

Tracking Interoperability Service in Digital Libraries for Orthodox Art and Knowledge

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Abstract. The implementation of the idea of improved access and effective usage of digital libraries content has led to a new type of services, providing their wider content integration and merging. In this context, the analysis of integrating service usability is essential and gives new directions for functionality extension and improvement. This paper presents an analysis of the usage of the interoperability service, compiling content from two digital libraries for Orthodox art and knowledge – the Encyclopaedia Slavica Sanctorum and the Bulgarian Iconographical Digital Library.

Keywords: Digital Libraries, Electronic Encyclopedia, Interoperability Service, Machine-Generated Traffic.

1 Introduction

Orthodox (East-Christian) iconographical art is recognised as one of the most significant areas of the art of painting. Until recently, it had been neglected in the digital documentation and the registry of the art of painting. But the accessibility to this valuable part of mankind's cultural and historical ancestry was enhanced greatly with the appearance of the Encyclopaedia Slavica Sanctorum and Bulgarian Iconographical Digital Library multimedia digital libraries in the world virtual space.

The Encyclopaedia Slavica Sanctorum (ESS) or Encyclopaedia Slavica Sanctorum Calendar or simply Calendar [Rangochev et al., 2013][Rangochev et al., 2014][Rangochev et al., 2015] is designed aiming to satisfy scholarly and educational needs as well as the general public's interest in lectures, multimedia products, and exhibitions in the Orthodox domain. An advantage for the users of the chosen platform is the multiple access to the data. If interested in a date of the calendar, users can find all the saints and feasts that are recorded in the consulted sources for this particular date. If interested in a certain saint or feast, users can find all the information on them, on dates when they are celebrated and books (sources) in which they appear.

The Bulgarian Iconographical Digital Library (BIDL, available at <http://bidl.math.bas.bg>) [Pavlova-Draganova-et al., 2010] is an Internet-based envi-

ronment—a place where iconographical objects of different kinds and origins have been documented, classified, and “exhibited” in order to be widely accessible to both professional researchers and the wide audience. The library provides services for registration, documentation, access and exploration of a practically unlimited number of Orthodox iconographical artefacts and knowledge, and end users can use this rich knowledge base through its interactive preview, complex object search, selection, and grouping.

Being in the same domain and supplementing each other in the content level, BIDL and ESS are integrated in order to extend the knowledge about their common objects or to exchange data. In [Paneva-Marinova et al., 2012] the main conceptual framework for content interoperability between the ESS and BIDL is presented. Figure 1 depicts the UML class diagram of the relation between the ESS and BIDL. This paper discusses key issues of usability of this federation. Main asked questions are related to the user’ activity and that it could evoke.

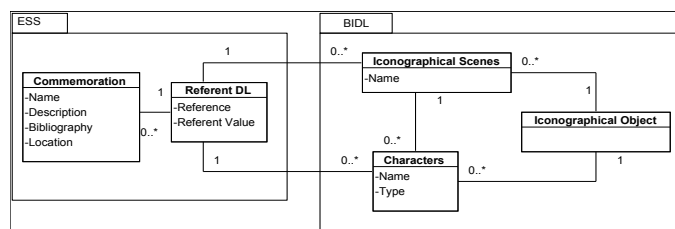


Fig. 1. UML Analysis Class Diagram of the Conceptual Relationship between the ESS and BIDL Entities

2 Analysis of the Interoperability Usage

This section includes several questions and statistical data collected by means of the QlikView, a business intelligence software for content and access analysis [Rangochev et al., 2013][Rangochev et al. 2014].

1. Which objects characteristics users use for browsing objects (grouping criteria) saints, holidays, periods, locations?

Figure 2 presents common object characteristics used for browsing and searching objects. Two types of searches are presented. A common informational search/browse by title, school, author, etc., and specialized search/browse. The search/ browse by title, author and school is common and naturally it takes about 70% of all searches/browsing. In fact, more interesting is the second type – the specialized search/browse. It is presented by two variations of iconographical technique searches – in both Bulgarian and English languages. Also, by two variations (Bulgarian and English) of iconographical base.

