

Leading Surveying Companies on Market Developments

Surveying at Length

The surveying market is changing rapidly. Because of all new technological and market developments, GeoInformatics asked six leading companies in the surveying market about their views on business and technological developments in relation to their market position. The interviewees are Jhannes Schwarz (Leica), Robert Wick (Magellan), Jan van der Weijden (Sokkia), Ewout Korpershoek (Topcon), Jurgen Kleim (Trimble), and Jean-Pierre Josqui (Pentax).

By Joc Triglav

What is your assessment of the current global surveying market situation and of its near future prospects? How do you evaluate your company's current and expected future position on this market? In your opinion, which are the main distinct shifts in business and technological development?

Leica: The current global surveying market situation will follow the general global economic situation, and as ever with a certain degree of latency. The main shifts in business are, as with most products in similar industries, a growing demand for increased productivity and functionality at a lower price. The main technological developments are related to the "coming together" of previously quite separate surveying instruments; the extending of the functionality of the instruments – especially within the software; the simplification in the use of surveying instruments; and changes relating to communication and data transfer technologies.

Magellan: The global surveying market is one of the most dynamic and presents one of the most significant growth areas today for GNSS technology. Magellan concentrates exclusively on GNSS-capable survey instruments having no presence in the optical survey instrument market. Magellan is the GNSS Surveying Value Proposition Leader, offering the right product at the right time at the right price.

After a market fragmentation phase, the surveying market is entering into a consolidation phase, leaving the marketplace with few major players. Magellan remains one of these major players and is very well positioned to gain a significant market share and to be among the top 2 or 3 leaders in the GNSS instru-

ment market segment.

The main shifts in business developments we see are:

1. Expanding distribution into new geographies
2. Increasing cooperation with business partners
3. Outsourcing of manufacturing
4. Shortening time to market

The main shifts we see in technology developments are:

1. New GNSS technologies, such as the combination of multiple satellite constellations, improving instrument ease-of-use while also reducing cost of ownership, and increasing product reliability.
2. The integration of more types of real-time communications.
3. The increasing use of standards to ensure compatibility among competing brands.

Sokkia: Global differences in application approach and requirements both technological and economical make the surveying market a very interesting market to supply to. Sokkia is one of the world's oldest surveying instrument manufacturers with almost ninety years of experience which show that our company has the flexibility to adapt market changes.

Decades ago, it was purely the intelligence of the surveyor who made the difference in surveying challenges. With the revolution of information technology which also discovered our industry a lot of errors are eliminated due to clever software. But despite all help from software, Sokkia never lost sight on its main focus offering continuous reliability and precision. Sokkia will continue to develop with the same values. We see a shift towards customized applications where automation is the keyword. It is not only the surveyor but a chain of branches and technologies that need accurate position-

tioning. Think about specific applications in steelworks, roading, tunneling, construction and agriculture.

Topcon: The rapid expansion of technologies on virtually all fronts creates many new opportunities for our customers and an environment of change. Major developments focus on automation of processes and work flows, with communication and remote access leading the way for our customers to increase efficiency, productivity and overall quality. From a technology point of view, mass data acquisition technologies in form of photo and video capture are emerging fast and offering our users true opportunities to capture reality in all its shapes, forms and dimensions. To combine and integrate different technologies into new efficient products



Robert Snow, Product Marketing Director at Magellan

is one of the challenges for us as a manufacturer; use the flexible handling of GNSS receivers and get a height reference via unique laser technology to build a reliable control system for survey and machine control like mmGPS. We are convinced that Topcon has all ingredients to continue to bring industry leading solutions via own developments and strategic partnerships.

Trimble: In changing environments organizations are looking to be more productive with its resources—whether it is through enhanced training, embracing new technologies or pursuing new and changing business opportunities.

Trimble has pioneered many of the innovative technologies that have changed the way surveyors work. These workflow innovations include real-time kinematic (RTK) GPS, servo and robotic total stations, and VRS (GNSS network infrastructure) technology. Trimble continues to enjoy strong growth in its surveying business by providing the industry with innovative solutions. Recognizing changing market trends combined with our technology leadership has made it possible to continuously provide our customers with enhanced productivity solutions.

