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CONNECTING GEOGRAPHY, CHRONOLOGY, AND BIOGRAPHIES – FRAMING NEW LITHUANIAN STANDARDS

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Origins of standardisation can be traced back to the states' building processes, when measurements units, measures and calendar were unified (see Szymański 2008). However, the most significant boom of standardisation is related to the development of the industrial society, global trade and economy and, in particular, to the establishment of assembly line production, when all complex mechanism were started to be mounted from separate units created in plants of different countries. In the modern world standardisation, which has been a sphere of exclusively practical activity for a very long period of time, slowly becomes an independent branch of science. Nevertheless, despite those, seemingly, positive developments, nowadays standardisation experiences a crisis. Transition to network digital technologies that started at the end of the 20th c. as well as formation of the network society (Castels 2006) pose challenges to standardisation, as increasing variety of methods of activities as well as high speed of processes allow 'non-compliance with standards' and 'obsolescence of standards'. Actually, many new fields of activity, which are very dynamic and difficult to standardize, come to existence. These two contexts – standardisation as science and standardisation developments in the network society – create a space where researches into digitalization processes of applied nature may be developed. The applied researches arise out of problems that are faced with in digitalization activities of practical nature. Their aim – to create open, dynamic standards adjusted to digital information systems.

The object of this paper is an integral model of historical geographical, chronological and biographical data intended for digital information systems. In 2010–2011 a universal, standardized, ontological model was created which could help to identify and describe geographical, chronological and biographical characteristics of cultural heritage object and of the scientific data of cultural heritage. From the point of view of cultural heritage and information systems of humanities, this model is a precondition for developing a knowledge base; the knowledge base must ensure integrity between the systems and the data of cultural heritage within the systems as well as external interoperability between different cultural heritage information systems and information systems of the data of humanities. From the point of view of the user of information systems, it is a tool, which allows multi-component, associative and semantic search by operating historical geographical, chronological and biographical knowledge accumulated in the system.

This idea originates from publications and practical activities of the authors of this paper in the project of Information system for Lithuanian studies 'Aruodai' in 2003–2006 (Laužikas 2005; Vaitkevičius 2005; 2007). The presented ontological scheme was created during the implementation of 'Development of the Virtual Electronic Heritage System', a project of M. Mažvydas National Library of Lithuania and its partners. When developing this model, the semantic and the open world approaches to the existence of reality objects and their transference to the digital surrounding were applied. International standard ISO 21127:2006 'Information and documentation – A reference ontology for the interchange of cultural heritage information' (corresponds with 'The CIDOC Conceptual Reference Model' (CIDOC-CRM)) methodology was followed, thus, modelling principles as well as a structure of the description are similar to the structure of the above-mentioned standard.

An idea to develop a standardised model of historical geographical, chronological and biographical data was encouraged by practical problems faced with when performing digitalization of the data of cultural heritage in Lithuania. Development of the national standard and its introduction within information systems of the data of cultural heritage and science should help to solve several problems, as follows:

Low level of structuring and standardisation of the data of cultural heritage and humanities

Structuring of the data, standardisation of the systems and exchanges among data of the systems are one of the most important problems of the digitalization process. Complexity of the digitalization of heritage is caused by huge variety of objects (archival hand-written and printed documents, books, exhibits of museums, immovable cultural heritage properties, architectural and archaeological monuments, photographs, audio records, films). In humanities the problems are caused by prevailing qualitative data. Digitalization is a method of transferring the reality objects into an information system with the help of paradigms. On the basis of a theoretical assumption that all elements of paradigm must have a common characteristic that determines their belonging to the paradigm (Fiske

1998), we also have to look for it for the data of cultural heritage and humanities. From this point of view, space, time and personalities are probably those elements (common characteristic) that link the heritage objects the most. After all, every heritage object (the majority of the data of humanities) has a certain place from the point of view of time and space and, usually, connects with one or several personalities of groups of persons.

