REMARKS TO COOPERATION BETWEEN THE CARTOGRAPHER AND THE THEMATIC SPECIALIST BASED ON THE EXAMPLE OF HISTORICAL MAPS

Ing. Pavel Seemann

Czech Technical University in Prague, Faculty of Civil Engineering, Department of Geomatics, **Czech Republic**

ABSTRACT

The paper summarizes practical insights of cooperation between the cartographer, the thematic specialist and the graphic designer or the technical editor. Presented useful suggestions are based on the experience gained in the projects which involved partnership with historians, namely historical atlases and ad hoc historical maps for text publications and papers. There are discussed preparation issues of map concepts, map unification and thematic content preparations. Several notes are devoted to map symbols design with emphasis on methods that improves the readability of map annotations. It is mentioned the importance of harmonizing map layouts and the matter of correct typography. One section deals with hints for preparation of underlying data model and topographic layers. Further tips are to the topics of workflow and labour management within wider team of authors. The article recapitulates previous knowledge, best practices and impasses for the upcoming interactive atlas of the Czech history, which will be held in the next five years.

Keywords: Atlas Cartography, Best Practices, Historical Maps, Map Making, Thematic Cartography

INTRODUCTION

During the last years, there has been successful cooperation of staff and students of the Department of Geomatics, Czech Technical University in Prague with experts from the Institute of History, Czech Academy of Sciences. Our joint works are also focused on creating historical maps and atlases. The *Academic Atlas of the Czech History* [1] was released in 2014 and publication *Frontiers, Massacres and Replacement of Populations in Cartographic Representation Case Studies (15th–20th Centuries)* [2] was published year after. Thanks to these two projects team of cartographers from CTU gained a lot of experience with historical maps production. Both these institutions will cooperate on the project Czech Historical Atlas from this year until 2020. As a main outputs are planed interactive map portal of Czech history with ties to Central European and European area and printed publication dedicated to the fate of Czech lands in the 20th century. At the beginning of large-scale projects is necessary to sort out previous experience, work procedures and determine which practices has been proved and which has not. Following presents selected insights to cartography at historical maps and to collaboration between the cartographer, the thematic specialist and the graphic designer.

MAP CONCEPTS

The presence of cartographers in the team since the beginning of the work is a fundamental condition for the formation of high-quality thematic map work. Without cartographic knowledge there are often created maps which communicate poorly or incorrectly spatial relationships and map topics. As an example from the *Academic Atlas of the Czech History* [1] can be mentioned exclusion of too extensive map proposal for Roman catholic church administration. Documentation for this topic counted dozens of pages which ware unrealistic to handle into several small-scale maps in financial, time and technical terms. (Later, the topic of Roman Catholic Church Administration has been processed in a doctoral thesis [3].) Historian's opinion that a cartographer with so much data creates map somehow indicate poor communication between both expert groups at the start of the project. Cartographer shall also correct ideas about how full a map can be. There were suggestions for content-packed maps and also for substantively poor maps in the publications [1, 2]. Unfortunately, the conviction of map authors on the need to better prepare thematic content has not always succeeded. The need to thoroughly explain principle of simplicity [4, p. 27] is a lesson for the future. Heavy map content can be be partially solved by selecting corresponding map field dimensions and scale, by appropriate distribution of map elements or by placing a map on the both book sides. But this assumes that the cartographer has the opportunity to work upon the initial conception and is not faced with finished design. On the other hand, stable scale range, which allows reader to easily compare spatial and temporal relationships between maps, also participates in the overall impression of the atlas. Therefore, it is not appropriate to choose unique size and scale for each atlas map only according to the content. Map readability can be also improved by adding a halo to annotations if the map concept is finished [1, p. 445] or by splitting content into multiple maps, for example via time levels of depicted events or according to qualitative characteristics [2, pp. 73–74].

In the introduction, it is also essential to agree on the method of transmission of author's materials intended for making maps. Familiarization of colleagues from the humanities with the basics database designing worked well. A lot of time saves data already organized into logically structured lists (tables) where the properties of individual items are distinguished by attributes, so not by font or colour, which is favourite way of data sharing among historians.

Cartographer should be a unifier of different map concepts provided by authors of thematic content. He should eliminate author's blindness in work maps, for instance by talking to the process of map theme selection – the atlas [1] has devoted significant space to the topic of railway network development in the 19th century, but the state in the 20th century is missing and no historian has pointed out, so choice of map contributions in this failed.