Despite the small share of this type of search – about 25%, this chart approves that the digital libraries became a learning handbook for specialists and the initially placed task is achieved – to provide specialized information for the Bulgarian iconography to the specialists.

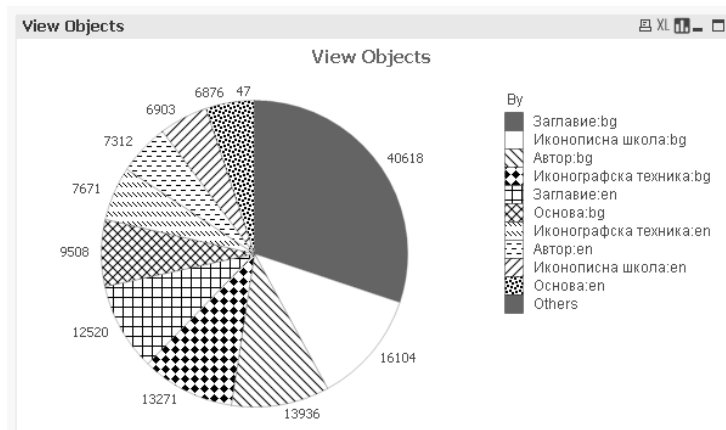


Fig. 2. Common objects characteristics used for browsing objects

2. Where the objects are (their location)? This information is needed to the user in order to visit the particular place/places.

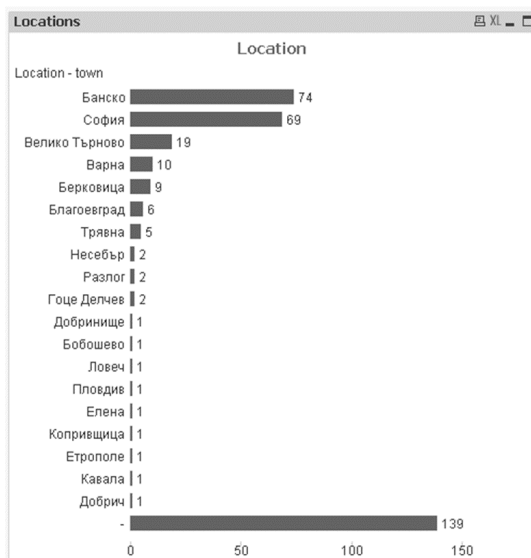


Fig. 3. Objects locations

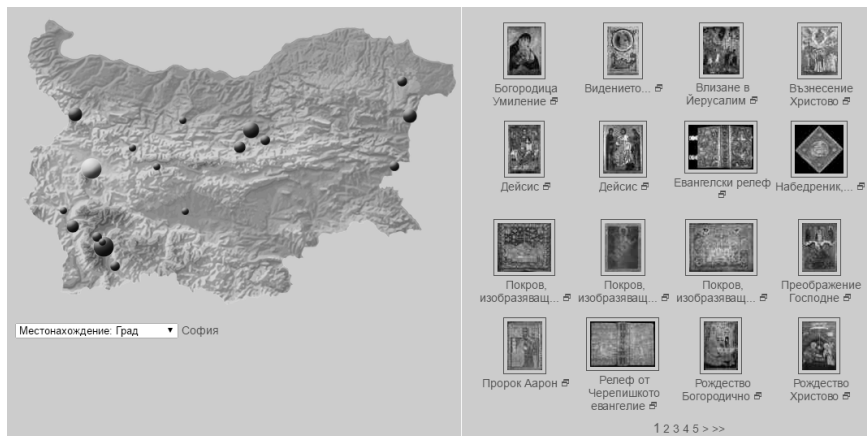


Fig. 4. Objects map

There is a BIDL feature to provide information about how and where it is possible to visit the place where the viewed BIDL object is physically located. This service allows BIDL integration with a large set of web based platforms for tour services [Zholt et al. 2015] [Kaposi et al., 2013]. This feature targets specialized tourists aiming to learn more about Bulgarian cultural and historical heritage.

