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A COMPARATIVE ANALYSIS OF ELECTRONIC ATLAS AND GEOPORTAL: THE CASE OF SWITZERLAND

According to the most common definition, atlases are *"intentional combinations of maps or data sets, structured in such a way that specific objectives are reached."* [1] The definition highlights the following properties of atlases: structuring of information, compliance with a specific objective (intentionality), and the presence of specific elements (maps or data sets). The first two properties are too general and can characterize any structured combination of elements based on a certain idea (e.g., presentation slides). Therefore, the definition primarily emphasizes the presence of a set of maps or data sets. The data sets are added to make the definition more versatile and to include electronic atlases (EAs). However, an intentional combination of structured data sets can be an ordinary data catalog without any graphical representation (replacing "data" with "layers" would slightly reduce ambiguity). In addition, most contemporary mapping applications also consist of a set of maps. Hence, this definition is acceptable only for paper atlases.

For EAs, the above definition is modified by Kraak and Ormeling [1] as follows: *"intentional combinations of specially processed spatial data sets, together with the software to produce maps from them."* A new function of atlases was introduced: map creation (producing), which implicitly means the generation of maps from the given list of data sets by user choice (flexible concept of map information provision according to [2]). Without eliminating the shortcomings of the main definition, this modification raises a number of new questions: 1) What list of operations does "map creation" include? 2) What category of authors/users can create maps? 3) What kind of "software" is meant? 4) What category do e-book atlases and EAs with a restrictive concept fall into [2]? While this definition may be correct from a technical viewpoint (especially for EAs of the 1990s), it characterizes EA as a final product from the perspective of use quite poorly. Such important properties of atlases as "an atlas is more than the sum of individual maps", coherence of maps, enabling map comparisons (thematic, temporal, spatial), narrative structure are not included in both definitions.

Initially, geoportals or clearinghouses were associated with mechanisms for searching and administering geospatial data based on the provided metadata. With the cartographic revolution of Web 2.0, geoportal web applications have increasingly begun to incorporate maps as a search tool and/or a means of presenting search results. Nowadays, the map interface has become the main interface for a significant number of geoportals, especially national ones. Moreover, for some countries, the geoportal has replaced the national EA (e.g., Finland, Italy, Poland), being considered a website for map-based access to spatial data of the country. Nevertheless, the main functions of the geoportal remain [3]: monitoring the availability of datasets in scope; discovering suitable datasets based on their descriptions (metadata); accessing the selected datasets through their view or download services.

In addition to geoportals and web GIS, with the rise of cartography web 2.0, EAs faced such competitors as cartographic information systems, interactive maps, and story maps. Google Maps and similar mapping services hardly should be considered competitors since it is no longer appropriate for EAs to function as navigators. However, the aim of this study is not to find theoretical solutions but to analyze the differences in implementation between EAs and geoportals in practice.

To avoid discrepancies between the theory and its interpretation in practice, the theory should characterize EA as a whole and its main components. The whole implies defining the key properties of EA, the functions of EA (why to use it) or the "work it does," the typical scenario of its use (how to use EA), and the target users. The main components of EAs as end products include: 1) information architecture and navigation; 2) cartographic representation or visualization (EA may contain various forms of data visualization or spatial visualization); 3) functionality (primarily interactive functions (IF)); and 4) interface (layout, flexibility, aesthetics). Only understanding these two aspects of EA allows us to answer the question, "What is EA?"—that is, to reveal the concept of EA as a specific cartographic concept and product. The integration of thematic content is envisaged by the concept of a concrete EA.

To demonstrate this approach, Swiss cartographic products were used, which are world-renowned for their high-quality combination of cartographic traditions and modern technologies. The Atlas of Switzerland (AoS) 3 [4] and the Statistical Atlas of Switzerland (SAS) [5] were chosen as the main EAs. The latest version of the AoS is the AoS-online (2016) [4], but the author lost access to this EA after 2020. The main differences of the AoS-online are a complete transition to 3D (positioned as the main advantage of EA in competition with other mapping applications), a new interface, simplified functionality, and the possibility of updating. It is also worth mentioning the Swiss World Atlas interactive (SWAi) [6], which was notable for its navigation capabilities. The key strengths and drawbacks of these two EAs were taken into account. Describing the basic idea of the AoS, Sieber and Huber [7] used the metaphor of the atlas as a "story book" that should make users feel comfortable and fulfill their curiosity and demands. Simultaneously, the AoS is positioned as a system for geographic analysis and cartographic visualization in a multimedia environment, as well as *"a distinctive compilation of cartographically well designed maps emphasizing the characteristics of the thematic information depicted, and ready to be explored by tailored atlas tools."* [8]

