

## A REVIEW ON THE CHANGING FACE OF CARTOGRAPHIC TECHNIQUES AND CURRICULUM



Geography

KEYWORDS:

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### ABSTRACT

Cartography involves graphical representation of geographical features usually on a flat surface such as map. Maps are important tools to geographers as they help them to understand the various earth's surface features visually. Geography and cartography are interrelated disciplines dealing with the characteristics of the Earth's surface. These days, a cartographer does not have to work on paper as computers make electronic maps. Modern technologies have positively affected the scope and methods of cartography, data acquisition speed, data management and the rate of delivery of the results of data processing. Hence, there is need to review the cartographic curriculum to meet the demands of the current advancements in modern technology. This paper will first reflect the changing face of cartographical techniques. Secondly it will highlight on the job prospects in cartography and finally it will focus on the need to review cartographic curriculum to meet the technological advancement.

### 1. INTRODUCTION

It is the fact that modern technologies in mapping has influenced the practice of cartography. The scope, methods of cartography, speed of data acquisition, processing, storage, management and production of maps etc., have been positively affected by the new modern techniques. Advances in digital technology have occasioned broadening of training programs for data acquisition in cartography profession all over the world. Creations of maps and map related information is now easily available on the computers based software's such as GIS. In order to incorporate the challenges brought about by the advent of the modern technology, some cartographic institutions/departments have modified or completely changed their names. For example in India, Anna University (Tamil Nadu) offers a BE course in Geo-informatics which includes a module on cartography. School of Geospatial affiliated to Bharathidasan University Tiruchirapalli, Tamil Nadu and approved by UGC. The School offers educational courses in the field of Geography, Geoscience, Remote Sensing and Geology. Nowadays, apart from producing paper maps/plans, cartographers produce their information in digital formats rooted in digital technology. That is, the information produced can now be handled in a large database incorporated in a GIS environment. This has necessitated the need to review the old training curriculum, in order to reflect the current technological advancement in cartographic profession. This is being done all over the world. However, some institutions/organizations are still in doubt of what to do while others have not fully realized the need for the change.

### OBJECTIVES:

1. To highlight changing face of the cartography techniques.
2. To discuss the changing trend in cartographic profession
3. To review the cartographic curriculum to reflect the technological advancement.
4. To suggest recommendations.

### DATA BASE

Secondary data from Internet and books. Sites such as [www.geo.earthmapping.com](http://www.geo.earthmapping.com), [www.cartography-gis.com](http://www.cartography-gis.com), [www.outragegis.com](http://www.outragegis.com), <https://learn.arcgis.com>

### 1. CHANGING FACE OF CARTOGRAPHICAL TECHNOLOGY

Map-making is first efforts made by humans to create pictorial representations of the earth on the walls or mud floors of caves. Cartography, the modern discipline of map design, compilation, and publication, is generally associated with the paper map, a flattened representation of the curved surface of the Earth, but it may also refer to the creation of globes, and increasingly it refers to the use of digital computers to manage the acquisition, manipulation, and eventual display of geographic information on the screens of computers. The advent of modern technology in the 1960s began a transition in the field of cartography that continues today. It has been the driving force that have brought many changes in the field of cartography. The early

manual cartographical technologies were based on **simple hand-held tools like brushes, quills and the stylus** (Fig 1.)

**Fig.1. Handmade Cartographic maps using Brush and Stylus**



Source: [starraven.deviantart.com](http://starraven.deviantart.com)

The **magnetic technology** (Fig 2.) begins with the invention of the magnetic compasses which were very useful device of China and later on brought to Europe around the twelfth century. This increased the accuracy of maps and the ability of storage and manipulating digitally. Advances in **mechanical technology** (Fig 3.) such as use of printing press and quadrant allowed mass production of maps and increased the ability to make accurate reproductions from more accurate data.

**Fig.2. Cartographic maps using Magnetic Compass**



Source: [angelicscalliwags](http://angelicscalliwags).