3. What is the distribution of objects from different periods and schools?

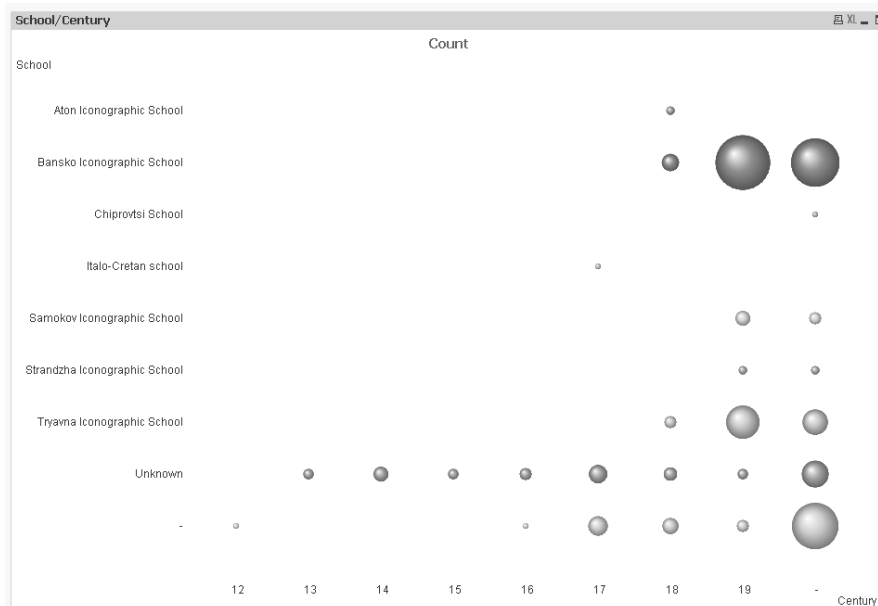


Fig. 5. Distribution of objects from different periods and schools

Figure 5 presents the BIDL wide variety of analytical features for executing specialized searches. A careful analysis of this chart shows that the most viewed objects are objects from the last three centuries (XVIII – XX) and not from the expected XII – XV (the second Bulgarian kingdom.) Thus, this chart expands the role of the specialized search in BIDL, which is not so obvious in the previous figures.