Insufficient interoperability among the information systems of the data of cultural heritage and of the scientific data of humanities

Interoperability of the data, according to that every information system, institution or sector maintains its independences, but the information they create on the basis of network communications successfully interoperate in the virtual space (up to a semantic interoperability level inclusively), is very important in the digitalization activities. Such approach treats the standardisation activities as a search for 'common denominators', a mean to increase interoperability among information created by different institutions and sectors. However, in Lithuania as well as in many other European countries memory institutions that preserve cultural heritage and humanities institutions that research it belong to different sectors. The Ministry of Education and Science supervise Lithuanian science institutions and their infrastructures, whereas the Ministry of Culture supervises memory institutions and information infrastructures of heritage. A similar situation is also seen at European level, where infrastructures of the data of humanities are represented by DARIAH, whereas heritage – by Europeana. As a result of different traditions and aims of activities of the sectors the search for 'common denominators' is a difficult process and historical space, time, personalities or their groups may potentially become those common denominators that increase interoperability of the sectors' infrastructures.

Problems related to provision of the data of historical geography within the information systems

The majority of the information systems of heritage and humanities use modern geographical data; however, any larger digitalization project inevitably leads to historical geography. Problems occur when we realize that Lithuanian history has witnessed frequent changes in administrative division (at least 6–8 reforms of territorial-administrative division took place in the 20th c. alone); changes in the limits (borderlines) of the territory of the state itself and administrative subordination (for instance, at different times during the 20th c. Vilnius belonged to the Russian Empire, the German Empire, Bolshevist Lithuania, the inter-war Republic of Lithuania, the Republic of Poland, LSSR, the Nazi German, USSR and the Republic of Lithuania); changes in place-names – Lithuanian place-names were written in various languages and in various writing systems (for instance, in Lithuanian, Russian, Polish and German) as well as in various forms. Relatively late Lithuanian written and cartographic tradition aggravate the situation of Lithuanian historical geography. The majority of detailed maps were printed in the late 19th c., whereas Lithuanian cultural heritage covers a long time period from the 11th millennium BC up to nowadays. Precise localization of some historical place-names is not possible at all (all we can do is to relate them to the old parishes and administrative units in general). Alongside to these problems the modern ones should be emphasized: multilingualism (writing Lithuanian place-names in foreign languages), other writing systems (for instance writing Lithuanian place-names in Cyrillic alphabet) and dialecticism (writing place-names in authentic dialectal forms). From the point view of historical researches the following points are important: identification of religious and secular territorial units formed during historical administrative divisions and changes in the territory of the state, interconnections and links with historical and current place-names; interconnection and chronological links among historical, extinct, written in other languages (Lithuanian, Russian, Latin, Polish, German, and English) and in various forms place-names and personal names; spatial localization of historical extinct and survived place-names and the old maps as well as their linking to current place-names and a geographical coordinate system.

Problems related to provision of the data of historical chronology within the information systems

Lithuanian historical chronology problems are closely related to general scientific problems of humanities that generally explore cultural heritage. First of all, these are different chronological schemes applied by different specialists in different institutions (compare a historical periodization used in Soviet Lithuania and nowadays). The situation is aggravated by the lack of sources, imprecise periodization and complex links between Lithuanian historical chronology and regional and Europe-wide chronological contexts (compare periodization of the Middle Ages in the Western Europe and Lithuania). Different methods of recording dates and time reading were used throughout the history of Lithuania (starting from the creation of the world – Byzantine tradition, from the birth of Jesus – Catholic tradition). Moreover, quite often historical dating is like an interpretation related to a general problem of historical research as separation of a scientist's authorial creation, a fact and an opinion. In this respect, not only identification of the date, but also the applied dating methods, which allow checking credibility of the date, are very important. For example, in archaeology we can date objects according to data of written sources,

stratigraphy, typology and coins or with the help of methods of physical sciences or hypothetically on the basis of our suspicion.

Problems related to provision of the data of historical biographistics within the information systems

The biggest problem in historical biographistics is that there are different variations of names and pseudonyms of the same persons (e.g. Motiejus Valančius is also known as Valančiauskas, Volončauskis, Volončevskis). Lithuanian personal names are written in Lithuanian, Russian, Latin, Polish and German in various forms (e.g., Radvila/ Radziwill/ Радзивилл). The situation of Lithuanian historical biographistics, just like in the case of historical geography, is aggravated by late Lithuanian written tradition as well as a

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A problem of a fact and an opinion in heritage research

A problem of separating a fact and an opinion, which has been already mentioned when analyzing the problems of historical chronology, is very important in historical heritage research. In the process of digitalization of heritage, first of all, it is necessary to address challenges that are caused by general uncertainty and inaccuracy of Lithuanian historical terminology (compare the following names of one archaeological period: the Brass Age, the Bronze Age and the Early Metal Period). Often, confusion of definitions, generalizations, features and interpretations (for example, a problem of establishment of towns which is related to different interpretation of a conception of a town), impact of personal interpretations (often very different) of famous researches from the past on historiography, uncertainty of historical processes or their definiteness merely in time and space (e.g., there are disputes regarding the date of the establishment of the State of Lithuania) wait for solutions. The lack of cooperation among institutions and specialist in standardisation of terminology has the significant influence on the problems of such kind. When developing an integral model of historical geographical, chronological and biographical data, a problem of separating a fact and an opinion was addressed in the context of international standard ISO 21127:2006; it has been suggested to develop subsystems of the information system that reflect different, authorized opinions of specialists on issues of dating, terminology, factology, authorship of works, etc.

