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# **Information Technology Strategy and Its Implementation in Museums**

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# Information Technology Strategy and Its Implementation in Museums

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## **Abstract**

The research is purposed to construct, and test in field a theoretical model of strategy of Information Technology (IT) development and implementation in a museum institution. Based on the materials of recent international museum informatics conferences, goals and functions of a museum institution, and theoretical works, the description, order, and microstructure of introducing of IT utilization ways is developed following Process Evaluation Review Technique / Critical Path Model, and process monitoring four-group determinants scheme. The theoretically synthesized model is successfully approved during the tests held in Ventpils Museum. It was found to explain satisfactory the processes of IT complex development, as well as identified several areas of advice to be given to the museum. Issue of memory institution consolidation is touched upon, and analysed both, in theoretical model set up, and in field tests. National museum industry overview with reference to Ventpils Museum position is given to support the analysis.

**Keywords:** Museum Informatics, Strategic Planning, Consolidation of Memory Institutions, Ventpils Museum

## 1. Introduction

Museums are normally non-profit organizations hardly ever granted any legislative power or bringing financial profit. That is why the strategic development of museums as of organizations usually falls out of scope from the business administration perspective academic researches. Although nearly a half of all titles published on museum management include a section on business management for museum workers, most of the works available describe fundamentals of business administration, such as SWOT analysis, and do not present any industry-oriented theories or models. Similarly, these publications *par excellence* deal with use of IT in museum; however, only few authors describe uses of IT other than museum collection database creation basics, while most of modern-day progress in Museum Informatics is reported on the regularly held professional conferences, organized by professional bodies, such as International Committee for Documentation of the International Council of Museums, or Electronic Imaging and Visual Arts, as well as presented in the 4<sup>th</sup>-6<sup>th</sup> Frameworks of the European Commission.

**Research question.** So far neither museum professionals, nor the literature available on strategic or IT management, give a description of the "ideal case" scenario for IT strategy development and implementation in museums, or other memory institutions. Therefore, the main intention of the thesis is to analyse the cases presented to the professional public on major IT-focused museography conferences in recent years, as well as the case study collections, and, based on them, to produce, and test *in vivo* the model of IT strategy development and implementation in a museum. The field studies will be run in two parts. First, the developed model will be tested itself in Ventspils Museum through on-site observations, interviews with responsible staff, and analysis of Ventspils Museum strategy. After validation of the model, the recommendations of how to solve the problems found through the model application will be produced. On the second stage of the fieldwork, the model will be used for more general description of the stage of IT development in the museum industry in Latvia to give an estimation of Ventspils Museum position in the industry.

## 2. Theoretical Analysis

### *A Museum*

Although the nature of the museum goes back to *chitrashalas*, or painting galleries, of ancient India, and temples and churches in Asia and Europe, the institutions we now call "museums" developed in Europe in the 17<sup>th</sup> century. First use of the word "museum", according to Ambrose and Paine (1995, 6), was fixed in 1682 when Elias Ashmole presented a collection of unusual things to the University of Oxford, putting the basis for one of the best university museums in the world, the Ashmolean Museum at the University of Oxford.

Theoretical definitions of the contemporary "museum" term given by different museology scholars, regulatory bodies, and professional associations vary describing structure of ownership, legislative status, or nature of collection; however, they all stay the same concerning the functions museums perform. One of the earliest theoretical museology scholars, George Brown Goode, in 1895 inspecting the basic principles of museum administration defined the "museum" as "an institution for the preservation of those objects which best illustrate the phenomena of nature and the works of man, and the utilization of these for the increase in knowledge and for the culture and enlightenment of the people" (Goode, 1895, 69). In our work we accept this definition because it fully reflects the functions mentioned and further developed by most of later definers, including those of the International Council of Museums, United Kingdom, and American Museum Associations, and UNESCO (Ellis Burcaw, 1997, 18-20).

### *Goals and Functions of a Museum*

Following the museum definition accepted, the museum functions might be classified into several goal-targeted groups of activities. These groups are important for understanding the ways of information use, which are the main issue of the IT strategy model development. Similarly to definition of museum term, the goal-targeted groups differ from one author to another.