**Fig.3. Cartographic maps using Printing Press and Quadrants**

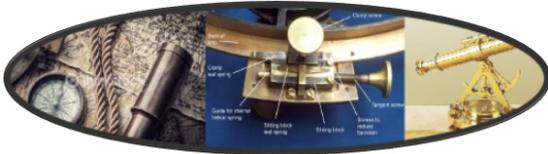


Source: [oldtopographer.net](http://oldtopographer.net)

Then came the **optical technology** (Fig 4.) such as telescope, sextant device and other devices that use telescopes, allowed for accurate surveying of land and the ability of mapmakers and navigators to find their latitude by measuring angles to the North Star at night or the sun at noon which have increased the accuracies of map making. **The photo-chemical technology** (Fig.5) began with the development of lithographic and photography in the early nineteenth century. Lithography of chemical printing and

photography allowed the map making with fine details and also saving the time of making and reproduce the maps.

**Fig 4. Use of Telescope and Sextant Device in Cartography**



Source: www.thinkstockphotos.in

**Fig 5. Use of Lithography Chemical Printing**



Source: faithusprinting.blogspot.com

In early 1950s another revolution in cartography was the **electronic technology (Fig.6)** Computer abilities such as plotter, scanner and printer etc. have expanded the creation of making maps more efficiently. This had a great impact on the thinking of cartographers i.e., about the map, data collection, production and reproduction. Today computers have become an essential part of cartography. As storage and the visualization in cartography have increased than in the past, the printing maps are being replaced by the digital base maps.

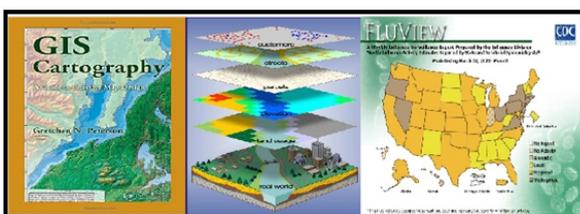
**Fig 6. Use of Plotter and Scanner in Cartography**



Source: markmakedo.co.uk

Today the new software's like GIS have provided a lot of advantages to the cartographers in creating interactive maps and map processes such as electronic maps in three dimensional. **(GIS) Geographic information systems (Fig 7.)** are computer applications concerned with the manipulation of geographic information, and today these software packages are capable of the representation, analysis, and visualization of virtually any form of information about the distribution of features and phenomena on the surface of the Earth. The initial developments of GIS occurred in the 1950s and 1960s, as computers became powerful enough to manage the large volumes of data being collected from satellites or digitized from paper maps, and today virtually all geographic information is in digital form, stored in a computer, at some point in its life. Many cartographers now prefer the term geo-visualization, and many GIS professionals consider themselves expert in the design of maps.

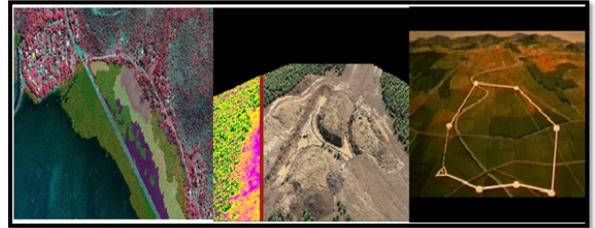
**Fig 7. Cartography Using GIS**



Source: geoeartmapping.com

Remote sensing (Fig. 8.) the latest technology is the acquisition of information about an object without making physical contact with the object. It uses visible light for pictures, infrared to measure temperatures, and Radar and Sonar to measure elevations. It is important because it makes maps more detailed and accurate than was ever possible before.

