FROM TRADITIONAL MAP-MAKING TO COMPUTER-ASSISTED PRODUCTION

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A HAGYOMÁNYOS ÉS SZÁMÍTÓGÉPES TÉRKÉPKÉSZÍTÉS ÖSSZEHASONLÍTÁSA

Összefoglalás

A hagyományos készítésű filmek a számítógépes térképkészítés gyors fejlődése következtében elvesztették korábbi értéküket. A számítógépet a térképkészítés szemszögéből precíz, finom rajzeszköznek tekinthetjük, amellyel a tervezési, rajzi, litográfiai feladatokat azaz az egész munkafolyamatot egy ember készíti a korábbinál rövidebb időn belül. A számítógéppel újszerű színvilág alakítható ki, a képernyő látványa alapján. A munka több ember között megoszthető. Megnő a kiinduló (bázis) alapanyag jelentősége. A GPS-es felhasználás igénye módosítja a generalizálási elveket. Az úthoz viszonyítva kell eltolni a többi rajzi elemet. A térképelőkészítés feladatai és a térképtervezés fázisai és sorrendje nem változnak a számítógépes térképkészítéssel. A különböző térképkészítő programok előnyeiről, hátrányairól, lehetőségeiről nem készült összehasonlító elemzés. A szerző javasolja, hogy az ICA Térképtechnológiai Bizottsága készítsen egy összehasonlító elemzést.

Summary

Traditionally made cartographic films have lost their former importance due to the dynamic development of computer-assisted map-making. From the point of view of map-making the computer can be regarded as a precise, delicate tool of drawing, by use of which compilation, drawing, lithographic functions that is the whole working process is made by one single person in much less time than previously. By use of a computer a new colour realm can be formed on the basis of screen visualisation. Work can be divided among more people. The importance of initial source (base) materials increases. Demand for GPS use changes the principle of generalisation. All other drawing elements are slid with reference to the roads. Preparation tasks of map production and phases and sequence of map compilation do not change in computer-assisted map-making. No comparative analysis has yet been made on the advantages, disadvantages, capabilities of the different map-making programmes. The Author suggests that the ICA Commission on Map Production undertake the compilation of such a comparative analysis.

Introduction

In 1991, we thought that traditional map production would be superseded by computer-aided map-making in 10 years. Until then both technologies would live side by side. Development in technology proved much faster. From the mid-90s in Hungary all new maps have been produced by means of computer.

Change of professional skills

In *traditional map-making* the compiler of the map was required to have good draughtsmanship, profound knowledge of established rules of map-making, processing technology, and – for making small scale (topographic and geographical) maps – extensive knowledge in geography and wide ranging skills in printing technology. Drawing or engraving of layouts and fair draughts was a time-consuming process, their revision, subsequent alteration required almost as much time as making a new map. Preliminary conception , „envisioning" of the map, its professional implementation, unity of content and form constituted the basic principles of map-making.

In *computer-assisted map-making* drawing skills have little significance. Draughtsmanship is of minor importance. In the case of aesthetic complaints, the finished map can be modified relatively easily in a short time. The solutions of visualisation have been detached from or are only loosely connected to the content. By means of cheap computers and drawing programmes map-making was made possible also without any cartographic training. Perhaps in none of the professions appeared so many bunglers as in map-making. The production of modern and high quality maps, however, continues to require map-making skills and experiences.

To put it simply, one can also say that the computer is a new, more precise, more delicate drawing tool from the point of view of map-making, by which the working phases of both manual compilation and lithography can be performed. In other words, the computer has replaced the former pen, engraving tools, the filmsetting machine producing the lettering as well as the work of combination printing. The whole work process is done by a single person in a shorter time.

Economy

Our experiences show that the time needed for producing a computer-assisted map equals to ⅔ of the time of the traditional (manual) compilation and drawing (lithographic preparation). Real advantage of the technique shows up in the new editions of the map with much faster correction.

In addition to saving time, costs are also reduced by much smaller material requirements. In traditional map-making the compilation, fair draughts and masks were prepared on plastic drawing material. Their combination resulted in the intermediate printing plates. In computer-assisted map-making one can have all lithographic (preparation for printing) functions in identical (good) quality made by the computer and only the printing plates (4 films in the case of 4-colour printing) have to be scanned instead of the former work of making 12-50-70 intermediate copies. One more advantage is the further use of the digital dataset for making other products, that is reusing certain elements or portions of a map with the purpose of a different cartographic publication, like an atlas or – with other scales and legend – for a wall map. The size of the traditional map could be changed only within restricted limits, even if the options of enlargement or reduction were taken into account. In digital map-making the size of symbols may be changed during enlargement, raster values can be matched with later enlargement. Thus a hand map can be converted to the

size of a wall map. The enlarged map has to be checked, because errors unnoticeable at smaller size now become visible. By correcting the drawing errors (radius of arc, gaps in road junctions) the new map can be produced at relatively low cost.

In the course of computer-assisted map-making maps with entirely new colour tones can be produced. With separate raster values of different colours relatively interesting map sections coloured in a new way can be worked out. The editor creates the vision, the colour effect by computer determining eventually the colours and the value of rasters. In theory, the technique of the past was no different, but at that time one could choose from two patterns only, while now the choice is abundant.

