S IN GEOINFORMATICS PROFESSION

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Abstract: *The researchers from the field of surveying, in which the first letter of the word surveying is "S", is always seeking to improve for efficient system. In the process of such development, geoinformatics word being used instead of surveying and it covers wide range of technologies to collect, process, visualize, storage, integrate and disseminate the data and information required for many applications to improve the livelihood of the people. This article tried to identify such system related to the alphabet "S".*

1. INTRODUCTION:

S is a nineteenth alphabet in roman language and first letter of word Surveying. This technology remained still for many decades; however, the techniques are modified and improved for achieving high quality of the results. Surveying is an inevitable component for developing the nation because no one can think of development without the maps. Due to which many countries established Survey organization and carried out surveying for the preparation of several types of maps. One of the oldest surveying organizations is Ordnance Survey of Great Britain. During British regime in the world, number of countries established their own Surveying organization. For example: Survey of India, Survey of Sri Lanka, et cetera for conducting surveying works for the preparation of different types of maps. Whereas in Nepal, although Surveying work was carried out in a very primitive way since the Lichhibhi period, but formally Survey Department was established in 2014 B.S.

Technological development is a continuous process, so the same principle holds in surveying sector as well. Hence, scope of surveying is gradually increasing along with the technological development in this phenomenon and the word Geoinformatics is invented to abreast the several phenomenon in the course of technological development of surveying, such as Geographical Information System (GIS), Remote Sensing (RS) and Global Positioning System (GPS), Spatial Data Infrastructure (SDI), et cetera. It is realized that although GIS, RS and GPS are applied in their corresponding fields but these three technologies became inseparable and thus recognized as 3S in the Geoinformatics communities.

One very important fact is that if s is added in most of the noun words it will qualify as plural such as ships, snakes, books, fruits, et cetera. Such practice is being applied in different technological development not in the sense of pluralism but combining different systems either for the efficient performance of the system or for the societal benefits; for example, Global Navigation Satellite Systems (GNSS), Global Earth Observation System of Systems (GEOSS), et cetera.

2. SPECIFICATION:

In the context of the article, the first terminology for the surveying is the specification. When surveying is to be carried out, a document with detailed technical information has to be prepared beforehand. The document is termed as specification in which, datum to be used, method of survey to be adopted, type of equipment to be used, accuracy to be achieved, et cetera need to be clearly mentioned. Similarly, for every map series there should have its own specifications because the components of the specifications for a particular series such as accuracy standards, map layout, map contents, et cetera may vary according to its characteristics and need. The characteristics and need of the map series could be distinguished in terms of purpose and type or scale of the map.

Map specifications should be used as a guide and a controller by the individuals involved in the mapping process. Every individual should follow strictly the instructions, standard limitations and constraints outlined in the specification in order to produce a standard product. Therefore, the specification should be made available prior to the commencement of the mapping. As the quality of the map is directly linked with the standards and accuracy specified in the specifications, therefore, it should be prepared in such a way that the final product should reflect the objectives of the map. The standards and accuracy mentioned in the document should be compatible with the methodology, equipment and resources to be applied for the map preparation.

3. SPACE SCIENCE:

Space science is being applied unknowingly even during ancient civilization period of humankind. In those periods, the Shepherds used the stars and planets of the sky as their guide for the navigation and reaching their destinations. Now the importance of the space science and technology was realized, hence so many activities are in the process of

technological developments and number of organizations established to promote and create awareness about the potential of the use of space technology and space related products. So space has supported directly or indirectly in human civilization. Using space science and technology, our quality of lives being enhanced and also could support sustainable development of our society.

The scientists of the world are trying continuously, to make best use of the space to facilitate the betterment of the life of the people. For instant: developed aircrafts to move from one place to another through the space, launched artificial satellites for establishing communication between two persons staying in different corners in the world, forecasting weather to facilitate their activities as per the weather condition, and many more.