By focusing on our customer's requirements, we continually enhance our product offerings. For example, we have added an innovative training component called Trimble Knowledge Network to our solutions. The Trimble Knowledge Network is a new training platform that allows for the deployment of blended training delivery options for Trimble Engineering and Construction customers and distribution partners worldwide. These blended training options include self-study, instructor lead and live interactive programs. It operates by a centralized learning management and content management system that deploys blended training in offline and online options. We offer these blended learning options to key accounts, customers and distribution partners. Results can be measured via testing and we can tie training to any employees work performance plan. In summary, we want to ensure that Trimble solutions are leveraged most effectively in the field.



Jean-Pierre Josqui, General Manager at Pentax

Secondly, Trimble added a Spatial Imaging portfolio to our well-known Integrated Surveying solutions. Our Integrated Surveying portfolio focuses on the land surveying products such as the Trimble R8 GNSS System, Trimble S8 Total Station for everyday survey work and monitoring applications, the Trimble S6 Total Station and many others including the workflow hardware and software solutions. Trimble's new Spatial Imaging portfolio is focused on enhanced 3D solutions and increased data communications with products such as the Trimble GX 3D Scanner and the Trimble VX Spatial Station. For example, the Trimble VX Spatial Station is an advanced positioning system that combines optical, 3D scanning and video capabilities—Trimble VISION technology—to measure objects in 3D and to produce 2D and 3D data sets for spatial imaging projects. The Trimble VX Spatial Station revolutionizes the scope of services that surveyors, engineers, mapping and geospatial professionals can offer as well as provide them with an entry into spatial imaging applications to enhance business opportunities. The Trimble VX Spatial Station enables users to blend extremely accurate ground-based information with airborne data to provide comprehensive datasets for use in the geospatial information industry. With recent advances in the geospatial arena, more opportunities and applications for spatial imaging data are being identified for industries such as

transport and civil engineering, utilities and communications, natural resources management, government and military. Many of these applications use airborne information, but would also benefit from ground-based positioning and imaging. While satellite and aerial imaging provide exceptional overhead views and long-range details, the only way to capture comprehensive eye-level views is from the ground. A ground-based sensor such as the Trimble VX Spatial Station is an ideal solution that delivers millimeter positioning accuracy, 3D measurements and video imaging—all in one package.

In a nutshell, convergence is driving shifts in technology development and business. At Trimble, we see that the traditional industry boundaries are blurring. The field and office are overlapping as data processing and engineering expertise move closer to projects. Surveyors are adding data management abilities to their skills portfolio. Engineering and spatial data are being tracked with project timeline and accounting data. Survey instruments are combining GPS, optical, and high-accuracy GIS and imaging capabilities. And construction machinery is utilizing GPS and lasers to enable 3D machine control that puts design surfaces, grades and alignments in the cab, allowing automatic, accurate real-time positioning for earthmoving operations. Put simply, everything is coming together, integrating, converging...connecting. With this in mind, Trimble's Connected Site survey solutions fosters this convergence and offers a vision for the future now; ultimately to improve productivity and change the way work is done.

Pentax: Both technology and consumer behavior have undergone important changes and the trend toward consolidation of surveying equipment manufacturers seems to be continuing. Also we can see new players gaining market share in the surveying market this by only using prices as weapons, but we will certainly be able to expand our market share by capitalizing on our precision technology and imaging technol-

ogy heritage. Pentax is probably the only company that has full command of all imaging technologies from capture to output itself. While the growth rates in the conventional surveying instruments are actually flattening out, the GPS-receivers and Robotic Total Stations segments are still strongly growing this because of the growing demand in productivity and for a better and more competitive total cost of ownership (TCO). I would say that currently no major new technological market dynamic has been initiated in the market place but there is a distinct trend in wireless connectivity which opens up a new kind of mobility.

How is your company ensuring the quality of instrument production process and the final product quality of the instruments and their accessories? Which are the most significant distinctions in the field of product quality between your company and your competition?

