Value-Added Mapping: The Challenges Of Modern Surveying

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ABSTRACT

The pervasive influence of computerization has had the greatest impact on surveying because of the routine nature of most of the operations. From instrumentation to field procedures and methods to final office data processing and presentation, computers have continued to simplify the operations. The consequence of this is that anyone with little or no basic training in survey can produce results. Faced with competition, the modern surveyor has to diversify his skill so that he can add value to his map. This is the only way to stay relevant and wanted. Adding value to a map implies being able to map spatial events and phenomena and showing them on his map and also being able to interpret the significance of the results. Fortunately, surveyors by their training possess the capacity to learn the basic methods used for value mapping. This paper calls attention to the challenges of modern survey practice and emphases the need for surveyors to quickly expand their horizon beyond classical surveying and embrace value-added mapping and its various applications.

INTRODUCTION

In all professions, computer systems have continued to take-up a sizeable portion of the tasks or activities involved, particularly the mainly routine type of operations. Professional experience has shown that most operations in Surveying are **routine** in nature. That is, one follows specific procedures and uses the same formulas to achieve results in all situations. The implication of this is that, nothing requiring the application of new skills and problem solving ingenuity is needed. Thus, computer systems have had the greatest impact on surveying as we know it. Computerized instrumentation has made the operations so easy that anybody with little or no training can produce results. The wider reality of this is that no one now needs to spend up to five years to be able to carry out most survey operations.

Surveyors have perfected the art of producing maps and charts of varying scale and accuracy over the years, however, what is of social and economic importance today is the **value** added to the map. Unfortunately, many surveyors, including those in charge of training have not fully appreciated the meaning of value added maps. Those who understand have found out that keeping their operations within the traditional scope of control establishment, base mapping and legal surveying is to limit their capabilities, reduce their relevance and of course restrictive their opportunities, especially in those countries where survey artisans actively lead the practice of survey..

A value-added map is one that portrays the spatial distribution or trend of issues and events which are of value to an individual, a corporate organization or government. Put in a technical perspective, a value added-map is a basemap enhanced to show items of value, which are located in space. Fortunately, the training of a surveyor puts him at a vantage position to carry out the mappings of many of the map based values commonly required for environmental monitoring and resource management activities, for social, economic, commercial, engineering, and political decision making processes. To produce value-added maps, surveyors have to be knowledgeable about and acquire the skills for the production of what modern scientists call **Spatial Information** (not data). This paper gives some ideas about spatial information and value-added mapping.

WHAT IS SPATIAL INFORMATION?

In its simpler form, spatial information can be defined as data which describe an entity within a space and which is useful for a particular application (Olaleye 1992). In order to appreciate the complexity of the term spatial information, it is necessary to understand the meaning of **space**.

Space is the continuous boundless expanse, extending in all directions, and within which all things exist. The complete description of space must take account of the changes that may occur to the entities either naturally or by interaction with each other to produce more things and events. In order to include the results of such object interactions and time variations, the space must be conceived as a multidimensional enclosure. However, because human imagination of space extending beyond three dimensions is practically difficult, a space-time system is usually selected to have three suitable dimensions (reference axes) with time as the fourth dimension. This space-time system is thus a continuum having the three dimensions of space and that of time in which any entity or event can be located. The practical realization of the space-time system for our global earth is achieved by choosing the first two locational axes as lines running along the great circles of the earth and labeled as latitude and longitude. Points along these lines are denoted by j and l in angular units. This pair of values (φ, λ) locate uniquely any entity on the earth surface. The time dimension is selected based on some observable epochs such as the passage of celestial objects through specified points within the space. The time unit is denoted as **t** in seconds and can be conceived as the distance of the event from a selected epoch. This time scale (axis) is constantly the fourth axis. With the first two axes and the time scale defined, the third locational axis is often left free for the user to assign a definition (v) depending on the type of description to be made about the entities or events of interest. For example, it can be chosen to represent the heights of surface points above the mean sea level (MSL). It can also denote the amounts of rainfall, population density, customer preference for a product, severity levels of the incidence of an epidemics, color, temperature, noise levels, pollution levels, features etc. This third axis is often used to define the **attributes of objects**, which may be described **as values for the map** (Olaleye 1992). These values are mapped using suitable methods and are attached to the other locational and time measures (φ, λ, τ) to obtain valued tagged point (φ, λ, ϖ, τ). The usual and most useful representation of these values is graphical form (topographic or thematic maps). It is therefore a simple matter to know that spatial information describes not only the locations of entities and events within a space, but also their conditions, attributes and relationships.

