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A Case for Geospatial Surveyors

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ABSTRACT

IN THE 1980S A NUMBER OF COUNTRIES began using the term Geomatics in relation to surveying. While first adopted in bilingual Canada it spread to a number of other English speaking countries. The reasons for its need were commonly given at the time a) it embraced a field wider than surveying b) land surveying had a poor public image, and c) a more modern term was needed to attract students to university surveying programmes. While widely used in academia, the surveying profession has been more reluctant to adopt the term and controversy and confusion have grown up around its meaning. This paper re-evaluates whether the term geomatics has met the original needs and if its use is still valid or if a better term is available. It concludes that “geospatial” surveying better meets the modern requirements for defining the role and practice of what has traditionally been “land” surveying.

Keywords: Geomatics, land surveying, geospatial surveying.

Introduction

THE ART AND SCIENCE OF THE MEASUREMENT of land and its depiction in 2 dimensions, be it on clay tablets, maps, plans or charts, has a long tradition. The “Blau monuments”, held in the British Museum, and which date from approximately 3100 BCE, describe a piece of land and its owner. Cuneiform tablets dating back to about 2150 BCE, which now form part of the Yale Babylonian Collection, record measurements and calculations giving the area of a field. They record the work of those we would now call land surveyors. Cooper describes the form of mathematics used by these surveyors as “geometric algebra” and suggests a range of applications beyond cadastral surveying to which they may be applied, such as the volume of conical piles of grain (for valuation) or the number of bricks required for a proposed building (quantity surveying) (Cooper, 2009).

The Roman agrimensores, or measurers of the land, also worked with civil and military authorities. They were influential in the mapping and recording of land (Dilke, 1971) but also were needed to assist in the construction of the Roman roads, aqueducts, and other engineering works (engineering surveying) as well as the site selection and laying out of garrison towns, both temporary and permanent (planning surveyors).

The Origins of the Modern Surveyor

Ballantyne (1996) attributes the first use of the word survey in the sense that it is used in the surveying profession, to 1550, based on a definition of “survey” in the Oxford English Dictionary. This coincides with the beginning of the developments referred to above but clearly indicates a beginning to the idea of the surveying of land. It is likely that the dissolution of the monasteries by Henry VIII, the resumption of their lands by the Crown, and the subsequent sale, rather than feudal allocation of land, encouraged the development of land surveying as an occupation. New owners wished to enclose what they “owned” and boundary demarcation became important. The

standardisation of measurements by Elizabeth I added further need for an individual with an understanding of measurements.

It was not until the Renaissance that England saw the development of what was to become the now traditional land surveyor. New equipment became available in the form of telescopes with cross-hairs, Gunter's Chain, accurately machined graduated angular measurement circles and Vernier scales. New knowledge of mathematics in the form of algebra, geometry and trigonometry had found its way to England from China, India and Arabia through the Moorish invasion of the Iberian Peninsula, and the travel of English scholars to study in Cordoba and Toledo (Joseph, 1987; Usvat, 2013).

Surveying as a Profession

The original professions, the church, the law and medicine, began being added to following the Industrial Revolution, and the trend grew in impetus in the mid to late 19th century and early 20th century. Professions were seen as of higher status than the trades and their guilds, but of a similar nature. Professional status and recognition was being sought by many occupations through this period. The Surveyors Club was formed in London in 1792 and was the precursor to the Royal Institution of Chartered Surveyors (RICS) which was founded in 1868 (RICS, n.d.).

Land surveying as an occupation spread throughout the British Empire during the era of colonial development. While the technical aspects of the occupation were common through the developing areas, some additional skills were added to those relating to measurement as local conditions required. As land surveyors were often the explorers with mapping expertise of new territories, they arrived early in the settlement schemes. They had the task of identifying plots of land that had been allocated to the settlers, and often had to lay out pre-planned towns. Additionally, as towns grew the land surveyors were required to design and supervise the construction of utility services such as roads and drains, and design additions to the planned towns as they grew with the influx of new migrants. Hence, in many cases skills that were usually the ambit of other professions were acquired,

such as town planning and engineering.