The two approaches most significantly influenced our proposed division are those of Beer (1990), and Lord and Lord (1997, 4-5, and 1999, 46). Beer's typology identifies nine types of goals a museum performs. Providing much more detailed sight on the goal-targeted groups than most of other reviews do, the typology includes groups from different levels of goals hierarchy, and therefore, cannot be taken for granted without further discussion. Lord and

Lord analyse the specific functions allowing reaching some specific goals defined by the museum term definition.

In our work similarly to Lord and Lord we classify functions directed to reach the goals mentioned by Brown Goode – curatorial, social, and professional, – as well as a special-purpose administrative goal, mentioned as an interaction-causing goal by Lord and Lord. Three former groups of functions are composed of the major goals stated by all above-mentioned authors; however, the interpretation of several of them is slightly changed. The administration function stays separately providing smooth intercourse among the three mentioned functions, as well as carrying responsibility for typical business administration issues relevant for all businesses (organizational, financial, marketing, and others). Refer to definitions provided in Appendix I for detailed definition of the functions.

### *Stakeholders of a Museum*

Analysing groups interested in museum activities, most of museology authors do not mention bodies other than customers – people attending the exhibiting events. Books printed on museum management, such as Fopp (1997), Ambrose and Paine (1995), or Lord and Lord (1999), planning the museum strategy do not mention the "stakeholder" concept at all. Lord and Lord (1997, 93) recommend using "stakeholder perspective" for planning of exhibiting events; however, they offer no any typology for the stakeholders.

In this work we derive the museum stakeholders from definition, goals, and functions of museum. In order to determine the structure of stakeholders, we treat museum functional activities as services having two major interested parties: service supply side, and service demand side, and examine four slices of the socium with different level of involvedness, such as museum personnel, professionals, society, and state.

Stated generally, such groups as museum specialists, administrators, support staff, academic researchers, museums, memory institutions, industrial and regional clusters, public and business community, regulatory bodies, and the state, are considered the main museum stakeholders. More explicit structure of stakeholders is further described in Appendix II.

### *Uses of Information in a Museum*

Analysing the titles of the reports presented on the annual conferences of CIDOC/ADIT 2003, and annual conferences of Moscow section of EVA in 2001-2003, we have identified four basic types of how do museums utilize the IT. In our work we define them as documentation, visualisation, informatisation, and interrelation. Each of the first three units mentioned has sequence of steps, which are given in order of technological complexity, and

knowledge utilization increase illustrating continuous development from the individual bodies, processes, or environments to the composite, and, possibly, further, to cluster level for these basic units. The fourth, the interrelation unit, similarly consists of three sequent subunits; however, it differs from the other units as its stages are more loosely linked among themselves, and should not be seen as a direct technological complexity order. Therefore, we construct our analysis following three-plus-one scheme of uses. See Appendix I for additional explanation of the terminology used.

The **documentation** collects the IT used for dealing with nature of data, standards of description and cataloguing, and creation of higher complexity data sets. This unit formally does not require using a computer in its formation, while the outcome of the unit is to be either retroconverted, or entered directly into an electronic storage. Following the Orna and Pettitt (1998, 61), we have identified three major stages of this level as: **unstructured data**, **structured data** (Oz, 2002, 366) of strict, or soft kind depending on the nature of collection, and **interrelated data** corresponding to inventory cards, catalogue of inventory cards, and catalogue of interrelations between the card files in museum inventory proceeding respectively.

The scope of IT collected under **visualisation** unit of uses includes all non-textual digital means, such as pictures, light regimes, or sound tracks, by which a museum either achieves formation of an integrated picture of something in the attendee's mind, or uses as a support tool for realizing the curatorial functions. Analogically to the major steps in process of museum digitalisation – digital archive, digital museum, digital learning, and digital content industry (Tsai, 2003), we propose three stages of visualisation process to be **digital archive** of presentation, as well as of preservation (Geschke, 2001; Vilbrandt, 2003), identification (Zinkina et al, 2002), or shared (Royan, 2001) types, **digital exposition** of navigator, interpreter, sublimator, or informer types following classification of Bogomazova (2003), and **digital reality** of integrated<sup>1</sup>, or digital (Matveyev, 2003) environment types according to Beckhaus et al (2003).

**Informatisation** aspect of the IT uses covers the technical complexity of the software structure employed. Following Loshak (2003), we define three stages of this use as **collection**

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<sup>1</sup> In our classification we treat the digital display and exhibit level exhibiting events as a part of digital exposition stage, while digital exhibitions are considered a part of digital reality (Dean, 1998, 3). Therefore, the extender type digital exhibit/exposition referred by Bogomazova (2003) is seen as a digital part of integrated environment type of digital reality.