Space related applications revolutionized the survey profession. In the past, space related technology was limited to finding out azimuth of a line and the location of the points by observing stars in the space. Now due to availability of artificial satellites, so many new technologies have been evolved such as Remote Sensing technology, Global Positioning System technology, et cetera.

4. THREE Ses OF GEOINFORMATICS:

As mentioned above, in Geoinformatics, Remote Sensing (RS), Global Positioning System (GPS) and Geographical Information System (GIS) are referred to three Ss. Reason being, in most of the application in Geoinformatics, these three technologies could not set apart. In other words, they have to be applied as an integrated way in number of applications. For example to locate a car parking location in nearby place when you are driving your vehicle, to spread net in the sea for fishing by locating the potential fishing area, et cetera.

5. REMOTE SENSING (RS):

The first S of 3S is Remote Sensing and this word is invented around 1961, originally to describe the topic of the conference entitled "Remote Sensing or Environment" held at the University of Michigan in 1961. Remote Sensing deals with air or space borne images created with devices other than conventional cameras. In airborne system, data are collected from the sensors installed in an aircraft or in helicopter where as in space borne system data are collected from the sensors installed in artificial satellites. Remote Sensing is characterized by satellites. They enforce a data transfer by telemetering rather than by film and the data collected from a distance are termed as remotely sensed data.

Remote Sensing technology is being used for mapping and interpretation of the features for different purposes for instance; extraction of geological features, land use features, forest related features, et cetera.

6. GLOBAL POSITIONING SYSTEM (GPS)

The second S of 3S is Global Positioning System (GPS), also termed as Navigation System with Time and Ranging which was developed for Navigation by United States of America (USA) in 1978. The system provides the services for determination of three dimensional coordinate of the observation station and for navigation in aviation, maritime and road transport using the signals received by the receiver at the station from several satellites orbiting the Earth. In order to locate the position, the receiver should receive signals from at least four satellites from a constellation.

7. GEOGRAPHICAL INFORMATION SYSTEM (GIS)

The third S of 3S is Geographical Information System (GIS). There are so many versions of definition of GIS, however, one of the definitions given by Arnoff in 1989 is as follows:
"Geographical Information System (GIS) is a computer based system that provides four sets of capabilities such as data input, data management (data storage and retrieval), manipulation and analysis, and data output to handle geo-referenced data ".

8. SYSTEM DEVELOPMENT TREND:

The scientists, researchers and data developers are always exploring to develop efficient, reliable, user's friendly and cost effective system. Recent trend in survey profession in this perspective is developing a system comprises of several similar systems or an integrated multi system approach. Some of such systems are Global Navigation Satellites Systems (GNSS), Global Earth Observation System of Systems (GEOSS), multi-sensors system, et cetera. In the following paragraphs some of such systems will be briefly described.

9. GLOBAL NAVIGATION SATELLITE SYSTEMS (GNSS)

Due to growing applications, easy operational system, high reliability in accuracy and affordable system in using GPS constellation of United States of America (USA); number of such constellations emerged from different countries or group of countries with their corresponding limitations. Accordingly, the constellations are categorized into Global constellation, Regional Constellation and Satellite Based Augmented System (SBAS).

In Global constellations, there are GPS from United States of America, GLONASS from Russia, Galileo from Europe and COMPASS/BEIDOU from China. In Regional Constellations there are QZSS from

Japan and IRNSS from India. Similarly in Satellite Based Augmented System from different countries around the world are also developed such as WASS from USA, MTSAS from Japan, EGNOS from Europe, GAGAN from India and SDCM from Russia *[5]*. Some of these systems are fully operational and some are partially operational and would be fully operational from the date announced by the corresponding organizations.

In order to make use of these systems, a concept of Global Navigation Satellite System (GNSS) was developed. In this system, satellites signals from the satellites of any constellations mentioned above could be used not only for Positioning, Navigations and Timing (PNT) but also for non PNT applications such as to compute wind velocity, height of sea waves, et cetera. Based on this approach of GNSS, the users could use satellites from different constellations at the same time and it believes that using this system, the users can be benefited in many aspects such as a user can receive signals of at least four satellites at any time at any corners of the world. This will certainly save time for the observation and consequently, will be cost effective without losing the expected accuracy.