The tools used in this era of land surveying were much the same as those that had been invented or designed in the 100 years around 1600. Land definition and land ownership were also largely unchanged, although the Torrens system aided the creation of a systematic recording of the rights in land that came with ownership. Thus it was that the colonial land surveyors also developed expertise in the law relating to rights in land. Consequently, land surveying, met all of the requirements defined in the literature as prerequisites for an occupation to be recognised as a profession (Coutts, 2017).

The Image of the Land Surveyor

From talking to many surveyors in several countries, it has become clear to me that the profession of land surveying has an image problem. The image portrayed, including by many surveyors, is usually a man, although now women are beginning to make a more regular appearance, standing around a device mounted on a tripod. It does not matter very much whether the device is an optical theodolite, a total station or a GNSS antenna. The picture is one of someone in outdoor clothing and who is likely to be wearing boots. Their purpose is unclear although the backpack and GNSS antenna does resonate more with the public than earlier measurement devices. The image is thought nit to be of someone who is a member of a profession, but some technician or technically qualified person. Educational institutions often reinforce this image, and some promote the outdoor activity of the land surveyor's work as an attractive aspect of the profession.

Anecdotal evidence suggests that land surveyors often under-sell their work and their contribution to society through their expertise in measurement, and have a tradition of undervaluing their outputs, even to the point of giving them away (Coutts, 2017). Additionally there is often the complaint that land surveying is not understood by the public. Three questions arise from this view. Firstly, is it actually true? Secondly, how much do the public understand of any profession, and thirdly, if the claim is valid who is

responsible for changing that perception. To answer the first question it would be helpful if rigorous research were conducted to test whether or not the perception is correct. The response to the second question is likely to be inconclusive. The greater the number of people who have had first-hand dealings with any particular profession, the greater is the likelihood of there being some understanding.

The answer to the third question is more complicated. Universities have an interest in attracting students to their programmes in order to keep their programmes viable. Professional institutions have an interest in ensuring that there are enough active professionally qualified practitioners to meet societal demand. The interests of the universities and the professional bodies are therefore aligned. The problem arises, where there are multiple tertiary programmes, or competing professional societies, in getting them all together and then coordinated to develop a coherent, consistent and communicable message. New Zealand is fortunate in this respect in that it is one nation (no states or provinces), has one principal professional body, and has one National School of Surveying. These are considered here to be the principal reasons why New Zealand has an ongoing programme that fills its quota every year.

Many land surveyors are unhappy with the image that they perceive the public have of their profession, but the question may be asked if this is indeed the public image of the profession. There are no known studies where this question has been specifically asked and a rigorous answer found. Is it therefore the self image of the land surveyor that is the more of a problem than the imagined public image of the profession? It may then be asked that, if the image is faulty then who might take responsibility for changing it and how can this be achieved? The answer to each of these questions comes back to the profession itself. But first, the professional land surveyors have to improve the image they have of themselves.

The Arrival of Geomatics

In 1975 Bernard Dubuisson referred in a scientific paper to a new

discipline, géomatique. It is not clear who first coined the word, but géomatique is translated as “geomatics” and is accepted by the International Standards Organisation. Little attention appears to have been paid to the term, but it reappeared in Quebec City, Canada in 1981. Michel Paradis “created” the word as an umbrella term to include all methods of acquiring and distributing data. At this time the term did catch on and spread throughout Canada (Bédard, 2007).

From Canada it jumped to Australia, where it was ostensibly used to define this “new” discipline which was a collection of new technology used to gather and process data added to the academic discipline of surveying. The surveying profession was less than enthusiastic about the adoption and use of the term geomatics. However it is apparent that a more important reason for the adoption of geomatics to define what the universities were doing was its use as a marketing tool, in an attempt to attract more students into struggling surveying courses. In the long term it has not been successful. Australian schools of surveying are disappearing into engineering schools and parts of the profession have adopted “spatial science” as an umbrella term, but it is unclear if the umbrella includes surveying. The principal national surveyors’ society, the Surveying and Spatial Sciences Institute, would appear to be unsure. However, there appears to be a developing preference for names that refer to geospatial rather than spatial science(s).