**database** with typology, and object<sup>2</sup> focuses<sup>3</sup> (Jordan, 2001, 242) depending on the needs of collection typologisation, **several functional packages**, such as curatorial<sup>4</sup>, presentation, administrative, inter-industry, and research software based on Drikker description (2002), and **integrated information system**, which is a homogeneous system, and might not be classified further (Burer, 2003).

Networking types of information use are gathered under **interrelation** unit. This includes both, entirely technical issues, and clustering issues. Based on Oz (2002, 254), we separate three stages of interrelation uses: **internal network** of resource, and information sharing purpose (Fitzgerald and Denis 1996, 246-247), **unstructured global network**, with museum-to-public, and museum-to-professional communication types (Dremailov, 2003), and **clustered global network** of professional (Ambrose, 1999), intra-industry regional, and region-based inter-industry (Campanini, 1999) clusters. As it was noted above, these stages are given in order of their technical complexity, which, however, might differ from the chronological order.

### ***IT Strategy in a Museum***

Employing the concepts defined in previous sections, it is possible to represent connection between the functions of museum, and the ways these functions are realized by the following scheme. The three-plus-one goal-targeted functions of museums affect each other following to all-to-all principle. All four functions employ information composing the museum information environment in four basic ways (see Fig.1, page 6).

Because all three stages of development for each of four basic units show sequent increase in knowledge utilization, as well as there are definite inter-functional connections among subunits, the chronological positioning of the subunits of four basic units present the goal-targeted sequence of development, or, a strategic model for IT implementation in museum.

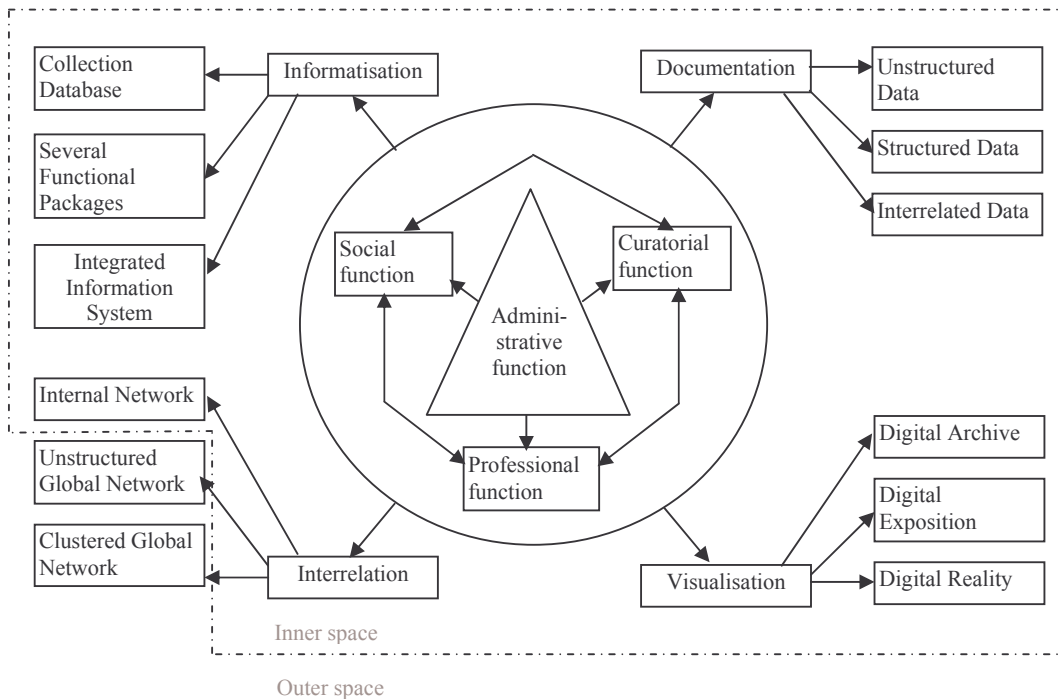
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<sup>2</sup> Technical abstract for the database of both types is given, among others, by Date (1998), or Hansen and Hansen (1999)

<sup>3</sup> Overlap of both focuses is realized through creation of knowledge database (Hansen and Hansen, 1999, 556)