Table 1. Computer-generated changes in map-making

	Computer-generated changes in map-making
1.	From the point of view of map-making the computer is a precise, delicate tool of drawing. To work on it map-making knowledge is needed, but drawing ability can be neglected.
2.	The whole process of map-making (compilation, drawing, lithographic processing) is carried out by one single specialist in a time span shorter than previously.
3.	A map can be made faster (time saved averages 25%), because of the cancellation of lithographic processing (combinations) there is less material requirement (saving in costs).
4.	Production time of map-making is considerably reduced. In traditional map-making idle time between the single phases cannot be neglected.
5.	A greater variety of cartographic colours can be formed on the basis of screen visualisation.
6.	Work can be divided among more people.
7.	The importance of initial source materials increases.
8.	The demand to use GPS changes the principles of generalisation. The other drawing elements are to be slid in reference of the road.
9.	Preparation tasks, phases and sequence of map compilation do not change in computer-assisted map-making.

The Process of Map-making

In order to determine the similarities and differences let us compare the processes of traditional and computer-assisted map-making.

In traditional map-making, the phase of preparation includes the determination of goals, market and copy number calculated on the basis of a survey of market demand and acceptable market price. Subsequently the area to be presented, scale, number of colours applied have to be chosen with a consideration to the price. A reduced model of the map has to be prepared, a folding specimen and in the case of an atlas a bound dummy, compilation and drawing legend, the specimen of facture (specimen sheet, specimen map extract) produced and the source materials and other data have to be assembled.

On the basis of the preparation a complementary technical plan is made, prescribing the implementation. It includes, besides data required for compilation, the compilation documents (hydrography, relief representation, outline draught, lettering, colour model, index of geographical names) and the drawing and printing preparatory (masks) documents possibly in the form of a flow-chart. It prescribes, as a measure of control, the preparation of a photomechanical or colour proof and specifies the deadlines.

In computer-assisted map-making the preparatory steps are identical with two exceptions. The legend is not produced in advance, but several versions are made by computer at the beginning of the work for assisting the decision-making. Instead of listing the compilation and drawing documents the layer structure used in the computer is to be given.

In traditional map-making the number of compilation and drawing documents were strongly limited.

In computer-assisted map-making priority is given to using as many layers as possible to display the geographical content to create different versions and to promote future use. Recording the names and content of the layers, and even memorizing them during work, as well as the desire to control the number of errors forced to limit the number of layers. Using 50 to 70 layers seems to be sufficient and reasonable for one single map or atlas.

At present the number and content of layers are different by firms and often even within a firm according to the editor's individual view. We firmly believe that this field will also have a generally uniform practice with an accepted number and content of layer suitable for exchange.

In traditional map-making the editor, compiler, designer had the whole surface of the map in front of themselves during both compiling and drawing the single elements. They could follow the work achieved, the pace of advancement day by day. The compilation, drawing documents prescribed in the technical plan (hydrography, relief representation, outline draught, lettering) were completed one by one, and then turned to the following element or plastic drawing material.

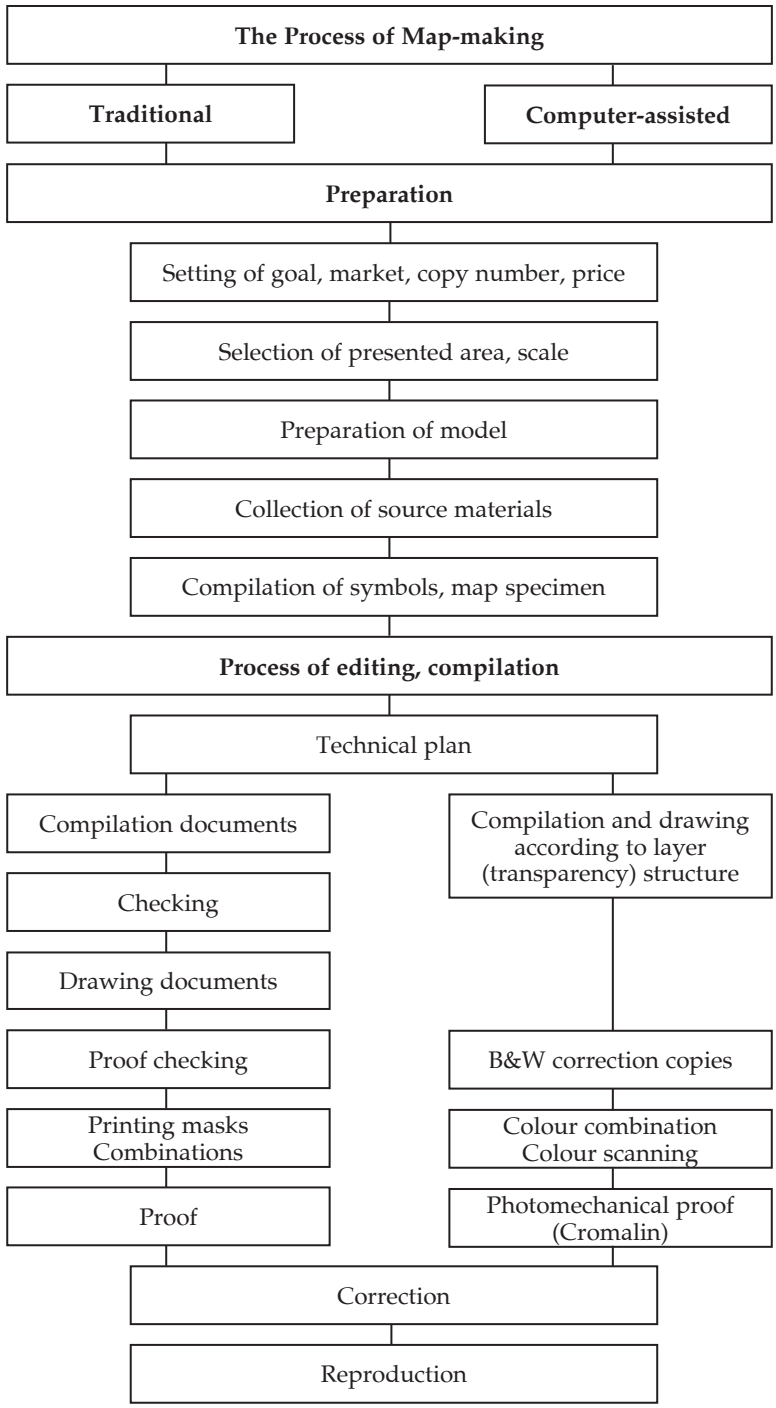
In computer-assisted planning and drawing the work is done on an enlarged section of the map according to the accepted sequence of map subjects (hydrography, relief representation, settlements, roads, railways, other symbols, lettering). Progress can be followed by the editor with difficulty because of the size of the computer screen. Following the completion of a workphase the joint drawing and checking of the given map subject (eg. hydrography) or subjects (primary and secondary roads) are necessary.