The United Kingdom followed Australia in adopting the term geomatics. While many tertiary institutions adopted it in some form, once again, the professional bodies did not. Its use by the profession’s practitioners has been minimal and its use by academia inconsistent. Some consider geomatics to embrace land surveying while others do not. Advocates for its adoption used similar points to those debated in Australia, namely the embracing of new technology and attracting of young people into surveying programmes struggling to remain independently viable.

Advocates of the use of geomatics instead of land surveying in the UK seemed unaware that it already had a definition and a meaning. Frequent mention is made in the literature of “being able to make it mean anything”, as if it was had no pre-existing meaning. An

apparently serious argument was made that since it had no meaning it would give those who use it an opportunity to explain what it meant. But then they were already concerned that when they said they were a surveyor they then had to explain that to people!

The reasons for its adoption do not appear to have been any more successful than in Australia. In support of changing the name of a profession that had existed under an agreed name for over 400 years, and had existed as an occupation for several millennia, Professor Paul Cross, a proponent of the adoption of geomatics, is quoted as saying “A profession that cannot even agree a name is unlikely to be taken seriously” (Cross, 1997. p5).

It might be noted that one English speaking country, New Zealand, debated and refuted the use of the term geomatics when it was becoming fashionable in the 1980s. Nevertheless the New Zealand National School of Surveying still continues to fill its 60 allotted spaces each year on a competitive basis, gaining more applications for entry than it can accommodate. It retains surveying as its name and within its core requirements for a surveying degree, teaches courses in all of the new technologies that geomatics was intended to embrace, all without the need of a new identity.

The Geospatial Identity

There is unrest about the use of geomatics to describe surveying. Practitioners in England, Canada and Australia, despite the widespread use of the term have not adopted it to describe their profession. Those coming nearest are the Australians whose professional body was the Spatial Sciences Institute, established in 2003; it changed its name in 2009 to the Surveying and Spatial Sciences Institute. A superficial consideration of the name change would suggest that Surveying, therefore, must not have been considered a spatial science. Nevertheless, those of the land surveying profession, be they in Canada, Australia or the UK still, in the main, proudly refer to themselves as surveyors.

Coutts and Grant (2016) used the term “geospatial surveyor”

in a paper presented at the FIG Working Week in Christchurch. It is interesting to note that it raised not a single comment. There are reasonable grounds to suggest, that at least in the English speaking countries, geomatics has not only been ineffective in bringing the changes desired when it was adopted, but it has raised the ire of many practicing surveyors. The evidence suggests that the use of the term geomatics is diminishing in those countries named above.

Where, then, does this leave the land surveying profession? The word surveying to describe those who measure aspects of land, particularly its location, dimensions, shape, topography and occupation has had centuries of use and reasonable understanding. The qualification “land” has been useful and relevant in the past. However the descriptor “land” is now a limiting factor in describing the capabilities of the surveying profession following the evolution and revolution of technology that occurred during the last century. Furthermore, location data gathering, analysis management and the distribution of information are highly valued and growing requirements of the digital age.

Given that limitation, it is suggested that land surveyors rebrand themselves as geospatial surveyors, a term that is more likely to succeed where the adoption of geomatics has failed. The term geospatial is already in wide use internationally, and in some places has already begun the takeover of geomatics as well as spatial science. It is also reasonably easy to interpret by the public as it can be related to devices they already have in their pockets. Never has mapping been so ubiquitous.

Discussion and Conclusions

The New Zealand surveying profession was wise not to join the global trend in adopting geomatics in place of surveying or to represent a discipline wider but inclusive of land surveying. The reasons others adopted the term geomatics were not relevant to the New Zealand profession at the time, namely; the need to find a term broader than surveying to include new technologies, the need to modernize the image of the profession, and the pressing requirement to attract

greater numbers of students.