<sup>4</sup> In our research we assume this package to be the first priority package, which developed further from the collection database stage (Koscheeva, 2003; Ponomarenko et al, 2003)

Figure 1  
Museum Goal-Targeted Functions and Ways of Information Use



### Model Design

The positioning of subunits in chronological scale relative to other subunits will take place in two steps. First, the hypothetical PERT/CPM network type (Evans, 1993, 622) model will be formulated based on rational analysis of the technical conditions necessary for transition to the next stage of the development, as suggested by Evans (1990, 180). The PERT/CPM model will be examined further by analysing each of the transitions between any subunits following the uniformed description system presenting the arguments used in rational analysis, and referred to a real case that took place in actual museum, and was presented to the professional public. The proposed sequence should not be seen as the only way of IT complex development; however, following rational analysis, and case studies, it represents the optimal route of doing this.

**Chronology.** There are several reasons to employ relative chronology measure in the model.

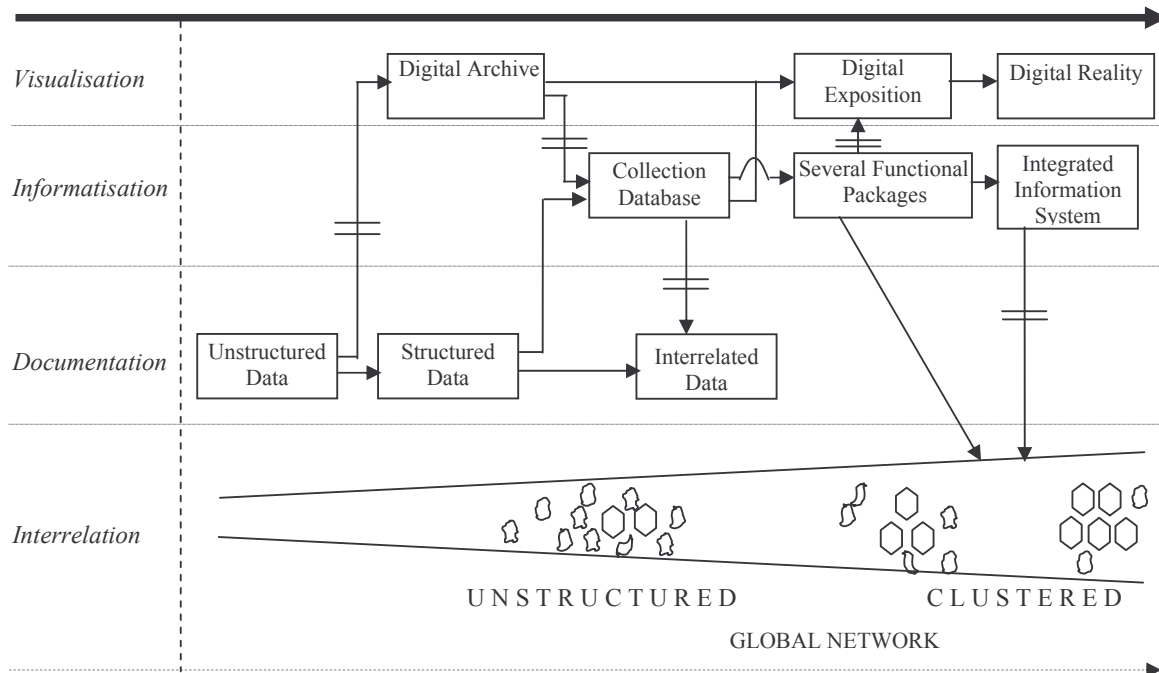
First, the axe direction illustrates several dimensions of development, which are of different nature. Thus, the subunits of each basic module of uses are placed along the same horizontal axe expressing the technological development direction left-to-right. Besides, subunits of each unit in increasing order assume higher degree of information usability,

starting from information flow in the stage associated with unstructured data, digital archive, collection database, and internal and unstructured global network, and leading to knowledge transmission in the latest stages associated with digital reality, interrelated data, integrated information system, and global clustered network. This stays in good agreement with trend of information institutions development from the information society to the knowledge society (Smith, 2001). Therefore, besides the technological direction, the chronological axe also represents the society informatisation level, oriented from the information to knowledge society.