4. Are there more ESS/BIDL visits from users on certain dates, associated to respective religious events?

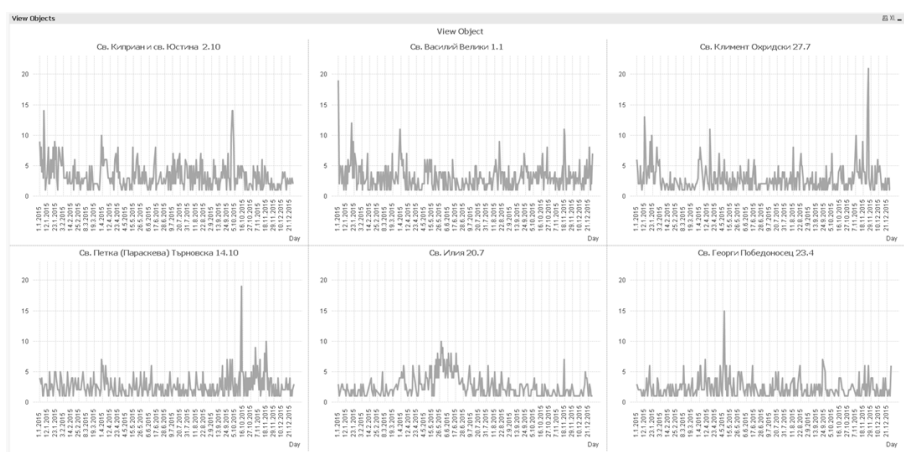


Fig. 6. Number of visits of certain objects during the year of 2015

Figure 6 presents the objects that cause the greatest interest to the ESS/BIDL users and the time, the search was made. As expected, some of the most famous Orthodox saints are in the scope of users' searches. St. Vasyli the Great (01.01), St. Iliia (20.07), St. George Victorious (06.05). Another interesting observation is regarding the regular searches for the saints St. Cyprian and St. Justina (02.10). They are not as popular as St. Kliment Ohridski (27.07) or St. Petka Tarnovska (14.10). They are directly related not only to the Bulgarian Orthodox Church, but also to the Bulgarian history during the X – XIV centuries. The great interest to St. Cyprian and St. Justina most probably is associated with the so called “Cyprian prayers against spells”. It is considered that the prayers are created by the two saints and nowadays they are read by believers' demand in the temples of the Bulgarian Orthodox Church. In fact, “Cyprian prayers” are not included in the official documents of the Church and most probably are translated (in the 70s of XX) from unknown Greek sources. Although they are not official, nowadays they are very popular and there are different practices according the region. For instance in many temples in Plovdiv and Asenovgrad, they are read every Thursday, in Sofia only by believers' demand. It is important that the interest to these prayers is primarily an urban phenomenon and it is increased during the last two decades of XX and the first decade of XXI. The increased interest in the both DLs proves the DLs as highly authoritative source of information.

4. Is the interest generally stable, is there wide set of returning users of the DLs?

Figures 7 and 8 show dynamics of active users. It is obvious that after the initial peak of interest there is a small decrease of activities, but, in fact, the trend is regularly rising up of the user activities through the last 2 years – 2014 and 2015. The “View date” activity has the greatest hop, which means the nonspecialized searches have grown up and new groups of users have joined the DLs.

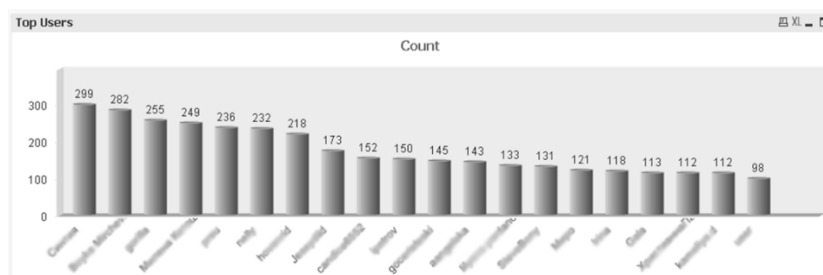


Fig. 7. Top users

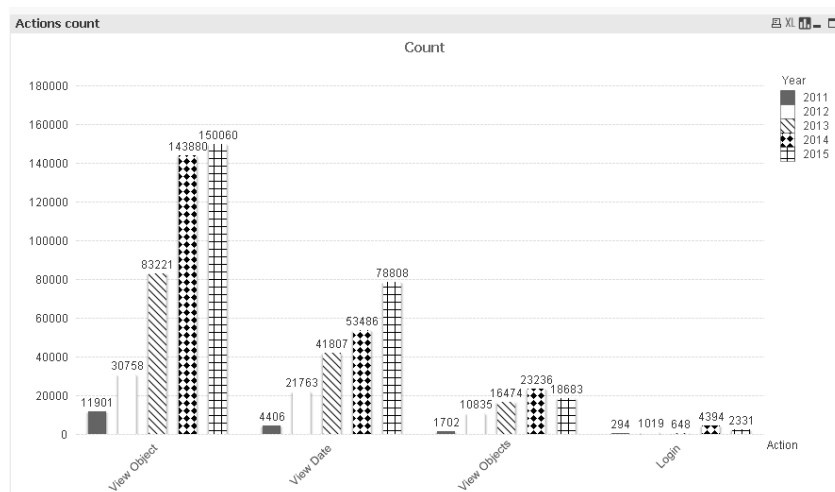


Fig. 8. User activities through years 2011 – 2015

5. Which icons/saints are most searched in the two DLs?

Figures 9 and 10 shows the saints/iconographical scenes with most frequent searches. Interesting here is that despite the interoperability between the two DLs, there are significant differences between the two charts. In BIDL most frequent searches are made for: The Virgin, Jesus Christ, Jesus Christ - Child, Jesus Christ Pantocrator, st. John the Baptist, etc. Generally the most frequent searches are made for the most popular saints of the Orthodox. Unexpected for ESS is the fact that most request searches are made for: St. Vasyli the Great (01.01), St. George Victorious (06.05), St. Kliment Ohridski (27.07). We can outline two main groups for the user searches in ESS. First group includes Bulgarian saints having important roles in Bul-