A problem of three levels of documents in cultural heritage digitalization processes

When talking about information of cultural heritage and its standardisation, we must separate three levels of documents: an authentic object, fixations of an authentic object of various periods and digital documents formed on the basis of the fixations. All of them are independent evolving systems that correlate with each other only semantically. Hence, we must reflect the data of both an object (a monument) itself and its analogous or digital fixations (archival material) in the information system. Archival material is fixations of a monument (authentic heritage object) of various periods: pictures, drawings, photographs, 3D images, etc. Hence, in each case standardisation approach has to be modified and must relate to the nature of a document as a cultural heritage object, because a document of each level is defined by different data sets (Table 1).

Dublin core element	**'Real' archaeological object (1st level document)**	**Fixation (2nd level document)**	**Digitized document (3rd level document)**
Title	The Memel/ Klaipėda castle	The photography of Memel castle	The digitized photography of Memel/ Klaipėda castle
Creator	Unknown	Klaus Holbach	Jonas Petraitis
Date (creation)	1252	1912	2009
Format (material)	Bricks, lime's mortar	Photo paper	Digital file, TIFF
Format (technique)	Building	Photography	Scan
Format (size)	500 square metre	10 X 15 centimetre	600 dpi, 10 X 15 centimetre
Coverage (place)	Memel, State of Teutonic order, Europe	Memel, German Empire, Europe	Klaipėda, Lithuanian Republic, Europe

Table 1: *Separation of metadata of three levels of documents (the provided metadata is invented).*

When we store a document within the information system, actually, we store the third level document. However, if we store the data and metadata only of this document within the information system, it will not be a good solution. It means, that it is necessary to find a possibility also to store the data and metadata of the first level (monument) and the second level (if necessary), however, not to mix them up in no case. This is also important when exporting data from one system into another, performing a general search in several systems, preparing mapping rules for and crosswalks of the metadata and data. It is essential to maintain semantic crosswalks among all three levels of documents but not to mix their data and metadata up.

Limited possibilities to apply historical chronological, place-names and biographical data systems of other countries in Lithuania

Basically, in Lithuania we cannot appeal to the data of thesauri of geography, personal names and chronology of other countries, as heritage and historical research are overly local phenomena. In other countries works in this field are also carried out, basically, at national level. A theoretical digitalization base and practical models are developed in every country. Standards are closely related to cultural heritage of the particular country (periodization, terminology, cultural dependence, etc.), an existing legal framework which regulates research, heritage protection and activities of memory institutions in that country, the country's economical capacities on which material facilities depend as well as to long-lived traditions of practical activities in each of the mentioned fields of science, heritage protection, memory institutions and digitalization. In these aspects the situation in Lithuania is very different from the situation in the countries that are in a leading position in the field of digitalization of cultural heritage: United Kingdom, USA, Canada, Australia and France. Application of digitalization achievements of the mentioned countries is possible in a technological level, but we must address organizational issues of the information systems and create models and standards ourselves. Furthermore, we can find only the most important Lithuanian place-names and personal names in foreign thesauri of place-names and personal names (e.g. TGN or ULAN), whereas smaller place-names, toponymies and personal names of national or regional level are not included. In the mentioned and other thesauri Lithuanian place-names forms are not linked to the time and administrative subordination; generally, geographical coordinates of their points rather than their territory (polygon) are indicated and quite often incorrect historical data is provided (e.g., the name of Vilnius was first mentioned not in 1128 as TGN states but in 1323). As regards digitalization of Lithuanian cultural heritage, foreign indexes of proper names (TGN, ULAN) suit perfectly for defining geographical and personal links of Lithuanian cultural heritage with places and persons localized outside the territory of Lithuania (a fair part of Lithuanian movable heritage valuables was created abroad or brought by artists who came from abroad, Lithuanian cultural activists also often travelled to other countries, etc.).