Leica: Leica Geosystems, with its long history in the production of surveying instruments has always had an enviable reputation for producing the highest quality surveying instruments. This reputation extends all the way back from instruments such as the Wild T2 and up to current products such as the Leica TPS1200+ or Leica GPS1200. This is not by chance - this is achieved through quality being present in all aspects of an instrument - from the initial concept, through the design and development and continuing into the production and testing process. Reliability, both in the instrument itself and the measurements made from the instrument are of paramount importance.

This dedication to quality and reliability extends to all of Leica Geosystems' accessories, too, as it is pointless to try to achieve 1" accuracy from a 1" total station mounted on a tribrach which cannot deliver the same level of accuracy and reliability - this is somehow the same as mounting poor quality tyres on a Ferrari and then wondering why the road handling is not as would be expected. The overall quality of a surveying system is only as good as the components within the system, and -beyond the hardware and software - the quality of superior customer support.

Magellan: Instrument production quality is one of the key aspects on which Magellan is focusing its attention in order to increase customer satisfaction and loyalty while reducing the cost of ownership. The process we use to

ensure quality is based on statistical monitoring and root-cause analysis. We have a dedicated Quality Team whose role is not only to ensure that our quality standards are met but also to make product quality our competitive advantage and differentiation. We audit our suppliers' quality processes as well as our own.

Manufacturers do not share information on return rates so it is difficult to compare product quality. However, to be a major player of 20 years in this industry as Magellan has been requires that product quality be high. Magellan offers free firmware upgrades for the life of the product unlike most of our competitors, which allows the customer to benefit from our continuous improvements at no extra charge.



Ewout Korpershoek, Director at Topcon Europe Positioning

Sokkia: Sokkia continuously invests in the improvement of its production methods and processes. The vast amount of knowledge and experience in our company was and is reflected in the professionalism and reliability of our products. We think we can say we build the most reliable instruments in our industry.

No matter the conditions our instruments will perform as expected. Many end-users will confirm the quality, reliability and accuracy of our products. Sokkia is market leader when it comes to build extreme accurate angle measurement devices. Apart from this we have lifted phase-shift electronic distance measurement to a new level where speed, accuracy and range (both short and long) is represented in our remarkable EDM-Red-tech EX technology. And referring to the comparison test of GNSS products in this magazine last year, we can say we have the best GNSS technology and algorithms in the market today.

Topcon: Topcon has an extensive global R&D and manufacturing network, with facilities and resources in all continents. Manufacturing is run via tightly controlled procedures according to the industrial standard norms and workflows that span all these geographical centres of activity. With the recent acquisition of Sokkia, we have started to completely rebuild our engineering and manufacturing facilities in Japan, to ensure highest efficiency, quality control and product reliability. After the initial move towards manufacturing in low labour rate countries several years ago, we are now finding that quality and overall performance can be achieved at generally higher standards for very competitive pricing in Japan, Europe and USA as well. Quality and reliability are critical elements of

our products; our users need to rely on our products when they are working in the field, often far away at remote locations, and during day and night. The best way to underline the quality of our products are the generally long warranty periods that we back them up with; upto 5 years standard for specific products.

Trimble: At Trimble quality is part of our core company values. In our manufacturing facilities around the world, we adhere to strict production quality control processes. Trimble instruments are specified, calibrated, and tested according to international standards for accuracy, such as ISO and DIN. Calibration is an important part of the process to

ensure the specified high-accuracy demanded for surveying applications. In addition, all Trimble instruments are shipped from our factories with an individual certificate which confirms the testing according to Trimble's specification.

Primary quality differentiators for Trimble include the company's history of innovation, strict manufacturing processes, proven in-field use and our world-class distribution network.

In the area of innovation, Trimble has led the way with virtually every key technology used in surveying today, including:

- Invented the first GPS survey system
- Develop and use our own GPS/GNSS boards
- Developed VRS network technology
- Invented Robotic total stations - everyone else has been following for 15 years
- Invented Real Time Kinematic (RTK) technology and made real-time GPS surveying accessible

- Developed Servo and Autolock technology
- Lead the development of the Integration of technologies to increase productivity – scanning for surveyors (Trimble GX 3D Scanner), all-in-one GNSS systems with integrated communications, combining traditional optics with imaging and scanning (Trimble VX Spatial Station), seamless software data and work flows regardless of sensors used

A second differentiator is our strict manufacturing control processes that include testing, calibrations and certification for all survey products.

