THE INTERNATIONAL TECHNICAL DEVELOPMENTS AND THEIR IMPLICATIONS FOR THE LAND SURVEYOR

Prof. Jean-Marie BECKER, Chair of FIG Commission 5, Sweden

Key words:

INTRODUCTION

The surveying profession has been subject to many important changes during the last decades. We have seen a rapid technological evolution especially concerning the measurement systems and instrumentation used for different applications.

The time of surveying with purely optical and mechanical instruments (steel meter, levels, theodolites, etc) has rapidly been replaced with more sophisticated surveying techniques and equipment like motorised total stations, GPS, etc. Today new kind of automated survey systems based on "Black box technologies" and producing digital data in real time are more and more used. Many of the surveying operations including the field operations have been reduced to simple "Push a button" operations with limited use of the knowledge and experience of the professionals.

This technological evolution has also deeply influenced the surveying profession in its various applications fields. The use of modern surveying systems like GPS, digital levels, field-computers and electronic field-books, have changed the surveying procedures both inside and outside the classical surveying areas. Many changes have revolutionised the whole profession in short time and we commonly agree that "the profession is in transition". Still we are not at the end of this transition period.

In the following chapters I want to illustrate with some practical examples the impact of the technological news on the surveyors profession in general, the survey-market and its actors. Furthermore I will mention some expectations, make some speculations and perhaps predictions about possible future realities. Sometimes we need dreams if we want to progress!

CHANGES IN THE PROFESSION

We can summarise some of these changes as follows:

- Globalisation of solutions (common software and global geodetic reference frame = WGS84, EUREF 99, etc).
- Integration of techniques (GPS, INS, Total stations, CCD cameras, laser-scanners, etc, included in different type of MSS = Multi - Sensor Survey Systems).

- Automatisation and robotisation (computer assisted survey systems and motorised robots).
- Real time solutions (positioning & guidance of mobile objects).
- New survey methods (RTK= Real Time Kinematics Positioning, MMS = Mobile Mapping Systems).
- New standards (ISO 9000-9001on production processing, ISO TC 211on GIS or/and the professional certification of the ”Geomatician” and TC 172/SC6 on survey instruments.
- New professional role and activities (multiple speciality generalist, knowledge and service workers, human robots).
- New activity sectors (Agenda 21, Environmental questions, Nature protection, Metrology, Navigation, GIS, LIS, Geomatic, etc).

FACTORS BEHIND THIS EVOLUTION

We can detect the following factors:

- Gradual deregulation of the survey-market: a majority of the official survey tasks/projects are put on the “**open market**“ and for “***free competition”***. This results from an liberal political philosophy and decisions as well as economic pressures (in Europe for example coming from EU-directives or in Sweden from the new NLS policy for network densifications, area photogrammetry, etc).
- ***Internationalisation*** and globalisation of the survey market concerning the manufacturers (Leica, Trimble-Spectra, etc), the survey companies (Bloom, Kampsax, Swedesurvey, etc) and the survey projects (Öresundsbro, Ostkustbanan, etc). Many companies are worldwide competitors especially on the market of important construction projects where the surveying part often is marginal.
- The ***new growing market*** not well structured yet (“wild!”), is dynamic and replaces the classic well-established market with traditional products. This new market demands new type of knowledge often missing by the traditional survey operators.
- We have to go over from a “*land surveying* role“ to a more “***data management role***” and have to satisfy the needs for a more global and diverse range of users.
- The companies have to modernise their instrument-park to be more efficient and competitive. The competition is very hard and only the strongest will survive.
- The implementation of new survey techniques for the same reasons.
- The obligation to have ***quality certified production lines*** (ISO 9000,) to be qualified for tender to projects.
- Reduction of the ***manpower-use*** by automatisation and robotisation which reduce automatically the costs
- Use of subcontractors (specialised companies) for special survey purposes
- Fully digital computerised production process from field-capture to final delivery which allows “***self-service”*** for the end-users

Time is money – money is power: “We have to think first and act thereafter!”