Second, financial and qualified working power availability issues are not analysed in the model. Nevertheless, it is evident that these factors are of crucial importance for rate of launching the IT system. Therefore, in framework of this model, these, as well as other similar factors, are to be seen as a part of the chronology measure. Since all ways of information utilization are found in case studies on real museum situations, and financial profit is not mentioned among the characteristics of museum in commonly accepted definitions, we do not doubt realisticity and merits museums receive from introducing these technologies.

**The Model.** Following the analysis of functions, we propose the following sequence of the transitions (see Fig.2).

Figure 2  
PERT/CPM Network Type Model of IT Strategy Implementation in Museum



The arcs joining the sub-modules show the transitions. Following the Service Design Scheme (Evans, 1990, 180), we define transitions as stages to add in order to facilitate the process, which are expressed in a way of two different kinds of arcs on the PERT/CPM diagram.

Unconditional transitions are the transition compulsory to be completed to continue the development further from the targeted sub-module; these transitions are illustrated with ordinary arcs. Conditional transitions represent the transitions that might be only particularly completed to maintain the development further from the targeted sub-module; however, particular completion of a conditional transition substantially lowers the capacity of every further transition following the targeted sub-module. We do not define any quantitative measures for conditional transition completion; qualitative measurement might be done in bottleneck analysis, which will be described further. Besides abovementioned, joining arcs having several lines merged into one injection mean that all the processes denoted by initialising sub-modules must be completed for completion of the transition, and semi-circles located on the interception of two arcs represent the crossing arrows that do not merge.

**Assumptions.** The major assumptions beyond the model are:

- Internal computer network stage of Interrelation module is ensured for all computers of the museum with bandwidth enough for all museum's needs, such as launch of digital profiles of exposition events or digital reality;
- Standard IBM type computers of satisfactory technical characteristics are accessible in museum in reasonable amount;
- Museum has worked out a general strategy for further development.

### *Theoretical Examination*

**Methodology.** The description system proposed for the theoretical analysis of transitions is derived from the general approach used in description of processes (Evans, 1993, 622). The system separates a description into three parts: process definition, resource planning, and project control. The fourth necessary part – process chronology – is not analysed for each separate transition, as it was described above. The structure of analysis is defined as follows:

- Process definition (PD) part is structured following Kaufman interpretation of Drucker's concepts (Kaufman, 1992, 24). It consists of problem identification (PDI) represented by transition title, determination of possible solutions (PDII), selection and design of the solution (PDIII), and implementation of the solution (PDIV) developed following each individual transition, and quasi-evaluation question and, if possible, control ratio (PDV) (Kaufman, 1992, 272) identifying reaching of steady state, or degree of completion of the transition;
- Resource planning (RP) part includes minimal resources to start the transition (RPI), technological park (RPII), including tools, such as hardware, software, and specially trained staff, involved in the process, and bottleneck analysis. The bottleneck analysis scheme is developed following system capacity concept (Gould et al, 1997, 417), and Services Design Scheme (Evans, 1990, 180). It includes identifying the limiting stage (RPIII) of process definition, determining its capacity (RPIV), as well as detecting the blocks, rate of introduction of which would be impeded by delay caused by the limiting stage in balance of capacities over the PERT/CPM network (RPV);
- Process control (PC) part traces the effect implementation of the solution makes to stakeholder groups (PCI), and change in the performance indicators (PCII) (Ames, 1991; Jackson, 1991) caused by process.

Although there is a robust resistance to use of performance indicators in museum industry (Marsan, 1993), we consider, this is caused mostly by lack of professional administrative training and resistance to change of museums' strong corporate culture rather than by sincere

reasons. Marsan (1993) also quotes several museum administrators' opinion in support on this position. Another common problem with employment of indicators is stated by Spencer, Pye, and Davies (1993), as well as by Jackson (1991). This is the process of indicators selection, and threat of overusing them. The indicators picked for current analysis are chosen following the rules formulated by Spencer, Pye, and Davies (1993), with exception of registration status, and financial management issues. The indicators analysed in this work are described in Appendix III.

Specific assumptions, if any, and case references used for each transition are concluding the description. Several points of description might be inapplicable for some transitions; these are omitted.

The reasons to choose such a complicated description system are, first, to find pointers helpful for identification of the studied museum position in the PERT/CPM type network during the theoretical analysis and *in vivo* tests, and, second, to find relevant and detailed support in the case studies for placing the subunits of information use in comparative chronological sequence.