A Situation in the Information Systems of Lithuanian Cultural Heritage and Humanities

In order to identify a situation in standardization and presentation of historical geography, personal names and chronology within the information systems of the data of cultural heritage and humanities that are under development in Lithuania, a list of such systems was drawn up; developers of the systems were questioned and a situation in presenting historical geography, personal names and chronology within the largest, the most developed information systems was analyzed.

The majority of the systems (see Annex A) use all possible date formats: dates are written by indicating a century, a year, a month or a precise day in Roman or Arabic numerals. Also names of historical periods are used (e.g. the Middle Ages). It should be noted that all systems developed in library surroundings: the database on archival funds of organizations and persons of Lithuanian-in-exile, ALEPH, the academic e-library of Lithuania (eLABa) and ePaveldas use LIBIS database on authoritative records of M. Mažvydas National Library of Lithuania. Lithuanian database on pseudonyms just like LIBIS database on authoritative records is developed in accordance with the same UNIMARC standard. Developers of LIMIS system have started making lists of place-names and personal names, however, they are ready to wait for 'General thesaurus of personal names, place-names and historical geography' (BAVIC) based on the model presented in the paper and are inclined to use it. Lithuanian Central State Archive develops a small independent database on historical place-names and personal names for departmental use.

During the analysis of the situation, the most important information systems of Lithuanian cultural heritage and scientific data from the point of view of historical geography, place-names and personal names were selected. These are the database on authoritative records of M. Mažvydas National Library of Lithuania, Lithuanistic Heritage Information System 'Aruodai', Database on Place-Names of Institute of the Lithuanian Language and the Register of Cultural Heritage. Tendencies of presenting historical geography, chronology and personal names within these

systems were analyzed. The aim was to identify how the systems *de facto* address above-mentioned issues related to the use of historical geographical, chronological and biographical data.

Database covering authoritative records of M. Mažvydas National Library of Lithuania does apply UNIMARC for descriptive records; its level of structuring and standardisation of geographical, biographical and chronological data is very high. The same database as well as Information System 'Aruodai' use methods which guarantee the high level of interoperability.

IS 'Aruodai' and Database on Place-Names of Institute of the Lithuanian Language are the only systems partly presenting the historical division of Lithuania into the administrative units, changes among the place-names, dialectic transcriptions of place-names, possessing crosswalks between geographical data and maps.

Database on authoritative records of M. Mažvydas National Library of Lithuania and IS 'Aruodai' present collections of historical personal names. Both systems deal with modern and historical forms of the personal names, its dialectic forms, synonyms of other character as well as pseudonyms.

An Integrated Model of Provision of Historical Geographical, Chronological and Biographical Data

When developing the integrated model of provision of historical geographical, chronological and biographical data, CIDOC-CRM structure and methodology were followed. The data elements are marked with capital letters 'DE', numbered and named as nouns; properties are marked with capital letter 'S', numbered and named as verbs. There are some numbers missing in sequences of numbering the data elements and the properties. This was done on purpose. Those numbers that during the model development process were given to the data elements or their properties, which later were deleted, are not used repeatedly. Unlike the majority CIDOC-CRM properties, the properties of Lithuanian model are asymmetrical. Symmetry of a property means that a connection is the same in both directions: from a category towards a field and from a field towards a category. As regards CIDOC-CRM, generally, it is a matter of an agreement, which class is selected as a Field and which is selected as a Category. Meanwhile, from the point of view of a specific property, a place of data element as a Category or as a Field is fixed (non-conventional) in Lithuanian model. In the thesaurus model it is indicated which data element is a Field (analogue of a grammatical subject) and which one is a Category (analogue of a grammatical object) and how these data elements are connected by a specific property (analogue of a grammatical predicate). This is determined by an applied purpose (less ontological) of the model.

In Lithuanian model both the data elements and their properties are presented in accordance with the same structure: a list of the data elements/ the properties, hierarchy, descriptions. The lists of the data elements and their properties, basically, repeat the same information which is provided in the descriptions, but the lists were chosen for the sake of convenience: the list shows all the data elements and their properties in ascending numbering order as well as their crosswalks with CIDOC-CRM classes and properties. Hierarchies of the data elements and their properties are auxiliary means of understanding and navigation. Meanwhile, the whole detailed information about the data elements and their properties is provided in their definitions in Annexes B and C.