The reasons geomatics was not necessary are quite simple. Firstly, the Bachelor of Surveying at the University of Otago has continuously evolved to include the new technologies referred to in the original definition of geomatics under the canopy of surveying, namely, remote sensing, photogrammetry and GIS. Secondly, while not having a high profile, the general public did and do have some understanding of the history and functions of land surveyors in New Zealand, and in particular the qualification of Registered Surveyor were held in high regard by the general public, even if the activities of a professional surveyor were not well understood. Thirdly, the National School of Surveying at the University of Otago was undergoing growth in its student numbers and entry to its flagship course, the Bachelor of Surveying, the only surveying course in the country leading to professional status, was competitive. As a consequence the annual intake rose from 40 per year in 1992 to 65 by 2006.

Geomatics as a term has failed to achieve the stated purposes of its adoption in the United Kingdom, Australia and even in Canada where it originated and was adopted by academia. Neither has it resonated with the public nor with professional surveyors in any of those countries. University programmes in each have largely been absorbed into larger departments, almost exclusively engineering. In the United Kingdom and Canada the programmes are more commonly branded as Geomatic Engineering. Not using the word surveying to describe the skill set being offered by universities is viewed now by many as a disadvantage, and some programmes have reintroduced surveying into their publicity, particularly their websites, so as to be findable by search engines (Coutts, 2017).

Continuing to refer to the profession as “surveying” is important for historic and consistency reasons. However the qualifier “land” has outlived its usefulness. Nevertheless some qualifier is necessary to distinguish what historically has been the land surveyor from other types of surveyors e.g. quantity surveyors. The term “geospatial” is already in use in university programmes, e.g. at RMIT in Melbourne, Australia. It is becoming more widely used and understood generally as smartphone technology becomes ubiquitous. The issue is that the

“land” descriptor now undersells the capabilities of the land surveyor. What is more, the need and demand for accurate location data is increasing and will continue to increase as current technologies continue to advance.

It is not suggested here that there needs to be a sudden adoption of new terminology, nor that institutions will need to change their names, at least in the short term. Nor is it necessary that changes be made by “statute”. No one needs to mandate that the new term be used. It is as much a mindset as anything else. It can be implemented on business letterheads and cards in an incremental way so that there are no costs in its adoption.

Furthermore, with some compromises, the term geospatial surveyor can be inclusive of the traditional land surveyor, the technologically advanced land surveyor, and those professional GIS practitioners who work in the geospatial landscape. International and local definitions already allow for this. However, all parties need to feel comfortable with the new appellation; that land surveyors are in the geospatial area, and that the appropriate GIS practitioners can feel comfortable being called surveyors.

References

Ballantyne, Brian. (1996, March). A polemic against ‘geomatics’: Buttering no parsnips. *Survey Quarterly*, 5.

Bédard, Yvan. (2007). “Geomatics”: 26 years of history already. *Geomatica*, 61(3), 4.

Cooper, M. A. R. (2009). *Who did they think they were? or Land Surveyors in Society*. Christmas Lectures. Royal Institution of Chartered Surveyors.

Coutts, B.J. & Grant, D.B. (2016). Geospatial surveyors – what are they good for. Paper presented at the FIG Working Week “Recovery from Disaster”, Christchurch, New Zealand.

Coutts, Brian J. (2017) Land Surveying: has technology fundamentally changed the profession. PhD thesis. University of Otago. (Unpublished).

Cross, Paul. (1997, Nov/Dec). Paul Cross - explaining geomatic engineering. *Surveying World*, 6, 3.

Dilke, O. A. W. (1971). *The Roman Land Surveyors: An Introduction to the Agrimensores*. Newton Abbot, Devon, UK: David & Charles.

Dubuisson, Bernard. (1975). *Pratique de la Photogrammetrie et des Moyens Cartographiques derives des Ordinateurs*. (K. J. Dennison, Trans.). Paris: Editions Eyrolles.

Joseph, George Ghevarughese. (1987). Foundations of Eurocentrism in mathematics. *Race and Class* (28), 15. doi: 10.1177/030639688702800302
Royal Institution of Chartered Surveyors. (n.d.). Retrieved 19 July 2013
<http://www.rics.org/nz/about-rics/who-we-are/history-and-mandate/history/>

Usvat, Lilianna. (2013). Medieval Times Mathematics. *Mathematics Magazine*. <http://www.mathematicsmagazine.com/Articles/MedievalTimesMathematics.php#.UqUvnuK9LMk>

Biographical Notes

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