10. GLOBAL EARTH OBSERVATION SYSTEM OF SYSTEMS (GEOSS)

An international organization named Group on Earth Observations (GEO) has initiated Global Earth Observation System of Systems (GEOSS). GEOSS is being realized to provide benefits to humankind through the process of informing comprehensive and sustained Earth observations and in a coordinated approach. "*GEOSS will build on and add value to existing Earth-observation systems by coordinating their efforts, addressing critical gaps, supporting their interoperability, sharing information, reaching a common understanding of user requirements, and improving delivery of information to users*". Information for Societal Benefits covered the sector of Agriculture, Biodiversity, Climate, Disaster, Ecosystem, Energy, Health, Water and Weather *[6]*.

11. SPATIAL DATA INFRASTRUCTURE (SDI):

Spatial Data Infrastructure (SDI) is being developed as a tool for national spatial data collection, storage, processing and dissemination. SDI is a basis of national information resources. Because the users can collect, revise and manage data from its own end in real time ensuring the information remains accurate and valuable. This broadens the importance of use of geo-spatial data beyond traditional users and brings them into mainstream of new technology. So, sharing of data between and within the organizations will be possible after SDI system is in operation and interoperability system will be focused in the development of National Spatial Data Infrastructure (NSDI). This can further be inter-linked with Regional Spatial Data Infrastructure (RSDI) and even in Global Spatial Data Infrastructure (GSDI) approach.

A good and reliable spatial and non-spatial data related with NSDI are the prerequisite for the effective and efficient decision making to address some of the major national issues of the Government such as poverty reduction, good governance, social justice, environmental protection, sustainable development and gender equity, et cetera.

12. SPACE SCIENCE RELATED ORGANIZATION:

In order to create awareness of usefulness of space science and technology for the society, several national, regional and international organizations are established. In Nepal, some of the national organizations are Nepal Surveyor's Association (NESA), Nepal Remote Sensing and Photogrammetric Society (NRSPS), Nepal Engineer's Association (NEA), and so on. Some of the regional organizations are Asia Pacific Regional Space Agency Forum (APRSAF), Asian Association on Remote Sensing (AARS), and similarly some of the international organizations are International Society for Photogrammetry and Remote Sensing (ISPRS), International Steering Committee for Global Mapping (ISCGM), International Federation of Surveyors (FIG), International Union of Geodesy (IUG), Group on Earth Observations (GEO) and so on. These organizations always organized events in regular basis in some parts of their working regions for promoting the applications of space technologies, informing achievements and status of latest development in space technology, increasing public awareness of the societal benefits, et cetera. If we surf the net for the calendar of events related to space science and technology, we can find some events are going to be held in one of the parts of the world in some days in every month throughout the year. So by participation in some of the events one could gain lots of space related information, update the knowledge and enhance the horizon of vision.

13. SERVICE DELIVERY:

Customer's satisfaction during service delivery is the most crucial component of the Government. The government always attempts to improve service delivery system but due to lack of adequate resources and appropriate infrastructure the problem remains as ineffective. Secondly, when a new minister or secretary comes, she/he will change the previous policy and mechanism. Therefore, in order to improve the service delivery, there should be cohesiveness in implementing the system. The officials involved in service delivery should be morally boosted and should be able to supply reliable, accurate and appropriate information to the

users. Furthermore, the process of delivery system should not be complicated rather it should motivate the users to receive the information by themselves so that they should not take help from the brokers. The most importantly, the user should receive their information within the reasonable time.

14. CONCLUSION:

There are so many terminologies in the field of Geoinformatics which are related to the alphabet "S". However, discussion is made from the specification of the mapping, space science technology, and the trend towards the development in the space science. Some information is also provided to know the several national and international organizations working with the space science. Finally, a small hint is given about the status of the service delivery to the customers and the ways to be improved for effectiveness in the delivery system.

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