondents are planning to invest in hardware or software this year – ranging from laser scanners and GNSS receivers to Lidar systems and aerial cameras, and GIS and photogrammetry software. This figure is an important indicator of business growth; it is not just about buying a drone to improve surveying efficiency, but it also signals a readiness to invest across the board. Another outcome that made me glow with pride was the fact that a staggering 95% of the respondents regard *GIM International* as a very important source that helps them to keep their knowledge up to date. It's always good to hear that our readers recognize and appreciate our efforts to put together consistently well-balanced editions full of high-quality, exclusive content. I sincerely hope that our readers' predictions for 2020 will come true. In that case, it will end up being a very successful year for the geoindustry as a whole and for the countless individual survey companies, manufacturers and software providers alike!

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Let's get digital

As a child, I could happily spend entire afternoons perusing maps and atlases. I remain an avid map lover and recently bought two large atlases. One of them depicts the history of the Netherlands in a hundred old maps – it's absolutely stunning. The other takes you on a journey back in time to the Dutch Zuiderzee, a former inlet of the North Sea: wonderful hand-drawn maps dating from the 16th century onwards. Not surprisingly – we're talking about the Netherlands, after all – a large part of the former Zuiderzee was reclaimed as land and turned into 'polders'... and I was born, raised and still live on one of them. But when it comes to cartography, much has changed since my younger days. Almost everything in our daily lives has become digitized, and maps are no exception. Besides having my nose stuck in old atlases, I also spend much of time with my eyes glued to a screen nowadays, as there is a lot about digital maps that fuels my curiosity and captures my imagination. The introduction and rise of digital maps has opened up a whole host of new possibilities – many more than we could ever have dreamed of before the digital era. Think of geoanalysis in all its forms, for example. We use map-based apps every day, and as for the good-old cartographers with their breathtaking craftsmanship, they can now benefit from innovative technology such as processed data from satellite images or 'big geodata'. The digital transformation has radically changed surveying methods and tools, and it goes without saying that this is set to continue. This edition of the *GIM International* Business Guide zooms in on the opportunities that digitalization encompasses, especially in connection with various application fields such as construction and infrastructure.

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Artificial intelligence

Never before in history have humans generated such gigantic volumes of geodata as we do today. The production of images and point clouds using a wide variety of geodata acquisition technologies is just one side of the coin; on the flip side is the extraction of meaningful information which is useful for a specific geo-related purpose. Information extraction is a skilled, labour-intensive and tedious task which is mainly executed by specialists. To diminish manual involvement, many researchers are working on developing automated mapping methods. The drive for automation has resulted in the revival of a research area which was first presented some 50 years ago as the Holy Grail for automatic object recognition from images, but eventually died a silent death along its winding road. It was called 'artificial intelligence' (AI). Just two of the catchy AI-related terms that have found their way into today's vocabulary are 'machine learning' and 'deep learning'. The sheer number of papers written in recent years on the application of AI in geomatics tasks shows that many believe deep learning based on convolution neural networks (CNNs) is the definitive solution for automating mapping. Other popular methods are random forest and support vector machines. A CNN is not a magic box of tricks, but rather software built on a sequence of 2D differential filters, such as the Laplace operator, and 2D integrating filters to construct a hierarchy of image pyramids by aggregating small neighbourhoods, e.g. windows of 3x3 or 5x5 pixels, in a process called pooling. This makes the approach sensitive to noise and texture. Many claim that this approach gives promising results, although the researchers also admit that there are several challenges to overcome due to the complexity of Earth-related scenes, such as the presence of shadows and occlusions. In other words, there are still mountainous problems to be resolved. A generally accepted research method is to collect a huge amount of prototypes, of which 80% are used as training samples and 20% for validation. Indeed, deep learning requires a huge amount of prototypes. But hopefully the optimistic promises will become reality and artificial intelligence will not die another silent death.

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