When describing data elements, the following description structure is used in the model: a name of the data element; extensions of the data element (partial data elements); attributes of the data element; a semantic description of the data element; examples of the data element; rules of supplementing the data element; data element corresponding to ISO 21127 (CIDOC CRM) class; character of data element correspondence to ISO 21127 (CIDOC CRM) class; notes regarding correspondence of the data element with ISO 21127 (CIDOC CRM) class; properties of the data element (properties are described according to a unified scheme – S + a number of the properties + a name of the property : DE + a number of the data element (as a category) + a name of the data element)

While describing properties, the following description structure is used in the model: a name of the property; extensions of the property (partial properties); the property's application domain; the property's application category; relation character of combined data elements; a semantic description of the property; examples; application of the property (presented according to a unified scheme – DE + a number of the data element (as a field) + a name of the data element – "Contents of the data element" : S + a number of the property + a name of the property : DE + a number of the data element (as a category) + a name of the data element – "Contents of the data element"); property corresponding to ISO 21127 (CIDOC CRM) property; character of property corresponding to ISO 21127 (CIDOC CRM) property; notices regarding the property's correspondence with ISO 21127 (CIDOC CRM) properties.

It is foreseen to implement the model in several stages. During the first stage, 'General Thesaurus of Personal Names, Place-Names and Historical Geography' (BAVIC) which is based on the model and which will

function as an information subsystem of 'Integral Virtual Information System of Heritage' (ePaveldas) has to be developed in the course of 'Development of the Virtual Electronic Heritage System (VEPS)', a project of M. Mažvydas National Library of Lithuania and its partners. During further stages, the Technical Committee No. 47 (Information and documentation) of Lithuanian Standards Board should legitimise the model as a national standard for describing historical geographical, chronological and biographical data in the information systems of cultural heritage and humanities. Standardization of the model is stipulated in 'Strategy on Digitalization of Lithuanian Cultural Heritage, Digital Content Preservation and Access' approved in 2009.

Conclusions

During the initial analysis of national information systems lack of interoperability and standardization of historical geographical, biographical and chronological data was identified, the most important problems were named. The model of provision of historical geographical, chronological and biographical data within the information systems is aimed at establishing a high level of interoperability among the systems.

BAVIC thesaurus developed on the basis of the model will function as a knowledge base and a mechanism of semantic interoperability of the data through geography, place-names and chronology. The thesaurus is developed as a future Lithuanian standard; all information systems facing national cultural heritage as well as scientific data will have to be connected.

Geographical, chronological data and data on personalities currently stored in the information systems will have to be transferred into above-mentioned thesaurus. While transferring Database on authoritative records of M. Mažvydas National Library of Lithuania into this thesaurus, subject data will have to be separated from geographical and chronological data as well as from the data on personalities. A separate subject thesaurus for subject data will be created in the future (in course of other projects).

The development of BAVIC thesaurus – a constant process – follows the open world principle. The open world is perceived as an assumption that information stored in an information system is not finite comparing to the entirety of the world that the system seeks to describe.

In the future a GIS part of the thesaurus and crosswalks with interactive maps are to be designed and the prospect of geoanalytical, chronoanalytical and bioanalytical modules of the thesaurus are to be analyzed. Analytical modules would allow application of methods of mathematical statistics, content analysis and GIS in BAVIC thesaurus developed on the basis of the model as well as in IS for the stored data related the thesaurus.

The thesaurus has to be easily compatible with ISO 21127 (CIDOC CRM), other international standards and the most important schemes of metadata (UNIMARC, Dublin Core, METIS, VRA) as well as with TGN and ULAN systems.

References

CASTELLS M., 2006. Tapatumo galia. [The Lithuanian edition of *The Power of Identity (The Information Age: Economy, Society and Culture, Volume II)*.] Kaunas: Poligrafija ir informatika.

FISKE J., 1998. Įvadas į komunikacijos studijas. [The Lithuanian edition of *Introduction to Communication Studies.*] Vilnius: Baltos lankos.

LAUŽIKAS R., 2005. Digitization of cultural heritage: model of an integral, three-dimensional spatio-temporal thesaurus, *Archeologia e Calcolatori*. T. 16. Firenze, p. 93-112.

SZYMAŃSKI J., 2008. *Nauki pomocnicze historii*. Warszawa: Wydawnictwo Naukowe PWN.

