LIBER QUARTERLY, ISSN 1435-5205

Cartographic Materials as a Means of Multimedia Communication

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In the early 15th century Gutenberg revolutionized the world by making possible the propagation of knowledge by printing. Today, with the appearance of individual multimedia computers, traditional maps tend to be replaced by maps on optical disks (CD-ROM) and Internet distributed resources that enable one to stock not only text, but also sound, static and animated images as well. What does this mean for cartographic materials[1] (CMs) collection in libraries? Cartographic materials existed long before anyone dared to dream about computers. Various Information Technologies (ITs) are as old as the human desire to gather information and pass it from one person to another. Information and communication technology (ICT), understood as a technique of storing and transferring information, is an integral element in the process of communication. Technological evolution changes the way we communicate through cartographic materials in many areas of activity in science.

In our article, we concentrate on certain selected aspects of this communication. We look at how IT has affected the process of CMs communication and how CMs can be accessed by the users potentially interested in them. We claim that the current transformations in ICT redefine the roles of the CMs usually regarded as an information (re)source, an information provider, and the reader/user, a (passive) recipient of the information provided by the CMs. The problem we are going to deal with is the following: can cartographic materials be included in the class of multimedia documents? If so, when and in what sense? The starting point is to concentrate on the dependence of access to information contained in cartographic materials on information carriers. At the same time, we would like to mention the difference between access to information and the skills needed for using it.

1. Multimedia Communication: A New Dimension of Communication in Geography and Cartography

The twentieth century is characterised by an extremely quick rate of developing new communication and information technologies concerning information processing. Information transfer between people involves primarily two senses: sight and hearing. For this purpose, the technological developments of the recent decades produced devices operating with sound and image. The decade of the 1990s is called more and more often the multimedia decade since several information channels have been integrated during that time [5].

Multimedia is an ambiguous term. There is no uniform or generally accepted definition of this term yet. However, people generally agree which properties are associated with this term. Most certainly multimedia means integration of text, graphics, sound, animation and video with the computer to provide interactive access to information carried by the respective media channels. We will use the term *multimedia* to describe the technology integrating these properties in order to facilitate interactive communication between man and such a system, as well as the use of cartographic materials through such a system. In this context, the manner of reacting and system operation depends on the activities performed by the users of respective materials.[2]

The Multimedia and Hypermedia Information Coding Experts Group accepts that the multimedia aspect is characterised by the following three features: (1) diversity of information being processed, i.e. the system manages text, sound, computer graphics, animation, film and stills at the same time; (2) interactivity, i.e. the system allows the user to control dynamically the course of presentation depending on current needs in real time; (3) possibility of concurrent presentation of various forms of information, i.e. the system allows the user to perceive various media channels at the same time. The multimedia aspect is characterised by the particular features pertaining especially to the manner in which the user receives the information transmission without limitation of the visual or acoustic perception channels [3]. In addition, multimedia features can be graded.

The first so called multimedia programmes were processed „linearly". These were programmes transmitting information through text. However, interactive multimedia allow the user to control the manner of receiving information in full. This means that each user can choose his or her own way of receiving information. Well designed programmes use a technology called hypertext. Specific key words, icons or press buttons are distinguished on the screen. After selection, the user receives different information associated with the previous information. The hypertext technology integrates comprehensive information included in the document e.g. a map becomes a „web" which can be freely „surfed" by the user.

Cartographic materials are only one kind of medium in cartographic information interchange. They are one type of document collected by libraries and

information centres. The term *document* is understood as information together with its carrier on which the information has been recorded. Cartographic materials also constitute a kind of text[3] containing cartographic information,[4] recorded now on a variable carrier [1]. In the communication process, the text becomes a message, or cartographic message in this case. Until recently, the only carrier on which the texts of this type of documents were recorded was paper.

Librarians and information specialists distinguish published documents distributed in large circulation and unpublished ones, or the documents occurring in single or few copies. This division was clear when printing plants were the only facilities involved in the production of documents in large circulation, while the unpublished documents were hand-written or typewritten manuscripts. Presently, computer and printing technologies allow for obtaining high-quality documents in large circulation without using a conventional printing process. In addition, the division into published and unpublished documents may not comply with the current interpretation of publication as offering information to the public, regardless of the methods and means used for this purpose.

In recent years, a new type of document has appeared. It is distinguished on the basis of the type of the carrier. They are electronic documents. This information carrier also creates new presentation possibilities for cartographic information in the form of text, pictures, sound, animation or video sequences, as well as access to the information recorded in particular ways. Cartographic materials in electronic form offer such possibilities which go beyond the standard print form. These materials kept in electronic files can be stored in mass memories of computers, transmitted through telecom-munication links and processed with respective software.[5] CMs are available in electronic media (Internet resources, CD-ROMs, databases). In fact, the number of titles available in this medium is growing at a phenomenal rate. The number and scope of on-line databases is growing too, partially due to the increasing popularity of the Internet and other international and national computer networks. So different and so revolutionary are these means of storing and delivering information that the terms new media or hypermedia have been coined to distinguish electronic information sources from their older printed counterparts.