And finally, our world-class global distribution network is local to our customers, which means local services and training as well as regional certified calibration facilities.

Pentax: Surveyors cannot do an effective job without high quality instruments. In general, we could say that, since our founding in 1966, Pentax Industrial Instruments has always been driven by the concepts of Innovation, Precision and Customer satisfaction. The adherence to these principles has been the main source of our success. As one of the most important parts of the surveying instruments is the telescope. It is the precision optics that really makes Pentax stand out against other products on the market. Since Pentax has a great heritage and unchallenged expertise in designing sophisticated optics. This is our DNA.

How does your company adapt with your surveying instruments and other products to the increasing convergence of measuring techniques? In your opinion, which directions of these convergence developments are most promising and most useful from the surveyor's point of view?

Leica: Leica Geosystems probably understands the convergence of surveying technologies better than most other instrument manufacturers. In 2005 we launched the world's first and only "SmartStation", the mounting of an RTK GNSS antenna on a total station. This "coming together" of surveying technologies was not simply a mechanical exercise in screwing an antenna onto a total station handle. The two surveying technologies and methods were integrated at every level – within the powering of the antenna from the total station, within the surveying software, within the database of the surveyed data – allowing the surveyor to quickly and easily determine the location of the total station. Almost 50% of all Leica TPS1200 total stations sold in Germany are now sold as a SmartStation. For these customers, time consuming and error prone traverses are a thing



Jurgen Kleim, General Manager of Trimble's Survey Division

of the past.

The Leica SmartPole followed shortly later with the GNSS antenna being mounted onto a 360° prism. Again, this was more than a mechanical exercise – the two surveying technologies and methods were once more integrated at every level.

The next surveying technologies to come together could be a scanner and a total station. Some manufacturers already claim to produce such instruments, but a true scanner can survey hundreds of thousands of points per second – not tens. Perhaps equally interesting to watch in the future will be the merging of surveying technologies and "non-surveying" technologies such as the Internet, digital images, data transfer and so on.

Magellan: We see the increasing demand for convergence of different measuring techniques within the same product or solution. For example GNSS receivers are being combined with total stations, laser range finders and reflectors, cable locators, compasses, digital cameras, etc. This convergence starts with compatibility between different devices (first-level convergence) and ends with a full hardware and software integrated solution within the same device (being "all-in-one" or allowing modular configuration and choice).

Magellan from the very beginning has been integrating different measuring techniques with first-level convergence. As convergence demand becomes more frequent and more affordable, Magellan has started to provide combined products integrating the GNSS instrument with electronic compass and digital camera.

However, we do not believe that fully integrated products combining several different measurement techniques like GNSS and total stations will be a major market demand. There will always be a compromise required between, e.g., size, weight and price of the product, and its performance and utility. Modular rather than dedicated combined products are more suitable because they allow flexible configurations and specific feature integration based on specific

customer needs at the same time not saddling the user with rarely used capabilities. "One size fits all" can quickly become "one size fits none"

Solkia: Convergence of different measurement technologies has their pros and con's. Combining all different techniques into one instrument sometimes could miss the objective since not all surveyors have the wide spectrum of surveying tasks in their portfolio.

It is software that brings different sensors, techniques and data together. Software packages support multiple different sensors like digital levels, robotic total stations and GNSS receivers. By this our instruments can be simultaneously used in projects for machine control, mining, tunneling etc...

Topcon: Customers are looking for the right solution for their job. No matter what the technology. Quality, efficiency and ease of use are the decisive criteria. For this, Topcon has been focussed in the past decades to either develop or acquire technologies needed to satisfy our customer's needs. Integration of technologies is critical for future success, as it will offer improved and new ways of working. A perfect example is Topcon's new imaging total station, which incorporates traditional robotic survey optics, with laser scanning for mass data acquisition, as well as photo and video imaging capabilities. Another example is Topcon's Handheld GPS+Glonass receiver that incorporates a digital camera for photo, bar code reading and complex measurements. In both these products you can immediately recognize, what we believe will be one of the most decisive common denominators, namely imaging capability, to truly offer the surveyor what he is looking for.