VAITKEVIČIUS V., 2005. Lietuvos archeologijos tezauro projektas, *Lietuvos archeologija*, T. 28. Vilnius, p. 231-236.

VAITKEVIČIUS V., 2007. Lietuvos archeologija Lituanistikos paveldo informacinės sistemos „Aruodai" perspektyvoje. In: *Archeologiniai tyrinėjimai Lietuvoje 2006 metais*. Vilnius, p. 28-33.

Annex A:
List of the databases and (or) information systems

Institutions	**Information infrastructure that would be connected to a network**
Lithuanian museums	Information System 'ePaveldas' (eHeritage)
Lithuanian libraries	
Lithuanian archives	
Lithuanian museums	LIMIS (Lithuanian Integral Museum Information System)
Lithuanian libraries	LIBIS (Lithuanian Integral Libraries Information System)
Lithuanian archives	Information system of storage of electronic documents in Lithuanian State archives
Department of Cultural Heritage	The Register of Cultural Heritage
Vilnius University Faculty of Communication	BARIS (Information System of Churches Archives)
	Virtual historical Grand Duchy of Lithuania
Institute of Lithuanian Literature and Folklore	Information system for Lithuanian studies 'Aruodai'
Institute of Lithuanian History	Information system for Lithuanian studies 'Aruodai', DB of Lithuanian Metrics, DB of ethnographic descriptions, DB of archaeological researches
Vytautas Magnus university Faculty of Humanities	Ethnographic descriptions and modern folklore resources
Klaipėda university, Library, and Center of Musicology of Faculty of Arts	DB of Lithuanian Diaspora organizations and individuals collections
Vytautas Magnus University Center for Diaspora Studies, Library	DB of Lithuanian Diaspora organizations and individuals collections
Šiauliai university Faculty of Humanities	DB of Joniškis district place names
Lithuanian Music and Theater academy, Institute of Musicology	DB of folklore
Vilnius university Gender study center	Women biographies DB
Vilnius university Faculty of History	Archaeological resources DB
Kaunas University of Technology Faculty of Civil Engineering and Architecture	DB of Lithuanian dendrochronological collections and landscapes; culturological evaluations of Lithuanian villages
Kaunas University of Technology Architecture and Engineering Institute	Lithuanian architectural history and iconographic research archive
Institute of Culture, Philosophy and Arts research	Ecclesiastical art heritage resources

Annex B:
List of the data elements within the BAVIC (General Thesaurus of Personal Names, Place-Names and Historical Geography) model

BAVIC data element	CIDOC-CRM equivalent
DE1 Administrative area name	E44 Place Appellation
DE2 Administrative locality name	E48 Place Name
DE3 Type name of administrative locality	E55 Type
DE4 Type name of administrative area	E55 Type
DE5 Type level of administrative area	E55 Type
DE6 Type character of administrative area	E55 Type
DE11 Mentioning of object name in sources	E5 Event
DE12 Event date	E50 Date
DE13 Address	E45 Address
DE14 Historical data of object	E62 String
DE15 Object description	E62 String
DE16 Name of the object source	E62 String
DE17 Bibliography name of object	E62 String
DE18 Language	E56 Language
DE19 Script system	E55 Type
DE20 Native language of person	E74 Group
DE21 Nationality of person	E56 Language
DE22 Profession of person	E55 Type
DE23 Name of person	E21 Person
DE24 Pseudonym of person	E33 Linguistic Object
DE25 Author	E21 Person
DE26 Date of starting point	E5 Event
DE27 Determination method of date	E55 Type
DE28 Name of group	E74 Group
DE29 Type of group‘s link with other groups	E55 Type
DE30 Type of group	E55 Type
DE31 Type of calendar	E55 Type
DE32 Accentuation number of name	E42 Object Identifier
DE33 Contact details	E51 Contact Point
DE34 Name of locality during coverage period	E48 Place Name
DE35 Type of period	E55 Type
DE36 Name of period	E4 Period
DE37 Name etymology	E62 String
DE38 Context of mentioning the name	E62 String
DE39 Name of topic	E62 String
DE40 Identifier	E42 Object Identifier