Traditionally, the surveyors are engaged in the determination of locational information (ϕ, λ, η, τ), in which h is defined as the height above the MSL. The time dimension of the data is often not given due consideration except when a re-survey is required for specific and often engineering applications. Using the principles of mathematical projection, Surveyors produce their reports and present them on a plane in the form of maps and charts of varying scale. This science has been their major areas of focus and they have perfected the art professionally. Nevertheless, other professionals have been engaged in the determination of other attributes of the entities and events, using the surveyor's information as a reference. Spatial events, attributes and phenomena such as population density, market distribution, facilities availability, land valuation, taxation etc are mapped using simple social survey methods. These results are then attached to the locational data produced by the surveyor to achieve the so-called value-added product. From a utilitarian point of view, these other professionals are the ones considered as adding value to map.

Unfortunately, while scientists struggle on a daily basis to simplify the methods and processes of acquiring (ϕ,λ, η), they are yet to consider systems that can simplify the methods and processes of other attributes mapping so that just any person can acquire them. Extensive computerization has produced simple methods and instrumentation, which enable non-professionals in surveying to produce maps and determine positions. Thus, the surveyor's dilemma is that his skill enables him only to determine (ϕ,λ, η) but he needs to be able to add value to his maps in other to survive and remain relevant. He can only survive if he learns to produce complete spatial information (φ, λ, ϖ, τ) as against (ϕ, λ, η). This means he must diversify his skill through organized training programmes. Happily, the surveyor, by virtue of his previous training has the necessary mathematical, statistical and physical preparation to cope with acquiring new skills within a short time (Olaleye 1998).

In fact, because of the preponderance of activities that the modern surveyor will be called upon to undertake, it has been suggested that the name of the surveying profession be changed to geomatics engineering or simply geomatics. This suggestion has been taken and as a matter of fact, many surveying associations in advanced countries have adopted this new name. While this paper does not address the issue of a new name, it has set the bases for the birth of a new group of surveying professionals who by their capabilities and activities can compete with the best in allied professions. These are people proficient in the area of applied science that deals with the study of the conceptualization, design, implementation and use of geo-space information processing systems. Their training embraces the study of data, data acquisition systems and procedures, data storage modes and systems, data analysis, data integration processes and methods, data dissemination, data dynamics, data utilization, and study of artificially intelligent systems, and of course policy issues (Olaleye 1992). Irrespective of the name they are called, they are the people who actually add value to maps.

3. CONCLUSION

There is a great difference between a map and a value-added map. Surveyors must move away very quickly from the narrow and restrictive role they have played in time past. Continued improvement in instrumentation is making survey methods so easy that people with basic education can produce results. The only way surveyors can assert their relevance and remain afloat is to learn how to add value to their maps. Nobody needs to go to the university to learn only how to do survey in modern times if the definition of such survey programme does not include value mapping and applications. The modern surveyor must be equipped with productive skills in geodesy, mapping and in all aspects of geospatial data management.

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GEOINFORMATICS AS A TOOL FOR FACILITIES MANAGEMENT

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ABSTRACT

Nigeria has invested several billions of naira in the establishment of infrastructures and facilities for communication, oil and gas exploitation and water development. Most of these facilities are in most cases buried underground. The recent tragedy in Jesse has brought to the forefront the need for the effective management of these facilities.