Trimble: Since 1997 Integrated Surveying has been a key component in Trimble's development efforts, which is based and dependent on our system design. This ranges from internal data communication between different sensors, structure of data bases, data security and reliability, backwards compatibility while preparing for new trends, such as 3D. The advantages for our customers are tremendous—they can obtain timely, complete and compatible data sets with different technologies, such as total stations, GNSS, scanning, image and video information.

Across Trimble, R&D efforts are focused on ways to make our customers more productive. This includes R&D research in optics, lasers, 3D scanning and imaging, communications, information and database management, GNSS, software, ruggedized field computers, network infrastructure, Web services, machine guidance and automation, precision timing, and much

more. Creating value for our customers is most probably the best way to summarize this question. We continually translate market trends and customer requirements into product offerings that enable productivity and transform the way work is done through the application of technology.

Beyond this, we are continuing to challenge ourselves to meet or exceed the needs of the surveying community. We strive to stay in front of the challenges faced by surveyors so that our solutions exceed these expectations.

For example, growth opportunities in the geospatial information industry and technology convergence provided the catalyst for the development of the Trimble VX Spatial Station.

Based on the industry's direction and the need for accurate data, our engineers and in-house surveyors were the first to combine optical positioning, 3D scanning and video capabilities to offer surveyors and geospatial professionals a dynamic solution that answers their real-world needs today while also equipping them for tomorrow's challenges. We can also look Trimble's data controller innovations, where surveyors can use one data collector to control all of their instruments in the field, even a 3D scanner.

We can also revisit the Connected Survey Site model which creates seamless working relationships among Trimble products, technologies and services through support, infrastructure and partnerships. Taking Integrated Surveying to the next level, the Connected Site solution enables surveyors to choose from a broad range of options, including surveying techniques, communications channels and facilitating services such as GNSS infrastructure in one fully-integrated and interoperable surveying solution. Surveyors benefit from complete data compatibility with Trimble field and office software; increased flexibility in employing the best tools and techniques for the job at hand; the adaptation of specialized technologies to fit the ideal workflow of surveyors; and the localization of surveying solutions to address specific market needs throughout the world.

Another example of convergence is the German AAA Model. This is a new approach to spatial information management by combining their Geodetic Control Station Information System (AFIS), Cadastre Information System (ALKIS) and the Topographic-Cartographic Information System (ATKIS) into one, online database.



Johannes Schwarz, President Geomatics Division, Leica Geosystems

Pentax: With the launch of the Visio-family of products Pentax has introduced in 2006 the V-300DN –series of total stations that included a digital imaging unit with 3.1 megapixel CMOS and with digital zoom this to ensure a high picture quality at the point of measurement.

For many years, surveying instrument manufacturers have been developing different product lines while trying to find synergies between them to lower development costs. So today there is still headroom to add a multitude of functions but one criterion for such an integration is that they must be useful to the surveyor and they must be easy to use and even more that it make sense. What really matters is the human –machine interface (HMI).

Also is the surveying industry entering into a fascinating new dimension by shifting the focus to a Web-based Environment.

Surveying field software products present an area where constant improvements are frequent in most brand names in order to ensure the surveyors easier usage and better productivity. How do you sense the surveyor's needs? On which specific field software capabilities is your company focused most and why? How do you evaluate the possibilities to standardize the software across the borders of brand names?

Leica: Surveyor's needs are sensed in a variety of ways. Leica Geosystems has an advantage in this respect due to its global and far reaching distribution network and mix of deal-

ers and direct sales. Feedback is constantly flowing from Leica Geosystems' end users (and non-Leica Geosystems end users) through sales channels to the development teams in Switzerland. In addition to this, our Application Engineers are constantly travelling the globe meeting customers – not only to listen to what they say but to watch how they work. Sometimes surveyors themselves are not aware of what improvements can be developed by the industry to increase their productivity. Leica Geosystems has additional tools within our support channels to make it even easier for development to gain access to cus-

tomers' needs and wishes.