garian history between X and XIV centuries. These are Kliment Ohridski (27.07). St. Petka Tarnovska (14.10), St. Demetrius (26.10), St. Clement from Rome (25.11), St. Forty Martyrs of Sevastiya (09.03), St. Gabriel Lesnovski (15.01), St. Joachim Osogovski (16.08). Second group includes saint who are relatively unknown for the regular ESS user, meaning that these are specialized searches. These saint are: St. Theodore Tyron (17:02), St. Marina 17.07), St. Gregory the Great (12:03), St. Alexei Man of God (17:03), St. Martin of Tours (11:11), St. Alexander Roman (13.05), St. Glikeriya (17.10). These two groups show that specialized searches in ESS DL is growing up, and the DL satisfies the requirements of erudite.

BIDL:

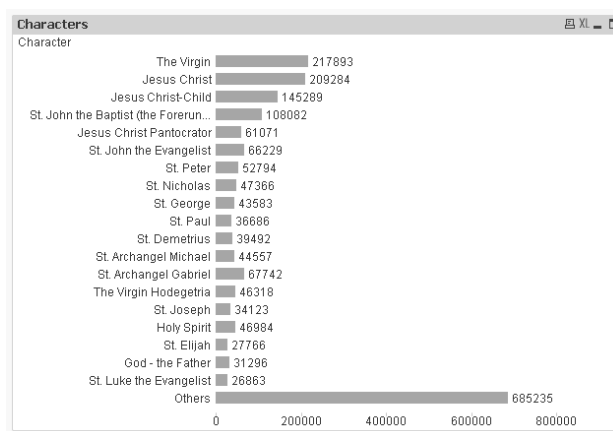


Fig. 9. Most searched saints in BIDL

ESS:

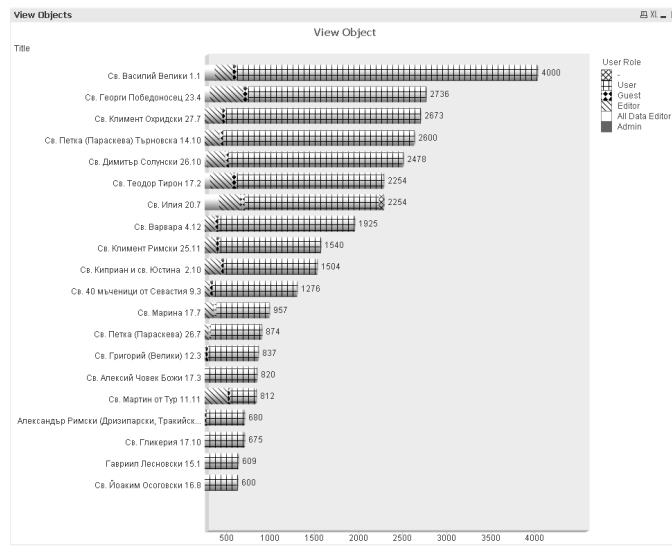


Fig. 10. Most searched saints in ESS

7. What to learn about the integration between BIDL and ESS?

Figure 11 shows highly specialized search in ESS, referencing BIDL. Two groups of saints are searched. The first one consists of the most famous and most frequently searched saints in Orthodox: St. Elias (20.07), St. George (23.04), Assumption of St. Mary (15.08), and St. Mina (11.11). The second one, having a smaller search frequency, shows specialized search. It takes about 20% of all DL searches: St. Theodore Tyron (17:02), St. Methodius Archbishop, Moravian (06.04), Consecration Temple St. Mary in Vlaherna (31.07).