The SAS was developed by the Federal Statistical Office using the Statatlas platform [5]. The Political Atlas of Switzerland, the Historical Atlas of the Federal Census, and the Statistical Atlas of Cities were also produced on the basis of this platform. The implementation of these EAs is identical, differing only in their thematic content. The Statistical Atlas of Cities is notable for its cartographic representation, which facilitates the comparison of the nine largest Swiss cities, each represented by a separate map. The SAS meets the rigid requirements for statistical atlases established in the dissertation [9] and is defined as follows: "*atlas, which in the form of an integral collection of mostly analytical maps and other information carriers (diagrams, tables, texts) graphically portrays current societal, and esp. socio-economic facts. In its true sense, it represents, by using primary sources and applying certain statistical methods, all spatial data gained by official statistics through special surveys or censuses for a broad societal insight*." [9]

Another Swiss federal institution, the Federal Office of Topography (swisstopo), has created the Maps of Switzerland (MoS) application [10], which is considered the "map viewer" of the Swiss geoportal. The main functions of the application are searching, viewing, organizing, and downloading geospatial data, along with printing maps. Although this application enables metadata browsing and supports address (geographic) and thematic search, its functionality related to accessing and searching metadata is inferior to other geoportals. Considerable attention is paid to the cartographic representation of a large number of themes and to "creating your own maps." What is the difference between MoS and EAs, especially the SAS and the AoS 3?

All three cartographic products are single-page applications. In AoS 3, switching between several visualization modes takes place in the same interface without losing the context/status of each view. The MoS interface is ahead of both EAs in terms of the amount of screen space allocated to the map. However, the interface elements (mainly sidebars) of the MoS, the SAS, and the AoS-online can be collapsed/expanded, while the layout of the AoS 3 is static. Infoboxes can be dragged and dropped in all applications. A full layout redesign is not supported by any application. The MoS and the SAS interface styles are coherent with each other (a feature of all federal applications). Also, only these two applications are accessible on mobile devices.

The information is organized by topic in all three applications. An important difference is in the approach to the provision of cartographic information. The SAS applies a restricted concept [2], which provides only ready-made maps without the ability to combine them. The AoS 3 approach can be called restrictive flexible [2], since each selected map can be supplemented with a second one from the list of system recommendations. In the MoS, users can select, combine, and reorder any layers—it's a flexible concept [2]. In addition, it is possible to change the theme classification in the Table of Contents (TOC), which is not supported by the mentioned EAs. A tree menu (TOC) is used for presenting themes in all three applications, although only the AoS 3 has graphical display elements (icons, colors) in the TOC. Also, only the AoS 3 shows all the subsections and elements of each section in a clear way (this overview advantage will be lost in the AoS-online). The AoS 3 and the MoS support a visual preview of themes, which is very rare among mapping applications in general. All three applications have geographic and thematic search (the most detailed in the AoS 3 due to an index (gazetteer)), but there are no advanced search options. Filtering elements is possible only in the AoS 3 index. The TOC sorting IFs that were implemented in SWAi are not offered. However, in AoS-online, users can sort maps by popularity or novelty. Similarly, the SWAi context-dependent navigation [6] has not been implemented in AoS versions.