Obviously, within field software development, Leica Geosystems focuses on the areas where further productivity gains can be made: data transfer, handling of images and background maps, speed of measuring points, ease of use, reduction in the number of key strokes etc. "Standard" operating systems such as Windows CE or Mobile make it much easier to run individual software on a variety of data logger platforms. More difficult is to steer the instruments themselves with the communication protocols not always being available.

Magellan: Magellan employs licensed land surveyors and works closely with our business partners to keep pace with the changing demands of the surveying industry.

Magellan is focusing on surveying field products, and the field software is a critical part of this focus. Our company is recognized for providing easy-to-use and intuitive software solutions. Magellan provides these easy to use solutions and also uses Business Partnership to provide more complex and fully featured solutions including compatibility with optical instruments. Our broad software portfolio allows us to provide the best software solution required by each target market and type of customer.

Software compatibility with different products is assured by using industry-standard data formats. We do not think and do not expect any specific standardization of the surveying software across the borders or brand names except through these standard data formats.

Sokkia: Sokkia always found it extremely important to speak the language of the customer. This is reflected in the way we have setup different focus groups within our company. Most of our staff have been working in the field and have years of practical experience. This is reflected in the philosophy of our software like SDR+, Spectrum Survey, GSR-NET Link etc. Apart from that we give the freedom to software developers to incorporate our command structure in local software solutions. This means that local popular surveying software, not necessarily developed by Sokkia, is open to hook up to Sokkia products. Different countries favor different methods of calculation and procedures. That is what we have to respect in a European area with over 35 countries, 22 languages and plenty of surveying cultures and data formats. We call that global reach, local touch.

Topcon: Within Topcon we focus on bringing solutions to the market. Field software generally is a critical part of that, offering the user access and control over the hardware he is using. We have various end user- and key-pilot customer programs that run in close conjunction with product management and engineering, and at the same time we try to nurture a customer awareness culture inside our own company, that stimulates all our employees to continuously listen to the demands and work with our customers closely.

For a manufacturer like Topcon, the field software is an integral part of our solution, and therefore a very important element. Especially as we keep on bringing unique new technologies to the market, we need tailored and focussed software to offer maximum benefit of use, and not limit our customers access to true innovations.

Furthermore, what we find today is that field software is differentiated probably as much or even more across the geographical borders of countries and local rules and customs. This is probably the biggest challenge manufacturers are facing. By the way we have an open interface policy, which allows any international, national or local software company to connect to our hardware.

Trimble: At Trimble, customer feedback through many touch points—whether it be with a local distributor, regular customer visits, surveys, road shows, our Dimensions User Conference or others means—provides many avenues to take the pulse of surveyors to access their needs. Trimble solutions are designed by licensed surveyors from around the world who work in our R&D, marketing, sales and training and support departments. In addition, we also have a discussion forum for our

worldwide users called Trimble Survey Team program to express their needs.

Trimble is focused on the total solution for its users, which includes field software, data collectors, positioning sensors and office software. Field software is an important part of the solution and it can vary depending on geographic regions and their specific requirements.

We evaluate the possibilities of standardizing on software based on our users' feedback and participation in industry forums and study groups. We output a variety of standard industry data formats including LandXML and NMEA. Our philosophy is to provide the most efficient interface and workflow for our customers.

Pentax: An increasing level of quality requirements and ever more demanding productivity standards make it crucial for surveying manufacturers to develop easy-to use field software which can be customized and localized whenever required. Therefore Pentax has adopted on his W-800 Series of Total Stations the now almost universal Windows CE -based approach which is far more convenient. Ensuring that separate surveying instruments from different brands work together as a unified whole is possible when applying an open software platform strategy. To this end, we developed a new field data collection software - with a simple software architecture allowing the user juggling tasks.

With traditional field data collectors used with surveying instruments measurement data are batched and downloaded later in the office. Now the smart mobile phones and wireless internet communication technologies are starting to enter the market and replace them sending the data between the field and the office immediately. How big is this need in the modern surveying world and how far is your company in implementing modern mobile communication technologies in your products?