In traditional map-making the editor could take the various subjects of the map from different source materials and the good editor certainly did it. It happened that he/she took hydrography and outline draught from different maps, used separate maps for the representation of administrative boundaries and of protected wildlife areas etc. The editor redrew the content of the map by fitting the base map, slid it under the compilation transparency, into the graticule.

In computer-assisted map-making adapting the different map subjects from other sources is not so easy. The new source materials have also to be converted into digital form, they are to be matched by computer to the content of the new map and the given subject to be adapted. The technique is remarkably labour-intensive, and increases the timespan of map-making. Thus the importance of the source material increases, from which most of the subjects can be taken over. The accuracy requirements on the datasets entering the databases are also larger due to an expected compliance with the positional accuracy of the GPS planned for the future. Therefore, the role of accurate official map series becomes more important in choosing the source materials. In generalisation stress will be on the position of roads. Other elements are to be distorted relative to the road. In the past hydrography constituted the secure frame, from which the individual elements were shifted during generalisation.

In traditional map-making, if there was a time constraint for the completion of a map, the compilation and drawing could be commissioned to no more than 2 persons each in the interest of uniform style. In this case the map was cut along an easily separable and matching feature (water or street represented by double lines). In computer-assisted map-making the map can be made by more people, the work can be more easily divided.

Table 2. The process of map-making



Partitioning of the map is carried out according to a similar concept like in the case of traditional map-making.

In compilation of the traditional index the geographical names were written onto library loose cards together with locating numbers (in case the of atlases also with the page number) from the proof or from the compilation manuscript without area colouring. Names already on the card were indicated by crossing them out on the proof. The cards were then arranged into alphabetic order. In the case of atlases occasional repetitions of names were filtered out at this stage. As the names on the cards were typed together, the index was ready.

The well-known computer-assisted map-making programmes only made simpler the arrangement of names into alphabetic order. The names must still be typed into the database in textual format. The preparation of the index can be accelerated by digitizing (scanning) the former index or converting it by a character recognising programme (Recognita). In new, larger, more expensive systems the name can be transferred from the map into the database or it can be retrieved from the map. In this case the character types to be applied are also attached to the name. Instead of a locating net finding of the name is also facilitated by supplying the geographical coordinates.

Production of thematic maps

In thematic map-making a significant part of the cartographer's worktime used to be taken in the past by choosing the representation method and drawing of a specific area by the use of several representation methods or of one method but with different symbol sizes. The computer increased the possibilities of preparing a sample. Several versions may be produced in a short time. The share of the cartographer is reduced in the production time as that of his/her colleague as data supplier increases, as the latter is already taking part in the editing process of thematic maps with equal importance to that of the cartographer.

Variety of computer programmes

Nowadays a great variety of map-making programmes are in use. In addition to the general drawing programmes (AutoCad, Corell Draw, Ocad, Macintosh: Freehand Illustrator), there are also a number of large map drawing programmes (Intergraph, ArcInfo, Mapinfo) and programmes of individual development. For the time being we have not seen a comparative analysis of advantages, disadvantages, capabilities of the different programmes. It would be appreciated if the Commission on Map Production of ICA undertook compilation of such a comparative analysis.