DE41 Name of country	E48 Place Name
DE42 Name of locality	E48 Place Name
DE43 Type of locality	E55 Type
DE44 Geographic coordinates of locality	E47 Spatial Coordinates
DE45 Point number of geographic coordinates of locality	E42 Object Identifier
DE46 Measurement type of geographical coordinates of locality	E55 Type
DE47 Measurement device of geographic coordinates of locality	E55 Type
DE48 Measurement unit of geographic coordinates of locality	E58 Measurement Unit
DE49 Type of geographic coordinates of locality	E55 Type
DE50 Locality link to the map	E42 Object Identifier
DE51 Dialect	E56 Language
DE52 Alternative name	E33 Linguistic Object
DE53 Type of alternative name	E55 Type
DE54 Title of person	E75 Conceptual Object Appellation
DE55 Type of title of person	E55 Type
DE56 Position of person in dynasty list	E42 Object Identifier
DE57 Object	E1 CRM Entity
DE58 Gender of name	E55 Type
DE59 Singular/Plural name	E55 Type
DE60 Formation of name	E55 Type
DE61 Origin of name	E55 Type
DE62 Source of origin of name	E55 Type
DE63 Population of locality	E60 Number
DE64 Area of locality	E60 Number
DE65 Measurement unit	E58 Measurement Unit
DE66 Value of corresponding measurement unit	E60 Number
DE67 Gender of person	E74 Group
DE68 Primary value	E59 Primitive Value
DE69 Name of local system	E41 Appellation
DE70 Type of dating	E55 Type
DE71 Type of connections	E55 Type

Annex C:
List of the properties within the BAVIC (General Thesaurus of Personal Names, Place-Names and Historical Geography) model

BAVIC property	**CIDOC-CRM equivalent**
S2 refers to (is referred to by)	P67 refers to (is referred to by)
S3 is identified by (identifies) geographical coordinates	P87 is identified by (identifies)
S4 consists of (forms part of)	Place: P88 consists of (forms part of) Time: P9 consists of (forms part of)
S7 has type (is type of)	P2 has type (is type of)
S8 has alternative form	P139 has alternative form
S9 has language (is language of)	P72 has language (is language of)
S10 has script type (is script type of)	P2 has type (is type of)
S12 has dialect (is dialect of)	P72 has language (is language of)
S13 has context of mentioning in sources	P3 has note
S14 has accentuation	P48 has preferred identifier (is preferred identifier of)
S15 is beginning of existence	P92 brought into existence (was brought into existence by)
S16 is end of existence	P93 took out of existence (was taken out of existence by)
S17 has time-span (is time-span of)	P4 has time-span (is time-span of)
S18 has author	P105 right held by (has right on)
S19 has determination method	P2 has type (is type of)
S20 has starting point	P4 has time-span (is time-span of)
S21 took place at (witnessed)	P7 took place at (witnessed)
S22 has name	Place: P87 is identified by (identifies) Time: P78 is identified by (identifies) Person/group: P131 is identified by (identifies)
S23 has preferred identifier	P48 has preferred identifier
S24 brought into life (was born)	P98 brought into life (was born)
S25 was death of (died in)	P100 was death of (died in)
S26 has historical data	P3 has note
S27 has nationality	P107 has current or former member (is current or former member of)
S28 has native language	P107 has current or former member (is current or former member of)
S29 has profession	P2 has type (is type of)
S30 has description	P3 has note
S31 has contact point (provides access to)	P76 has contact point (provides access to)
S32 has address	P87 is identified by (identifies)
S36 is related with locality	---
S37 is related with time span	---
S38 is related with person	---
S39 is related with group	---

S40 is related with topic	---
S41 is mentioned in bibliography	P129 is about (is subject of)
S42 overlaps (in time) with	Place: P121 overlaps with Time: P118 overlaps in time with (is overlapped in time by)
S44 has etymology	P3 has note
S45 has identifier of measurement system	P48 has preferred identifier (is preferred identifier of)
S46 has character of measurement	P2 has type (is type of)
S47 has point number	P48 has preferred identifier (is preferred identifier of)
S48 has meter	P2 has type (is type of)
S49 has measurement unit	P91 has unit (is unit of)
S50 borders with	Place: P122 borders with Time: P119 meets in time with (is met in time by)
S51 has type of gender	P2 has type (is type of)
S52 is singular/plural	P2 has type (is type of)
S53 has formation	P2 has type (is type of)
S54 Has source of origin	P2 has type (is type of)
S55 has corresponding measurement unit	P91 has unit (is unit of)
S56 has value of corresponding measurement unit	P90 has value
S57 has gender	P107 has current or former member (is current or former member of)
S58 has primary value	P90 has value
S59 has local system identifier	P48 has preferred identifier
S60 has local system	P48 has preferred identifier