Leica: With the Internet explosion and wide range of communication possibilities (WLAN, GSM, GPRS, UMTS, CDMA etc) it is difficult to ignore the potential of the new communication technologies. No longer is it needed to drive into the survey office in the morning to pick up the data which needs staking – simply download using WLAN while drinking a coffee in the local coffee shop on the way to the job. And this is only the beginning: As communication networks extend and data transfer times reduce, the possibilities increase exponentially. Leica Geosystems of course is heavily involved in the utilisation of these technologies in all areas of hardware and software.

Magellan: The capability to send collected data immediately to the office is relatively new but is developing quite rapidly. There are two different approaches here; one can either embed high-end surveying products with wireless communication capabilities, or use existing wireless communication devices such as smart phones. Both approaches assume there is a wide band wireless internet communication (such as Wi-Fi, 3G, etc.) available so that large data sets can be quickly, easily and cost effectively sent to the office. While this is certainly the case in urban areas, it is far less the case in developing areas where the cellular infrastructure follows the surveyors rather than leads them. While new technologies, such as Wi-Max, may improve this situation, it will certainly take time to become a common and dominant scenario in many areas of the world.

Magellan has been aware of this trend and need, and for some time now has been implementing by such capabilities as Bluetooth, Wi-Fi/WLAN or GPRS data modems into its product. Implementing wireless communication capabilities is a "must" feature for our professional products, but the use of this technology for tightly integrating the office and field is only just now becoming of interest to the early adopters. It has not yet reached the mainstream surveying market.

Sokkia: Already before the introduction of PDA's and Bluetooth Sokkia developed its own SFX technology. This technology was built in our equipment in order to send and receive data through a GSM network. Only a cell phone was needed to get data as quick as possible from or to the office.

Today's standards from consumer electronics are also adapted in our instruments. It gives a short learning curve as we use the same technologies and media as our users known from their phones, cameras and audio systems. It saves travelling time from the surveyor but also it gives more room to adapt project changes. The latest project update coordinates are available in the field just in a single moment. And that's because of the modern communication technology.

Topcon: Remote access and control, smart communication, process control are all elements that can make work processes more efficient, faster and better. This also applies to many survey applications.

For this reason, Topcon is using industry standard controller platforms like Windows on both total stations as well as all our field controllers, to allow the use and application of industry standard communications and other 3rd party solutions. This has been our philosophy for

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many years ; with all Topcon GPS+GLONASS survey sets, robotics or mid range total stations, any user can easily access the Internet via his mobile phone from the field, communicating to the office or anything else.

In addition, Topcon has recently established an exciting new service called SiteLink, offering a wide range of telematics subscriptions and solutions to our customers, ranging from simple remote access and data logging to complete, advanced fleet management solutions.

Trimble: Wireless communications is and has been a core competency for Trimble; beginning with the first radios that were used to receive differential corrections and perform RTK surveys. We have continually used the latest in communications technologies to enhance and enable our products/solutions. WiFi and Bluetooth are available on Trimble's data collectors and, connections to a network while in the field are available today with Trimble's solutions. In fact, our customers have been sending emails, using instant messaging, and transferring data from the field to office since 2005.

Pentax: A crucial aspect in the job of a surveyor is availability of the correct data in the field and how fast he can get back to the office in order to further process the data. Smart mobile phones are small and inexpensive having initiated a new market dynamic and are the future of mobility.

This trend will continue and we will see more communication functions implemented into our surveying instruments.

What is your comment to this provocative statement, often heard in the surveying community: "While surveying instruments are becoming ever smarter, the surveyors are getting ever dumber"? Can the global surveying community really afford this statement to be(-come) true?

Leica: It is pointless asking the question as to whether "the global surveying community can really afford this statement to be (-come) true". Tens of thousands of surveyors and non-surveyors measure hundreds (sometimes thousands) of points per day. Instrument manufacturers are not going to stop product development in order to "save the surveyor". Indeed the surveyor actually drives this process by asking for easier to use instruments.