**Fig 8. Use of Remote Sensing in Cartography**



Source: www.2d3d-gis.com

Hence, cartography has changed a lot with passage of time and the developments in cartography have led to changes in the cartographical products and cartography itself in the future. In addition, there is tremendous impact of the modern technology on the instruments and techniques of cartography profession. Though most of the traditional cartographical courses are still being offered in various Universities and Polytechnics colleges, however new courses like Geoinformation systems, Digital Mapping, Digital Coastal Management, GIS tools and applications, etc. have now been introduced to reflect the dynamic digital revolution in surveying education (Fajemirokun et al 2002).

**2. JOB PROSPECTS IN CARTOGRAPHY**

The importance of cartographic professionals (Fig 9) have increased tremendously with revolution in digital cartography. As we know that maps and detailed geographical information are needed for a range of purposes, from everyday use by individuals to large-scale industrial development. They are used by planners, engineers, utility companies, state agencies, construction companies, surveyors, architects, and ordinary citizens. Other than these, maps are also used for a variety of purposes, including topographical maps, maps related to town planning, weather forecasting, travel and tourism, geological or mineral exploration and military and development of geographical information systems.

**Fig 9. Cartographic Professionals Creating Maps**

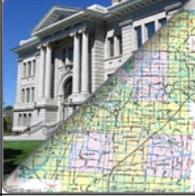


Cartographers therefore can work within a variety of areas, including:

1. Publishing Services
2. Surveying Services
3. Conservation Services

**1. GIS Cartography & Publishing Services (GISCAPS)** is a digital map provider that provides high quality, custom maps for a wide range of clients and industries. GISCAPS specializes in using the latest GIS data for custom map creation. Digitally, the maps can be provided as cartographically styled geodata base or as pdf's. GISCAPS can also print the map in various formats including folding maps, map books or wall maps, whatever product that best suits the needs. Maps are created to the client's exact specifications and can be delivered digitally or as printed material. Variety of maps can be created like infrastructural maps, county maps, speciality maps and Realtor maps as shown in **Table 1.**

**Table: I GIS Cartography & Publishing Services**

Types of Maps created by GIS CAPS		
<b>Infrastructural Maps</b>	Shows the network of transport and communication.	
<b>County Maps</b>	Shows the territorial division of countries or cities	
<b>Speciality Maps</b>	Are used to show a specific event.	
<b>Realtor Maps</b>	These maps are for searching the real estate for sailing and rent by location.	
<b>Source: WWW.GISCARTO.COM</b>		

**II. Surveying Services:**

Surveyors and Cartographers are responsible for gather data and create maps of the surrounding area. Surveyors are responsible for visiting the sites that need to be mapped and collecting necessary data by utilizing special measuring equipment. Cartographers typically collect and utilize a select pool of information to create maps. These maps may show a wide variety of things, including area borders, elevation, water sources, and the overall geological makeup of a place.

They are often responsible for keeping maps up-to-date and aiding digital map makers with aerial photography efforts. The job demand for Surveyors/Cartographers is expected to grow 14% within the next 10 years, which is about average compared to other careers. Digital advancements in mapmaking and geological measuring have allowed for the collection of more data than ever before, causing this career to grow (Environmental Science.org).

**III. Conservation Services:** Cartographers can also get opportunities in conservation services such as land conservation, forest conservation, soil conservation, energy conservation etc.

Besides the above services a cartographer may work for local authority planning departments, oil and utility companies, universities, commercial map publishers and the Geological Survey. Cartographers can also join NGOs and other developmental agencies engaged in population studies, rural development and various environmental issues. Cartographers can also join the Survey of India or state Survey Departments or Private organizations such as Eicher maps, Google maps etc. Teaching in schools/colleges/universities is also a good option for a Cartographer. They can work with various research institutes. Some Cartographers, called project cartogra-

phers, work on a short-term freelance basis. Businesses that deal with selling maps, producing maps for encyclopaedias, reference books and atlases, publishers, planners, engineers, architects also need cartographers. Hence, government is one of the main employers of cartographers, in departments including Ordnance Survey, the Ministry of Defence, tourism departments and the Department of Transport. Several private sector organization using GIS and remote sensing technology also require the service of a qualified Cartographer.