The development of computer networks caused the domination of visual presentation of information, also the one originating from distributed databases designed for end users. The computer technology allows for the presentation of text in electronic documents using hypertext techniques supplementing documents with respective references, similarly to printed documents. Cartographic materials in electronic form may also result from the implementation of dynamic forms of presentation (e.g. animation, sound and

video sequences). One document can integrate various media concurrently performed during viewing maps (together with other cartographic materials) and video films, as well as listening to music (e.g. anthems of particular countries), reports on cartographic items etc. Such electronic documents are multimedia documents usually distributed on CD-ROM disks[6] (e.g. encyclopaedias, manuals, tourist directories etc.) or through local- and wide-area networks (documents with various contents and applications), including the Internet. When talking about cartographic materials, we should also remember about globes whose presentation in computer form is certainly associated with multimedia technology, e.g. when a revolving globe is supplemented with music presentation, diagrams or text/sound commentary.

IT allows greater possibilities for graphic design. Many forms of information technology are facilitating the presentation of material in an easily accessible and manageable electronic format. The second effect of the possibility of image processing is an increased tendency to view CMs no longer as being static but fluid. The immediate manipulation of CMs image offered by the wordprocessor to the user through commands such as cut, clip, copy, paste, move, edit etc. has in effect led to diversification of the sign. Digital manipulation of CMs image and text is possible. In fact a new model of cartographic communication is created in which original thought is arguably as important as visual presentation. In the multimedia form of CMs the users now has the ability to decide not only what type of information they view, but also decide the form and sequence in which the information is to be viewed. This presentation form gives interactivity and as advanced information technology is like multimedia.

2. MULTIMEDIA COMMUNICATION THROUGH CARTOGRAPHIC MATERIALS

The analysis of communication processes concerns primarily a comprehensive analysis of streams of information channels existing between communication participants, i.e. information providers, transmitters and receivers, type of the communication channel, type of information being transmitted, subject matter of information being transmitted and completeness of such information. The structure of the cartographic communication process depends on the character of information processes ensuring the links among communication participants, i.e. authors/publishers of cartographic materials and their users. The elements of the cartographic communication system are: transmitter, message formulated in the form of a substantive model of reality (maps or other cartographic materials), channel and receiver (or map user). Depending on the context, with reference to maps, we can use such terms as *message* or *cartographic image*.

The use of such materials in the sense of perception of the information contained in them depends primarily on the linguistic competence on the part of users [6]. For our purposes we need to look at language less as a system of signs and more as a medium or vehicle for thought and cartographic information expression. The way of recording cartographic information (e.g. the process of the input of information) has undergone significant changes. Computer technology threatens to replace writing with word (image) processing. Image is no longer something stable but rather fluid. It has been dissolved into „blocks" that can be expanded, moved around, deleted or copied repeatedly.

Another term which can be used to describe CMs in communication process is *hypermedia*. It is a multi-faceted word in that it not only takes multimedia and electronic texts/images into account but it also makes references to hypertext/hypermedia. The term *hypertext*[7] can be defined as a method of navigating through related but non contiguous pieces of electronically stored information. The process of navigation is no longer a linear one as is the case with reading a print version of text, but a non-linear one. A hypertext system allows the user to select his/her own way of using CMs. A hypertext database containing the CMs would allow the user to „jump" between the two, making the tedious task of searching more immediate and efficient. An additional advantage of hypertext is that it may give the user an opportunity to annotate the original object (CMs) with their own notes. These notes could then become part of the database and would be searchable like any other information contained in the database. The user is assuming a more active role in the process of information transfer. In essence the new media threaten to redefine the role of the user from that of a passive information receiver to that of an active information manager.

The fusion of hypertext techniques with multimedia techniques has given birth to hypermedia making it possible to explore hyperspaces by means of a non-linear strategy. These techniques further offer numerous advantages to users by providing a good support for managing complex information to be used in different fields and for different applications. A hypertext forms a network of ideas that are different from a database by the existence of active references. These allow the reader to move freely in different directions. Data is stored as separate recordings and is read following different paths. A hypermedia structure is very complex because of the association of several documents of a different nature. The system is composed of nodes and links. The nodes are the information holders and can be of various types (reference, annotation, illustration). They are connected together through links which allow the reader to move from one node to another, to have complementory data. The links can be identified on screen either by buttons or icons or by using video attributes (brightening). The node and link structure of hypertext

system is very important because the ease of creation, modification and access depends on it.