**Description of transitions.** Applying the description system to the best practice cases of real museum work, we have identified the following characteristics for every transition supporting our proposed sequence and interconnections. Since relation of stakeholders to every transition depends on the functions of the museum the transition affects, as well as the museum performance indicators represent complex measures, which should be perceived in a set of supporting data, the Process Control description below will be referred in form of functions the transition affects. Applying of functions mentioned and units involved for each transition to the structures presented in Appendix II and III might illustrate effect of the process on different stakeholder groups, as well as changes in museum performance indicators.

**References.** The case studies from Orna and Pettitt (1998) were used for illustration of transition description. Although IT change rapidly, transition between two steady stages in PERT/CPM derived model are still based on the fundamental principles. Therefore, for most of transitions we do not consider these case studies outdated.

#### Unstructured Data → Structured Data

PDI: Formation of structured data, PDII: Identification of application areas for soft or strict typological models, PDIII: Adaptation of strict, and development and adaptation of soft typological models for the museum collections, PDIV: Classification of the museum collections according to the adapted models, PDV: Are all collection elements classified?

Percentage of classified elements in the collection, RPI: Data classification standards, RPII: Typology proceeding tools, RPIII: Implementation, RPIV: Rate of card files processing, RPV: Interrelated data, Collection database, Clustered global network, PC: Curatorial, Professional, Public education, Public Entertainment

References: Falkirk Museums, Manchester Museum, National Maritime Museum, RAF Museum

#### Unstructured Data → Digital Archive

PDI: Formation of digital archive, PDII: Identification of technological base and algorithm for creation of digital archive of chosen purpose, PDIII: Planning and ensuring the technological park, PDIV: Processing the algorithm, PDV: Is archive usable for the purpose set? Percentage of collection objects with digitalized file, RPI: Technological park, RPII: Digital image producing and storing tools, RPIII: Implementation, RPIV: Rate of collection elements processing, RPV: Digital exposition, Digital reality, Unstructured global network, Clustered global network, PC: Preservation, Cataloguing, Professional, Keeping the national cultural heritage

References: BEAMISH Museum, Norfolk Museums Service, Museum of Victoria, Victoria and Albert Museum

#### Structured Data → Interrelated Data

PDI: Formation of inter-object relations, PDII: Identification of methods composing the algorithm of card file proceeding for establishing the inter-object relations, PDIII: Executing the relation search algorithm, PDIV: Registration of the inter-object relations established, PDV: Are significant inter-object relations found? Percentage of card file cards proceeded, RPI: Possibility to execute a parametrical search over collections, RPII: Relationships forming tools, RPIII: Design the solution, RPIV: Rate of card files processing, RPV: Clustered global network, Collection database, PC: Acquisition, Cataloguing, Professional

Reference: Ceredigion Museum

#### Structured Data → Collection Database

PDI: Structured preservation of retroconverted collection documentation, PDII: Database and retroconversion algorithm design, PDIII: Ensuring the structured electronic storing facilities and approving retroconversion algorithm, PDIV: Executing approved retroconversion algorithm, PDV: Does database allow to execute a simple parametrical search? Percentage of retroconverted card files, RPI: Technological park, RPII: Database management and maintenance tools, and retroconversion tools, RPIII: Implementation, RPIV: Rate of card

files retroconversion, RPV: Clustered global network, PC: Curatorial, Professional, Keeping the national cultural heritage

References: Bradford Art Galleries and Museums, Falkirk Museums, Ceredigion Museum, Hampshire Museums Service, Manchester Museum, National Maritime Museum, Norfolk Museums Service

#### Collection Database → Interrelated Data

PDI: Introduction of expanded search tools in retroconverted collection documentation, PDII: Knowledge base design, PDIII: Development of Structured Query Language and Object Query Language data complementation realization algorithm, PDIV: Retroconversion of inter-object relations, PDV: Is the inter-object relation based search possible? Percentage of retroconverted inter-objects relations), RPI: Technological park, RPII: Knowledge base management and maintenance tools, RPIII: Implementation, RPIV: Rate of inter-object relations retroconversion, RPV: Clustered global network, PC: Acquisition, Cataloguing, Professional