**3. NEED FOR A REVIEW IN CARTOGRAPHY CURRICULUM**

Cartography is normally offered at three main levels - Universities, Colleges /Polytechnics and the Technical Colleges. These institutions train professionals, technologists and technicians respectively. In India for instance there are several universities offering PG (Post Graduate) diploma in Cartography, including Osmania University, Hyderabad that offers PG diploma in Geographical Cartography. Utkal University, Bhubaneshwar and Annamalai University offers PG diploma in GIS. Anna University offers a BE course in Geoinformatics which includes a module on cartography. Similarly INCA (Indian National Cartographic Association) INCA is devoted to the cause of cartography as a graphic mode of communication. The majority of its members are practicing Cartographers from Multiple Organizations Universities, Private Industries and other Scientific and Research Organizations spread all over India. The main purpose of INCA is to promote cartographic research in the country, to co-operate with international organisations with similar objectives; to hold a National Cartographic Conference, ordinarily, once in a year.

The advent of large memory personal computers and the need to acquire, store, manage and retrieve geo-referenced data led to the changing pattern of cartography training. Due to this change the training of cartographers needs to be modified to meet the training needs of geomatics education (Fajemirokun et al, 2002). In other words, it has become rather imperative for cartography institutions and departments to review their programmes in order to align their curricula with the dynamic technological developments in cartographical education. In many cases, cartography departments have changed their names to Geomatics Engineering, Geoinformatics, Surveying and Geoinformatics etc, in order to reflect the new orientation to digital technology. In India, many institutions are now modifying their cartographical curricula to reflect the new modern technology. For example Indian Institute of Surveying & Mapping, Survey of India, Uppal, Hyderabad offers various advanced courses like Digital Cartography & GIS, Advanced Photogrammetry & Remote Sensing and Advanced Geodesy. Many professionals in allied fields like engineering, sciences and social sciences and even in education and business administration is now embracing modern technologies. Hence, adequate training schemes must be put in place to meet up with the new demands in modern cartography industry.

**4. CONCLUSION**

Modern technology has revolutionised the practice of cartography all over the world. Therefore, the need to modernise cartography curricula in tertiary institutions has arisen in order to meet the demands of the technological advancements. If such programs are to keep abreast of the dynamic nature of the technological advancement, periodic reviews of the academic programs and curricula are necessary in Universities and Polytechnic colleges offering cartography. This could provide better job prospects for cartographers in the near future.

**5. RECOMMENDATIONS**

1. For the survival of the discipline like cartography, there must be a broad curriculum that should also focus on a specialised area of research.
2. The significance of reviewing the cartography curricula at university and college levels is so great that the choice to review of

curriculum should not be left within each cartography institution or departments.

3. Therefore, government regulatory bodies of cartography institutions/departments should continue to insist on the review of surveying programs in the Universities, Polytechnics and Colleges of Technology. That is, the bodies should formulate clear policies on cartography and geoinformatics education in line with advancements in cartography technology brought about by the digital revolution. These policies should clearly lay down minimum academic requirements and desired component parts of new curricula for all surveying departments in Universities, as well as in the Polytechnics and Colleges of Technology. An advantage of this is that it will encourage international and inter-institutional exchange programmes for students undergoing cartography training in Universities, Polytechnics and Colleges of Technology all over the world.

4. There is also the need for re-training programmes for cartographers so as to build up appropriate human capacity for modern Technology. This further makes it imperative for all other stake holders in cartography education to provide adequate funding for training and purchase of facilities for institutions offering cartography and geoinformatics.

5. Cartography institutions can also seek help from non-governmental agencies and other international organizations for funding cartography and geoinformatics education.

6. The industry now requires a demand driven, learner-centred and process-oriented approach to education and training (Resl, 2009).

7. Country like India can become modern day Navratna or the Nine Jewels by adopting the vision of cartography/geography/modern technology together.

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