

Parallel Development of Three Major Space Technology Systems and Human Side of Information Reference Services as an Essential Complementary Method

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INTRODUCTION

Ever since the first human footprints were made more than 1,9 million years ago; the Homo erectus Era; ‘upright man’; socio-economic-Historical Development came into being. When humans could walk; it left their other limbs, the hands free to do other things. This Era was followed by the Stone Age; the man used stone tools to defend their territories and to hunt for food. This culminated to the Bronze Age and the Iron Age. These were the human development eras when man could actually work with minerals to make tools. These people could farm and rear domestic animals. The primitive smelting industries grew into the Industrial Revolution; The Industrial Revolution was a period from the 18th to the 19th century. The major changes in agriculture, manufacturing, mining, transport, technologies had a profound effect on the socio-economic and cultural conditions. This was followed by the Information Age; the Era we are in now. It is a shift from traditional industry that the previous era brought through industrialization. It is an economy based on the manipulation of information. The Information Age has allowed rapid global communications and networking to shape modern society. It is a digital world of Information Communication Technology (ICT). It is also commonly known as the Computer Age or Information Era, and it is an idea that the current age will be characterized by the ability of individuals to transfer information freely, and to have instant access to knowledge that would have

been difficult or impossible to find previously. The idea is linked to the concept of a Digital Age or Digital Revolution. This chapter elaborates upon Geographical Information Systems (GIS) and Remote Sensing; the highest echelon of the ICT world. It looks at their development in studying our home, the Earth and its systems. In particular it looks at, compares and contrasts the four globally used systems; these are:

- **GOES:** The Geosynchronous Orbiting Environmental Satellite;
- **LANDSAT,**
- **SPOT:** Satellite Pour l’Observation de la Terre and
- The WorldView.

The first three has transacted five generation and the last system, the WorldView is the newest and most fast developing satellite system. These Earth Resources Data capture satellite systems are compared in their longevity - temporal resolution and age factor which gives results as:

- **LANDSAT1 (ARTS 1) - LANDSAT 8** range July 1972 to February 1993;
- **GOES 1 - GOES 15,** Range October 1975 to March 2010;
- **SPOT1 – SPOT 7** range February 1986 to June 2014 and
- **WorldView 1 – WorldView 3,** range September 2007 to August 2014.

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The comparison criteria were made based on spectral resolution (Figure 5 – WorldView 3); spatial resolution (Figure 6 – WorldView 3) and radiometric resolution (Figure 7 – SPOT). Apart from that; the human side of information reference services in the form of Traditional Ecological Knowledge (TEK) is discussed as it is an essential complementary entity in GIS and remote sensing endeavours. In order to be useful information, the remote sensing data need human input in the form of referencing coordinates system, data interpretation using the visual variables of position, shape, size, texture, tone, orientation, and motion. These can then be analyzed and used for modeling the environment, disaster preparedness and decision making. The 3 Dimensional characteristics of satellite, digital elevation models (DEM) (Figure 7 – SPOT DEM) are also investigated.

The Chapter is also about the essence of data sources specific for geo-spatial science (Bossler, Jensen, McMaster, & Rizos, 2002) information for land cover mapping. The use of geospatial science techniques provides opportunities and challenges in many aspects of life including for land cover, forestry for climatic change measurements and agricultural engineering which is vital for food security (Opara, 2003)

First, it elaborated about developments of digital world in remote sensing and geographical information system (GIS) as modern day techniques for Earth surface monitoring (Mather & Koch, 2011). Satellites whose data has widespread international applications for the past four decades are discussed in details and compared. Second, it puts emphasis on the importance of the human side of information reference services that is essentially the brain behind machine based data. The human thinking is applied in the interpretation of this machine data and it acts as knowledge substitute where the remote sensing and GIS data are inadequate or unavailable. The 2012 study (Maphanyane, 2012) on the reconstruction of historical landscape for the investigation of land cover changes in the human side of information reference services based method on Ramotswa,

Botswana case, had sufficiently proved that it can be applied to fill in the gap where modern technology is inadequate or unavailable (Figure 1 and Table 1). For emphasis, graphical examples are given, where the aerospace based Ramotswa digital data; its analytical techniques and their resultant information are compared to the same area data, but those that had been derived from the systems based on the human side of information reference services (Figure 2). This too has shown that the human side of information reference services was complementary.

BACKGROUND

The essence of this study hinges on technological developments of robust data collection tools. Remote sensing is one such. It shows the importance of human side of information reference services and the role it plays still, as it adds meaning and time independent data sources, even in the wake of superior tools of remote sensing.

Curiosity of Humankind: Their Cognitive Ability and Feature Naming

Humankind interest in the distribution of everything that exists on and beyond the Earth itself was triggered by what they could see (Benedict, 2002). The evidence to their cognate abilities is the byzantine names they gave to the phenomena. The Batswana were captivated by all that was around them. Some evidence in that are meaningful names they gave to celestial bodies (Kitaura & Enßlin, 2008) They also employed the skies - *legodimo* as direction tools and identification of time and its subdivisions using daily and seasonal rhythms. They put what seemed to be a scattered litter of sky furniture into distinguishable bodies with meaning. The obvious ones been the *Sun - Letsatsi*, it was used to distinguish between night and day – *Bosigo* le *Motshegare* and the stars – *Dinaledi*. *Mars* was also identified and named *Mphatalatsane*, the red

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