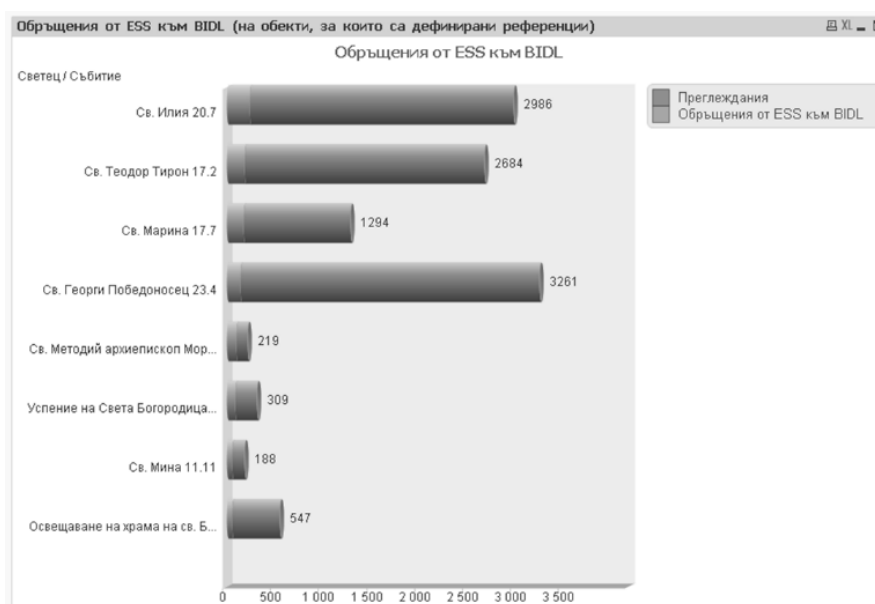


Fig. 11. User references from ESS to BIDL

8. How to adapt end user interface (also, the interoperability layer) between ESS and BIDL, so it became more user friendly, accessible knowledge platform, leading to enhanced learning experience.

Easy and intuitive searching and browsing of content is very important for every DL. But content presentation is one of the most important points for the end users. Thus we are concentrating our activities for improving content presentation. Web technologies like HTML5 and CSS3 allow to make interactive 3D content browsing and presenting. New ways for navigation are in place. WebGL technology will allow us to present real 3D objects, 3D environments of DLs. Switching from 2D to 3D will give our users the great opportunity for discovering information the best way ever.

3 User and Functional Interoperability

Extending interoperability with users' integration and functional integration is another point for improving user experience. Functional and users' interoperability between the two digital libraries will also lead to more statistical information, which is important for acknowledgement of different statements regarding respective domains and user experience over these domains.

There are several common ways and standards for implementing user interoperability. One of the most popular standards that we are going to implement in our digital libraries is called OAuth 2. OAuth 2 is token based authentication mechanism. It is simple and at the same time it guarantees secure authentication and authorization for end users. Its implementation is based on HTTP services. The main concept is to allow user to log in to one application/ website/ mobile app using the credentials from another. This mechanism is used and provided by companies like Google, Microsoft, Facebook, and can be implemented, consumed, or provided by any system. So we have two main options for this implementations. First one is to build both our digital libraries as OAuth consumers and to use, for example, Google as OAuth provider. Thus any user having Google account can log in to our DLs and will be authorized as a standard user (until an administrator decides to change their role.) Every user will have its own profile with respective settings. The second options for implementing the OAuth user interoperability is to create own user repository and own OAuth provider. So, any user registered in one of the DLs will have a standard user access to the other DLs. There will be a common profile for all of the DLs.

Functional integration is more complex topic, because every domain has its own diversities. That's why it is hard to use a common standard. But from user's perspective, there is a way to generalize the activities they do. For example, activities like searching, browsing, viewing, and so on. So, from this point of view a way for implementing functional interoperability is to create a common platform (or extend the current one), where one function requested by user, will be executed on both DLs and the result will be merged into the platform's front end. This approach we are going to implement, extending our current content integration solution.

4 Conclusions

The analysis of interoperability usability discussed in this paper revealed new directions of functionality improvement and extension in the two libraries, as well as an extended research of user' behavior and needs.

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