Reference: Ceredigion Museum

#### Digital Archive → Collection Database

PDI: Formation of references between retroconverted collection documentation and data in digital archive, PDII: Database design analysis subject to possibility of image links registration, PDIII: Execution of database design corrections, if needed, PDIV: Registration of digital archive data references, PDV: Are collection database entries associated with their entries in digital archive? Percentage of retroconverted relations between the objects digital file and entry in database, RPI: Technological park, RPII: Database management and maintenance tools, RPIII: Implementation, RPIV: Rate of registration of references, RPV: Digital exposition, Digital reality, Unstructured global network, Clustered global network, PC: Preservation, Cataloguing, Professional, Keeping the national culture heritage

References: BEAMISH Museum, Hampshire Museums Service

#### Digital Archive + Collection Database → Digital Exposition

PDI: Formation of digital exposition, PDII: Development of combined, digital and non-digital, exposition event concept subject to exposition purposes and museum's planned/possessed presentation purposed technological park, PDIII: Development of digital profile for the exposition event by compiling the digital modules from collection database, PDIV: Compilation of exposition event by joining digital and non-digital profile, PDV: Does digital exposition work and fulfil its purpose? RPI: Presentation purposed digital archive as part of Collection Database; conception of exposition event, RPII: Exposition development



tools, exposition presentation tools, RPIII: Design the solution, RPIV: Rate of manual compilation of modules, RPV: Digital reality, PC: Social, Participation in museum education and networks

References: BEAMISH Museum, Museum of Victoria

Collection Database → Several Functional Packages (→ Integrated Information System)

PDI: Formation of multifunctional integrated information system, PDII: Putting priorities on acquiring specific categories of functional software based on general strategy of museum development, PDIII: Selection of software packages according to the priorities set, PDIV: Customisation and employment of acquired software, PDV: Does acquired software help to realize the tasks identified in museum development plan? Complex performance indicators, RPI: IT strategy, RPIII: Design the solution, RPIV: Rate of manual compilation of modules, PC: Administrative, Acquisition, Preservation, Professional, Social (Several Functional Packages); Administrative, Preservation, Professional (Integrated Information System); Notes: the Integrated Information System forms when all functional packages acquired are theoretically and practically integrated into the monolithic system; integration realization might require additional data processing software;

Assumptions: all packages either initially use, or are adapted to work with, data of the same standards;

References: National Maritime Museum, Norfolk Museums Service, Portsmouth City Museum and Records Service, Victoria and Albert Museum

Several Functional Packages (Integrated Information System) → Global Clustered Network

PDI: Information resources consolidation with other cluster members, PDII: Identifying information standards for adoption among cluster members, PDIII: Development of output information layout expected from the consolidation, PDIV: Use of inter-industry software for join use of cluster information resources, PDV: Does the information resources sharing work correctly? RPI: Same standard adapted collection database in global cluster participant organizations; relevant inter-industry functional software package; retroconversion, RPII: Inter-industry interaction tool, PC: Professional, Public education, Keeping the national culture heritage

References: Bradford Art Galleries and Museums, National Maritime Museum, Norfolk Museums Service, Victoria and Albert Museum

Several Functional Packages → Digital Exposition

PDI: Automatic formation of digital exposition, PDII: Employment of exposition planning presentation functional package for creation of combined exposition event, PDIII: Design the

digital profile of an exposition event subject to exposition purposes, and possibilities of presentation functional package(s), PDIV: Realization of exposition planning presentation functional software produced exposition event, PDV: Does digital exposition work and fulfil its purpose? RPI: Presentation purposed functional package, RPII: Exposition development tools, exposition presentation tools, RPIII: Design the solution, RPIV: Rate of automatic compilation of modules employing specialized presentational software packages, RPV: Digital reality, PC: Public education, Public entertainment

References: Museum of Victoria, Victoria and Albert Museum

#### Digital Exposition → Digital Reality

PDI: Formation of digital reality, PDII: Development of digital reality concept subject to exhibition purposes, museum's planned/possessed presentation purposed technological park and natural environment, PDIII: Planning and ensuring the environment-making effects for the existing/planned, digital or non-digital exposition profile (if applicable for the concept chosen), PDIV: Compilation of environment-making effects profile and exposition event profiles into a single digital exhibition, PDV: Does the exhibition create environmental effects, and fulfil the purposes set before? RPI: Technological park, RPII: Reality development tools, reality presentation tools, RPIII: Design the solution (digital environment), or none (integrated environment), RPIV: Rate of reworking digital exposition profile, PC: Social