NEW TRENDS AND IMPACTS ON THE SURVEYING PROFESSION AND ACTIVITIES

In the following chapter I want to point out some new trends, which appears more and more clearly in our profession and its activity field as:

Between private and official actors on the survey-market

- Liberalisation and privatisation from official state projects and transfer to the open surveymarket in EU (Germany, Sweden, etc). Less and less state regulated survey projects (financed by official grants) are reserved purely for the Officials (governmental, local or municipal employees). Many such projects are today put on the open market for free competition.
- Officials (State employees) are more active (participation/involvement) and compete actively on the open market.
- New actors from neighbouring disciplines or industries (geology, agriculture, construction industries, computers science, etc) often without any survey education or knowledge(background) try to take over a part of the survey market. This is facilitated by the new generation of survey equipment (GPS = Global Satellite Positioning, ATS = Automatic Tracking Station and CAS = Computer Assisted Survey).

Between educated (knowledge people) and non educated or unqualified employees (service people)

- "*Knowledge people*" will need larger competence in several disciplines, they have to be generalist with many specialisation's and know much in a broad spectrum: much more than the classical geodetic surveyor.
- New types of qualifications are needed: Geomatician, electronician and analyser.
- The majority of the survey operators will be "*Service people*"; their activity will be reduced to some kind of "*push button operator*" or "*human robot*".

Between survey activities in urban (around agglomerations) and rural areas

- About 90% of all survey operations are concentrated in *urban areas* and this especially for the new survey applications fields (in-house, construction sites, infrastructure surveys for water, canalisation's, GIS, etc). Much happens where people are living, it is a dynamic environment with many spatial changes, which have to be positioned, and registered on a regular basis at regular intervals.
- In the *rural areas* the changes are less and at longer time interval. This part of the surveymarket is decreasing in importance and contributes only with few separate specialised survey projects. Other actors can take over the surveyor activities and satisfy their own needs with the help of GPS for example.

Difference between high and low accurate surveys for different applications.

- Again in urban areas high precision is asked for many engineering and real estate survey applications.
- In rural areas it is mostly surveys for GIS applications demanding less accuracy.
- Accuracy on the demand from the users which is specified for each project

Simplified and complicated surveys systems

- Measuring robots or "***One man***" instrument like total station with active commands from the moving reflector who can be handle by everyone.
- ***CAS*** = Computer Assisted surveying.
- ***MSS systems*** who require the integration of several high-developed measuring systems in combination with sophisticated software and a specialist as operator.

From macro to micro space activities

- From atom determinations to Mars and Moon survey
- Everything between this two extremes.

What is the future of the surveyor profession?

"Predictions are always difficult, especially of the future" Niels Bohr

As mentioned before we are in a changing phase where a lot of factors together are influencing our future. We do not need to be prophets to predict that:

- The Helmert vision about geodesy as "*the science of measuring and mapping of the Earth's surface*" is no more correct today, now we have to add "*and its temporal variations*".
- We are going from a 3-D world (only position) to a ***4-D real time world*** (= temporal position changes), most time combined with the 5-D component "money".
- That means moving from a world where the surveyor has had to answer only the questions: "**WHAT & WHO**?" to a world where he has also to answer to the questions: "**WHY & WHEN**?"and "**WHICH PRICE**?"
- The surveyor has to satisfy the needs (= demands) just in time, at the right quality and at the lowest price.
- He is moving to **a *space related information-processing*** *role*. This means that he has to determine not only the spatial position of objects, but also to sample them together to information's, look on their spatial relations, detect and explain their changes. As example online surveys of environmental changes (vegetation, pollution, culture, forest, vegetation, metrology, climate and deformations), etc.
- He will use a global reference frame both at the national and international level. In Sweden for example (SWEREF 99) and/or (EUREF 89) and know to go from one to the other, from local to global.