Today, the full text electronic databases exist containing the original image (graphics) found in the print version of CMs. The user can „save" the results of his searches onto diskette and then retrieve any relevant information from the diskette. Commands such as clip, copy and move allow the user of CMs to pull information straight from a database and place it within the text. A database is only as good as its indexing system or table of contents. The user must be familiar with the system of indexing to be able to search for any term.

CMs are stored in a hypertext form with links to other relevant documents that could be kept on various machines around the network. Users can retrieve these pieces of data and information (from wherever they reside on the Web[8]) by pointing and clicking with a mouse and interact with services such as databases by using forms and menus. There are several programs available that allow a user to view, write, and publish documents on the Web. Information can be located on the WWW by using subject indexes, Web crawlers, and on-line databases. New capabilities and information resources are continuously created on the Web making it a very dynamic system.

The new media represent a revolution in information providing in that they give the user of CMs a much greater level of interactivity over the entire information gathering/providing process. The CMs as old media in a traditional form were a uni-directional form of information providers; information was gathered and presented in a format decided by the authors, publishers and producers of CMs. The user was entirely passive, having little or no control over how or what was being presented. As a new information technology multimedia allows the user to combine existing formats of information, i.e. to discover the whole information spectrum. For example, when we click a given symbol on the map, we can hear an anthem of a country, while another click (e.g. on the name of a town) will display information about it, its history or weather conditions. The develop-ment of multimedia technologies provides unique possibilities of including acoustic materials, 3D images and video films in electronic publications.

In our article we tried to analyse the impact of changing information technologies on the process of CMs multimedia communication from the perspective of the CMs user. The digital media are plugging into our language and culture. This convergence of computing and the humanities requires learning new knowledge and skills. New tools and standards for the encoding of textual and pictorial information enables the ability to make cartographic resources available to a global audience and to incorporate the use of computer technologies in communication through cartographic materials.

The advances in information technology have made the process of cartographic information transfer increasingly interactive as the user/receiver

gains more and more control over the type and structure of the cartographic information they receive and over the mode of its presentation. The new technologies in information processing and CMs communication, storing and retrieving, as well as the new media, are rapidly transforming the way we communicate in our individual disciplines. We can say in the light of our considerations that cartographic materials can be treated in the broad sense of their meaning as documents similar to multimedia documents.

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1 Cartographic materials include all materials that represent, in whole or in part, the earth or any celestial body. These include two- and three-dimensional maps and plans (including maps of imaginary places); aeronautical, navigational, and celestial charts; atlases; globes; block diagrams; sections; aerial photographs with a cartographic purpose; bird's-aye views (map views), etc. [2].

2 We propose as a definition: Multimedia is the use of a computer to present and combine text, graphics, audio, and video with links and tools that let the user navigate, interact, create, and communicate. This definition contains four components essential to multi-media. First, there must be a computer to coordinate what you see and hear, and to interact with. Second, there must be links that connect the information. Third, there must be navigational tools that let you traverse the web of connected information. Finally, since multimedia is not a spectator sport, there must be ways for you to gather, process, and communicate your own information and ideas. Equipped with a high-resolution color graphics screen, a high-density hard disk, an optical disk and a sound card, the Personal Computer became multimedia in 1991. It became so because it allows associating and managing several media. It groups togeher text, sound, graphics, fixed images and video.

3 Text is a structure made of language expressions and organised in accordance with grammatical rules [4].

4 The term *cartographic information* means any information presented in cartographic materials.

5 The new electronic environment has significantly changed the world of information we used to know. The ever-easier access to the digitised information and emerging of electronic documents have made the nature of the information transfer processes alter the very process of social communication. The fundamental change concerned even the meaning of the term document". In fact, a digitised document may be dispersed among many computers working

in remote places. Its particlular parts are linked into one wholeness through electronic links, with the use of the hypertext technique. The document exists, then, only in the „spectator's eye" (virtually) and can have a different shape for its different users.

6 Data transfer onto digital optical disks started in 1987. It allows the reduction of storage costs and facilitates direct access to date.

7 The hypertext concept was first introduced in 1945, when Vannevar Bush - President F.D. Roosevelt's adviser - proposed the designing of a system called MEMEX to facilitate access to huge quantities of data in an associative way. It is one of tools which are necessary to access a large collection of data through cross-references. The term „hypertext" belongs to Ted Nelson who used it in 1960 in several papers and conferences. But the first one to apply the hypertext principle was Douglas Engelbert in 1965. He built a textual database NLS (oN Line System, known today as AUGMENT) that could be used in a multiuser network environment and that allowed linking file segments by cross-references.

8 The World Wide Web (WWW, or the Web) is a distributed information

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