MAP SYMBOLS

Late involvement of cartographers to the atlas project [1] and related close deadlines have resulted in a map key without full harmonization for similar issues across the chapters of the atlas. For instance, maps of Roman Catholic Church Administration are in the various chapters – each of which had its responsible cartographer – a little different. These are mainly point map symbols of ecclesiastical building that have not fully adhered to the principle of unity [4, p. 25] and the principle of associativity [5].

Paper [6] have tried to correct this state. It is important not to take slavishly map signs from author's maps, but actively seek for cartographically better solutions, which will correspond to the overall concept of map work. Choosing map signs is entirely up to cartographers with the fact that the thematic specialist has right to comment it, but cartographer should give a final decision. Uniform appearance of map features improves communication function of a map and enhances aesthetics of the work. It is necessary to argue in this way when discussing with the map authors who are not always willing to accept the unifying proposal of map key.

A certain weak point of ArcGIS platform and ArcMap, in which the maps for both publications [1, 2] has been created, is design of own symbols associated with features, e.g. for industry, military affairs or buildings. The default list of symbols represented by fonts supplied with the platform is generally insufficient for historical maps, respectively, symbols does not act uniformly. So map maker have to shape new signs. Either by so-called cartographic representations or, and this has proven more, using a custom font, which is not bound to ArcGIS platform.

Technically, readability of the labels can be improved in the ArcMap either by false mask, i.e. by halo or via special functions for masking from Cartography Toolbox. The first method is simple and easy to prepare for post-processing in a graphical software. The disadvantage is, however, only a single halo colour which surrounds labels. This means that the annotation placed on the boundary of two or more underlying surfaces (areal symbols) has its false mask visible – see *Figure 1*. The second option creates polygon feature class with masks, so they can be used for hiding close surroundings of annotations – polygon masks typically linear features that utilize rich colours. The drawback of the later approach is more time consuming preparation, the need to generate mask again when changing layout or content of annotations and higher requirements for post-processing in graphic programs. If the software Adobe Illustrator is available, masks surrounding labels can be created in it via the tool for offset path. Then, offset path is used to hide linear features below annotations. Last variant is easier and faster in generating masks compared with the second method. But it requires software Adobe Illustrator and the final graphic compilation of map have to be done by cartographer, not by graphic designer.

Figure 1 – settlement's annotations without halo or mask (left), settlement's annotations with single colour halo (centre), settlement's annotations with masks (right)

For the future, it is worth to represent large diagrams in cartodiagram maps only by annulus, or place diagrams outside their proper geographic location or completely

outside the map field. Doing so will lead to grater clarity of maps because large diagrams will not cover areas of choropleth thematic map that are forming background.

BASEMAPS

After clarification of conceptual and compositional properties of a planned map work and after design of a suitable map signs it can be proceeded to preparation of the underlying data model and topographic layers. This step does not pay to rush. Time spent on tweaking basic data and preparation of map templates prevents subsequent downtime when errors in the underlying data have to be repaired for each single map. External spatial data sources have to be carefully checked, especially in foreign regions. Common data mistakes are in the water network, where rivers do not flow from the source or where they have inaccuracies in their course or when they are hydrologically incorrect – they "flow uphill". Localization verifying is also needed for settlements and altitude points.

It is important for maps of history to obtain good quality materials for historical borders. They should not be smaller scale than a new map. Ideal boundaries have the most accurate and detailed form, which is available for a given period. Historians and cartographers should know the geographical and historical context of the spatial and qualitative changes in boundaries. It is not enough to know only when the change of borders occurred, but also where the boundary lines changed their course. The historian must not resign in searching the old map data, to which he is often closer than an ordinary cartographer. Vice versa the cartographer must try to explain clearly which form of underlying data and maps are useful and which are not. Double sided cooperation at this point is really necessary [7].

A factor that also influences the final base of topographic data is a scale range of future maps. It is essential to derive generalized data classes for less detailed maps from the most detailed layers and reconcile their mutual database and spatial coherency within individual scales. Unprofessionally acts over-generalization when sharp bends are seen in the line of phenomena that have continuous curvature (rivers), or lack of generalization when topographical base is unnecessarily detailed.

Figure 2 – excessively detailed data (left), over-generalized data (fight)

MAP LAYOUT

Legitimate criticism on the composition of map elements was featured in a review [8]. There were pointed out that many map readers could not easily locate smaller displayed

area within the broader geographical context only on the basis of several guidance settlements. Small-scale maps are therefore a useful supplement for the localization of large-scale maps, so the position of the main map is shown in a small-scale map of a continent or a country.