The description of layers in the SAS and the MoS is limited to formal information, a metadata description, or a short summary. In contrast, the AoS 3 texts are longer, didactic in nature, and sometimes accompanied by multimedia. Still, texts and multimedia in all applications are linked to maps. Multimedia elements in the MoS only make up the content of individual layers without playing a supporting role for other themes. The MoS does not provide access to the attribute tables of thematic layers at all, unlike the SAS. There is no attribute table as such in the AoS 3, but users can view the selected values of the thematic indicator for territorial units in the "comparison" panel. The editors' publications of the above-mentioned atlases [7-9] note that it is desirable to supplement the topics of EAs with multimedia for better storytelling. Multimedia is partially implemented only in the AoS 3. However, none of the applications tell the story. Only the AoS 3 offers to add maps that would help users create meaningful storylines (connections). Both EAs do not provide alternative theme classifications (for the SAS, this is due to the standardization of themes in statistics). Neither the MoS nor the AoS 3 offer attribute tables, focusing instead on cartographic representation. The presence of tables in the SAS is explained by the statistics requirements.

The SAS basemap displays administrative boundaries, hydrography, and terrain. Only layers of the basemap can be switched. In the AoS 3, users can activate all the main layers of reference maps, including labels. The list of basemaps is extremely limited (the same applies to the AoS-online). Instead, the MoS provides a huge number of basemaps in the form of layers and layers of individual topographic elements. However, there is no intentional distinction between thematic and base layers of the map.

The symbolization of the SAS maps is mostly limited to choropleths, proportional symbols, and combinations of both. The AoS 3 and the MoS are characterized by the use of various types of maps. However, the AoS 3 has multivariate maps, although there are relatively few synthetic maps. In the MoS, the legend is a static image. The user can only modify the layer's transparency. In the SAS, the legend allows users to highlight individual classes of an indicator. Instead, the AoS 3 realizes a significant part of the “smart legend” [7] potential. Charts as standalone forms of visualization are not implemented in any application (in the AoS-online, charts are built when comparing map objects). In contrast to the Swiss atlases, the MoS 3D visualization focuses on displaying local objects (buildings, vegetation). However, the MoS 3D visualization also successfully represents thematic layers, and map navigation is smoother and faster. On the other hand, the AoS 3 has several 3D modes (panorama, block diagram, prism map).

The comparison capabilities play a key role in the functionality section. Animation is the only IF for comparing maps in the SAS. In the MoS, the animation is supplemented by a vertical slider for a map view. Instead, the AoS 3 provides the ability to open maps in different visualization windows, supports animation, and displays statistics for selected map objects. The map/data export IFs in the MoS and the AoS 3 are approximately at the same level (however, the MoS enables users to print any pages with information). The SAS is superior to the previous ones since a user can download layer output data in various formats (directly from the EA). In terms of extensibility, the MoS with “drawing” IFs (adding markers, lines, polygons, labels as single objects to the map) outperforms the mentioned applications.

Therefore, the essential differences between the MoS and the AoS (the SAS has many limitations due to its type [9]) are the opposition of layers and “ready-made maps” (although the basemaps are autonomous elements in both applications), the differences in the nature of map/data descriptions, the possibilities of manipulating symbolization in EAs, and a greater variety of means for comparing maps and objects in EAs. However, it is more about qualitative differences (how detailed and perfectly certain aspects are implemented). The MoS formally meets the definition of an atlas [1]. In both applications, maps or layers are classified not randomly but according to a certain idea and are divided into sections/subsections. Certainly, one could argue that the layers and their sequence are more carefully selected in the AoS, and they try to show certain cause-and-effect relationships. Instead, the MoS aims to simply provide as many layers cataloged in a certain way as possible. But neither application tells a story, even within sections.

The “map viewer” of the Bayern geoportal [11] is an application completely identical to the MoS (it seems to be a product of the same framework), but it is called the “Bayern Atlas.” Although the “atlas nature” of the MoS remains debatable, it is no longer possible to ignore the fact that one interactive map can represent a large number of themes. If we focus on storytelling in EAs, which often implies a linear structure and combination with multimedia, we will have to look for differences between EAs and geonarratives (in particular, story maps). Turning EAs purely into “comparison machines” leads to competition with dashboards and geovisualization applications with multiple coordinated views. Betting on only one property of EA is unlikely to change the situation. Preserving the high status and uniqueness of EAs requires a new concept that would integrate the set of old and new properties of EAs into a single whole, clearly answering the question of the expediency of EAs and their functions. Nevertheless, existing concepts of EA need to be clarified and systematized. To achieve all of this, cartographers need to move the “cartographic horizon” beyond maps, looking at EAs as holistic systems from the user's perspective.

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