Geoinformatics technology can play a major role in achieving the above objective. Maps, positions and other attributes about the infrastructure can now be stored, updated and easily retrieved through the medium of the computer. The GPS positioning system, remote sensing and Geographic information system can be integrated to achieve good results very quickly. These will help in improving decision-making. For example, the map of all the pipelines of the Nigerian National Petroleum Corporation with all necessary metadata about them could be stored in a digital format in a computer, accessed and updated as needed. This approach could be used to manage the problems of encroachment on the right of way and also help in reducing oil and gas spill problems.

In recent times, however, some utilities and oil companies in Nigeria such as Shell Petroleum Development Company have used geoinformation technology to manage their facilities. A lot still needs to be done. The Federal, State, Local Government and their parastatals need to take advantage of the capabilities of geoinformation technology in the management of their facilities. There is also a need for capacity building in these establishments through training. Finally, there is a need for facilities management policy in Nigeria. Use of geoinformation technology in facilities management should form an important component of this proposed policy.

INTRODUCTION

Utilities are part of the industries that make every country tick. The services they provide are vital the survival and well being of all and sundry. They include such vital services as telecommunication, electric, oil and gas and sewerage. For the purposes of this paper, facilities encompass all those physical assets belonging to individuals, or companies (large or small). These facilities include physical assets such as buildings, land, machines, equipment, pipes, cables e.t.c. We focus more on those facilities that are not usually mobile and so we are not including assets like moveable equipment and vehicles.

From the above explanation of Facilities, it follows then that the efficient and sustainable use of these facilities is Facilities Management Practically every company or business organisation has facilities to manage with larger corporations usually having more. Utility companies in Nigeria such as NITEL, NEPA, oil & gas companies and water corporations have invested billions of dollars in setting up their infrastructure. Sustainable management of these facilities is paramount to their usage.

ISSUES IN FACILITIES MANAGEMENT

The preliminary planning and feasibility of transmission lines be it gas or telecommunications requires firstly, the knowledge of land use issues, zoning restrictions, property ownerships and physical features. In the management of these facilities, the first requirement is an up-to-date knowledge of the available facilities: what facilities are available, location of those facilities, access to the facilities, maintenance information, state of the facilities and proximity of a set of facilities to other sets.

For instance in a Water Corporation company such as the Lagos State Water Corporation, there must be a record in a simple format about the spread of their water pipes in the state. From time to time, repair works will be carried out on some parts of their pipe network and since they are underground, there must be, for example, a way to locate exactly the nearest manhole or other access to the part of the pipe that needs to be accessed. Also information about the history of the pipelines must be available, the kind of materials the pipes are made of and their size. Another issue in the operations of the Water Company is the issue of extension of the pipe network into areas that are without water. For the design and subsequent construction of this extension, a record of the current network of the particular utility must be available. There is also a need for the record of objects or other facilities underground best represented in the form of an underground utility map. This is to guard against designing and subsequently laying of pipes on places that already contain other lines.

A major requirement in the management of their facilities that also applies to every underground facility is that of protection from damage. In the management of their underground pipes, they must be prevented from unwilful damage one way or the other. Several times in this country, this has proved to be extremely difficult as nobody can see through into the ground to know what is where and at what depth under the ground. Hence, NEPA burst water pipes while digging for theirs while road construction workers damage NITEL cables unknowingly and this vicious cycle continues.

Another industry with extensive underground facilities is that of oil and gas. In this industry, pipes (mostly underground) are used to carry crude oil from the oilfields to the refineries and from refineries to depots all over the country. The gas industry is relatively new but the pipe network will be almost the same in density. In this industry however, damage to the pipelines can be very disastrous. The Jesse saga in Delta State is still very much on the minds of several Nigerians where several lives and properties were lost. Gas can even be more dangerous. Gas lines are currently