- The activities of the surveyor in the future will cover a much ***wider spectrum*** as described in the activity field from several FIG commissions. He will be a *multiple speciality generalist*.
- The surveyor will not only capture and store geodata but also handle and process them to geoinformation and contribute to their maintenance.
- A majority of the non-qualified survey operations will be taken over by people from outside the profession.

How can we prepare for the future?

"Life is change – Progress is successful change!" Saveriano

The facts and trends enumerated before are influencing the surveyor community around the world. Nobody can ignore that we are jumping into the **IT and Communication world** and that our profession is deeply involved in the global change of our Society (UNCH-FIG Bathurst declaration). We can no more stay outside this process because we are one of the key producers of its basic information based on ***spatial positions and references.***

The governmental Survey and Mapping authorities as well as the responsible for the national geodetic reference frames and the professional organisations (CLGE, FIG, IAG, ISPRS, etc) are engaged in different projects, to prepare and adapt their structures and organisations to meet the demands from the new IT world. In France, Finland, Germany for example different national reports have been presented concerning the future and the orientation of our professional activities. The same holds for Sweden. Many of you have certainly read some of these papers: "VVV = Vi väljer väg or we choice our road", "Vision 2004 – en digital Sverigekarta = a digital map of Sweden" or "Geodesi 2000" etc. Just before and around the jump into the new Millennium many predictions or prophecies were published on the same subject.

So let us shortly see how we can prepare us?

I believe that most of us are or will be involved in this new process! We have to be conscious of the changes:

- Globalisation, diversification of the products, digital form.
- Regular and automated upgrading and updating in real-time operations.
- Spatial geoinformation data with in ***4 or 5-D reference frames***.
- Quality certifications and qualifications.
- ***24 hours electronic business based on IT, Internet,*** WWW, S.C. WEB business with *"Where is?"* Maps.
- ***Self-service*** for the End-users with electronic transactions facilities, Work on demands and End user specified – User financing.
- Everyone has to see forward about his future activities in the new surveymarket: what is possible or not for him? Why? - What can he do?

- We have to be awarding about the implications on our actual situation what concerns our resources: ***knowledge***, personal, equipment and financial capacity.
- We have to update, upgrade our structures and resources to the new needs in order to be attractive and competitive.
- We need to be more flexible, more dynamic, more End-user friendly and wide-range oriented.
- We have to be more engaged in the matters concerning our profession.
- We have to give our young successors (students) a more adapted education including new items as management, economics, ethics, languages, etc.

The traditional survey products are no more sufficient to survive; we have to extend our activities to new sectors and to act in the processing phases for example by combining our geoinformation with informations from neighbouring disciplines. We need to be creative and expansive.

However we have to remember that also in the future we still have to work with data from ***the past***: *"the future is shadowed from its past!"* We can not ignore:

- The old data collected and stored in non-digital form (in paper, etc). - They have to be updated and transferred into databases, perhaps also upgraded.
- The use of many different reference frames especially at local level with poor or no-existing connections to the modern networks. - We have to establish the relationship between them and produce transformation possibilities. That is one of the biggest and most difficult work, but fundamental.
- We have to maintain knowledge about the regulations existing at that time, the techniques for production and calculation used, the quality of the results obtained, etc, to be able to evaluate the old data and facilitate their future use.

I believe that the Surveyor in all time, more than other profession, need to have one foot in the past and one in the future if he wants to survive. He has to maintain a good balance between them if he want to progress and not fall, that is the charm and beauty of the profession. Dreams and expectations can only be reality if we contribute to it.

We have also to be conscious that we have less and less influence on the technical developments, it is the politicians (who have money), the manufacturers with their developers (computer people, geomaticians and electronicians) who more or less decide over our future.

CONTACT

Prof. Jean-Marie Becker
National Land Survey of Sweden
Lantmäteriet
S-801 82 Gävle
SWEDEN
Tel. + 46 26 633 728
Fax + 46 26 610 676
Email: jean-marie.becker@lm.se