The question should therefore be "Where does the surveyor go, when surveying instruments are becoming ever smarter?" The surveying community should not complain about the fact that anybody can and does now survey and stakeout points – rather they must adapt to an ever-changing surveying world – at every level:



Jan van der Weijden, Managing Director at Sokkia

Exploit new measurements basing on new technologies (for example, scanning) and the coming together of measurement technologies (for example, the SmartStation and SmartPole); increase efficiency by utilising the most reliable instruments (measurements and hardware) and accessories; investigate the communication technologies which can save time consuming trips to the office. As with all other species, surveyors (and instrument manufacturers) develop with a Darwinian type evolution, only the fittest and those smart enough to adapt to a rapidly changing environment will survive.

Magellan: The same statement has been applied to children who can no longer add and subtract without a calculator. In both examples the truth is somewhat different. Providing tools that make someone's job easier does not make that person dumber, it frees up their mind and time to increase their productivity. On one hand surveying products are becoming more and more complex, but at the same time more intuitive and much easier to use. The result is that more of the math is done by the instrument and less training is required to operate the instrument. On other hand, with surveying product democratisation, more and more people can use the instruments on a regular or occasional basis to find accurate positions. At the same time, this does not mean that there is or will be no need for high surveying competencies and skills, particularly in the area of licensing and legal recording.

recording.

Sokkia: Let's put this as follows: "If I buy myself a state of the art digital photo camera, does it make me a good photographer?" You need to know the principles of the profession of surveying. Off course there is a difference between today's surveyor and his colleague 30 years ago. A lot of mathematical pitfalls are no longer an issue and resolved in the way software solutions control this. It does not make the surveyor dumber but a new generation of end-users' handling surveying challenges smarter. The new generation has the possibility of using sophisticated software solutions.

Topcon: If you look at it only from one angle, I have to say you are right. Steps in technology development were huge in the last decades and also job description and profession requirements have changed rapidly, what means that standard jobs like data collection or stake-out can be done today more or less automatically by any user or even by construction machines. As the technology that is available gets more advanced and offers new functionalities, we are faced with the challenges to change and have to adapt work flows and procedures to maximize the use and efficiency. These are the constant challenges that we, and our customers are faced with.

Trimble: In general, all of our lives and professions are evolving and changing to due technological innovation.



$v = \frac{d}{t}$

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With this in mind, surveyors have embraced new technologies to meet the daily challenges they face to provide more accurate information, faster and efficiently to improve productivity. In fact, that statement couldn't be further than the truth... surveyors are smarter than ever before. In staying ahead of the curve, surveyors are keeping up-to-date with the technological improvements that are available for use on a day-to-day basis. These skills and expertise are setting them apart because they know how to use the tools productively, the potential errors and limitations in their operation and what specific data to collect to create their deliverables.

For example, laser scanning—another technology that has been added to the surveyor's arsenal—is changing the methods and processes used to collect positioning information and other types of data. In contrast to traditional single-point measurement methods, scanners are able to capture thousands of points per second as well as digital images that provide visual detail for reference and analysis of complex scenes.

While laser scanning provides a convenient means for collecting rich 3D data, the amount of data the surveyor needs to work with can be daunting. Scanning is not solely about collecting millions of millimeter positions over an entire scene. To be a productive tool for the surveyor, a scanning solution needs to focus the collection of information on the areas that the surveyor specifically needs. The solution also needs to provide the end deliverable quickly. Without easy integration, productivity gained in field data collection is lost through delays in office processing. Advancements in scanning technology, such as Trimble SureScan™ technology are moving in this direction. SureScan allows surveyors to define a uniform resolution for an entire scan in one simple frame. This allows the surveyor to capture a consistent spacing between 3D points over a framed surface, giving them the data they need, not just more data. Again, technology is helping the surveyor achieve success.

As I mentioned before the field and office are overlapping as data processing and engineering expertise move closer to projects. Surveyors

are taking on new roles and adding data management abilities to their skills portfolio which allows them to make more decision in the field instead of waiting for the office. The technology and tools are allowing surveyors to be more productive.

Pentax: One important criterion for the integration of additional assistance functions to the user is that these functions must be useful to the surveyor and they must be easy to use. Generally speaking people shouldn't have to understand computers; computers should be able to understand people! In a world in which smart devices serve people, instrument keypad, surveying field software and so on shouldn't stand in the way of what really matters – communication.

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