An alternative for geographically adept readers may be the adding geographic coordinates to the frame of map field or depiction of latitude and longitude passing through the area of interest. The second option is widely used for maps of small and medium scale. But it can be utilized in large scale maps if map content completely covers map field, when there is no suitable space for the north arrow.

Beyond the importance of consistent scale range and map sizes in atlas works, cartographic team have to also agree on whether and how to use so-called island maps. Islands maps are particularly suitable for works that deal with a single territorial unit, e.g. country, region or manor. However, it is better to avoid islands maps if atlas content aims to present area of interest in a broader context with ties to the surrounding places, i.e. displayed area will be often slightly different. Then, choropleth thematic maps and cartodiagrams should be presented in entire map field with topographic content as well.

TYPOGRAPHY

Each cartographer should also know the rules of punctuation, which can be found in labels and annotations of maps. There is a difference between a hyphen, a dash and a minus sign which are frequently interchanged. Similarly, it is necessary to pay attention also to the proper notation of physical units, degrees, percent or times sign. Besides the appropriate translation, different grammar rules for writing numerals or punctuation must be taken into consideration when working on non-native language maps (e.g. in English). All text, and especially legends, needs to preserve uniform character and line spacing and distance between items.

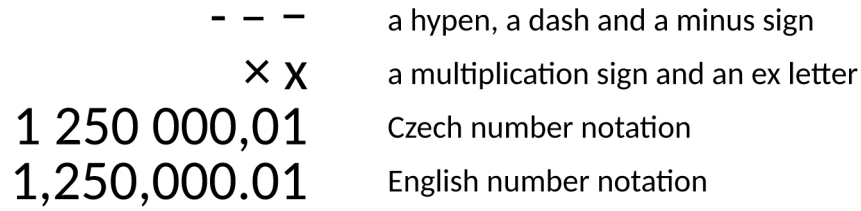

Figure 3 – punctuation rules

WORKFLOW AND LABOUR MANAGEMENT

Late submission of map proposals, associated documents and significant interventions in map concepts are annoying ills related to the organization of work in the later stages of cartographic production. It is therefore appropriate to carefully prepare the content of the map wok, cartographic project, time schedule, responsible persons, deadlines and penalties for delays. Keeping the principle that thematic author's interventions have nature of corrections rather than reworking map can be saved a lot of time of map makers. Also, poor thematic documentation extends the time to process maps. These include the need to search for courses of historical boundaries, existence verification of settlements in a given year, or spatial data assembly due to the incompleteness of underlying lists.

The printing masters for maps of the *Academic Atlas of the Czech History* [1] were forwarded to print composition in three file sets. The first contained a map background (usually phenomena represented by areal symbols), the second layer was the hillshading and the third file included the foreground, i.e. line and point features, labels and legend. The task of the graphics designer was to combine the individual layers into final map using software which allowed setting transparency to hillshading in the CMYK colour space. However, said procedure did not work well from the perspective of map corrections. It was necessary to export printing master files after every minor repair and pass it again to the external graphic designer who merged them. Considerable time could be saved if the cartographer had handed over only complete maps. Data would not travelled several times throughout sequence historian – cartographer – graphic designer. But the proposed workflow requires cartographer's knowledge in handing graphics software.

It is desirable for cartographic publications, which include reproductions of old maps, paintings or photographs, to have one team member who is able to do retouch of image data. The overall aesthetic of the work is raised by uniform colour balance. Absence of errors made during map scanning helps as well.

Last remark is to the task organization within wider team of authors, whose members works separately on different sites and they are not able to immediately respond to project issues. For such groups, it is preferable to replace email correspondence by internet-shared documents and files. Each team member has access to these documents independently on time and place. They can be edited at the same moment also. Current state of working problems is clear thanks to the comments and edit history, so everybody knows what are the opinions of others.

CONCLUSION

The topic of interdisciplinary cooperation is very broad, and many of the tips could be discussed in a greater depth. However, article effort is to describe the most interesting aspects and the most useful advices for other map makers, which have been obtained during collaboration between historians and cartographers at atlas projects. Given findings perhaps may seem obvious to mapping professionals with years of experience, but the contribution is aiming to students, map maker beginners and experts from other professions who shows their work results as maps. Experienced team of cartographers will cooperate with those people in the next five years on the project of the Czech Historical Atlas. This project will present the history of Bohemia, Moravia, Silesia and the surrounding Central European area in the forms of an interactive web atlas and printed publications to everyone who is interested in. The paper's author hopes that he or one of his colleagues will be able to inform on the further development of the Czech Historical Atlas in the coming years of SGEM conference.

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