Reference: BEAMISH Museum

#### *Consolidation with Other Memory Institutions*

Unification of all three types of memory institutions – archives, libraries, and museums – is the focus issue of the 6<sup>th</sup> Framework of the European Commission – domain of research activity DigiCULT under Information Society Technologies Programme. The main idea of this unification is to ensure possibilities for complex parametrical search for information on a topic in all types of information storing annals. Since libraries usually are the primary source of search for academic references (Dremailov, 2003), this approach leads to increasing utilization of knowledge by rising efficiency of use of memory institutions' collections for research and education. In addition, full access to shared information resources helps to preserve, and archive in digital form, the global knowledge (Iljon, 2001). Demonstrating a transition from education process in information society to learning process in knowledge society (Smith, 2001), the consolidation practice of memory institutions' funds facilitates the knowledge society formation

Nevertheless, there are issues opposing this trend. Doerr (2003) has summarized the documentation threats to this consolidation. First, different from other memory institutions, museum object has its value formed not only from its content, as has a book, but also from its context – an ordinary pencil used to sign a famous peace agreement is worth to be stored because of its context only, not the pencil itself. Thus, a museum object cannot be consumed by the same way as a book; therefore, not metadata, which is a way of information organization in libraries (Taylor, 1999, 77), but specific museum documentation gives the user access to the context. Second, the documentation systems for different museum objects are too much different to unify them. Since a dinosaur's skeleton, and a painting require absolutely different standards to describe their typological attribution, joining them all into a single-structure database allowing advanced information proceeding options is problematic.

The solution of these problems, according to Doerr (2003), is delivered by ICOM/CIDOC in CRM standard in ISO/CD 21127. The CRM represents ontological system for a formal description of concepts and relations to the documentation of cultural heritage. Technical realization of the search is ensured through NISO Z39.50 information exchange protocol (Taylor, 1999, 220), where the in-deep search is organized over the pre-selected servers (Dremailov, 2003). This not only solves the inter-industry data exchange problem, but also gives access to the database information, which is often unavailable in non-structured global search carried out by search engines.

To conclude, unification of the memory institutions information resources is beneficial for all groups of their users, and should proceed. However, in order to be equally useful for search in funds of all types of memory institutions, it requires fulfilment of three conditions: collection documentation data retroconversion and digital interrelation, support of ISO/CD 21127 CRM standard and NISO Z39.50 protocol by collection databases, and grouping of memory institutions consolidated in either professional, or intra-industry regional clusters.

### **3. Field Studies**

#### ***Methodology and Research Design***

Taking into consideration that Latvian museum industry is very heterogeneous in sphere of IT employment, the range it occupies on the information to knowledge society transition scale is quite large. Therefore, since the level of IT development differs immensely in different museums, the statistical analysis option for the major part of the work was rejected in the favour of case study fieldwork. Besides, in contrast to the statistical analysis, the case

study approach gives opportunity to trace the transition process between the nodes in the model tested, and, therefore, is considered a better method of model validation than the quantitative research is.

The VM was chosen to be *in vivo* polygon for the model testing because of three major reasons. First of all, according to Latvian public media, VM is one of the national industry leaders in IT employment field (Tifentale, 2001; Vembre, 2001). Moreover, the global museum industry participants assessed VM visualisation unit during the *Festival Audiovisuel International Museums & Patrimoine*, San Paulo, Brazil in November 2002 (Klavina 2002; Steimane, 2002). Secondly, VM is one of the first museums in Latvia participating currently in the memory institutions consolidation project. Since the consolidation currently is an important issue for memory keeping industry, theoretical analysis of the museum-side could produce sensible advice for the consolidation process. Finally, VM was interested in complex assessment of its informatisation in order to work out the directions for further development. Besides, VM administration assured us that we would be given access to all information in VM we need for the study, which made in-deep research possible.

The fieldwork consists of two parts: on-site observations and semi-structured interviews in VM on the individual museum level, and analysis of the use and strategy of IT in Latvian museum industry in general by carrying semi-structured interview in SCM on the industry level. Organization of semi-structured interviews is available in Appendix IV.

### *Methodology of Model Testing*

After validation of the model assumptions, based on the on-site fieldwork observations, and interview results, we identify the level of intensity of employment for every sub-unit to test the level of filling of the nodes for PERT/CPM type model providing theoretical implication for every unit description. Next, we analyse the transitions between even partially filled nodes according to transition description scheme in order to find out if the transition was made in a "theoretically correct" way. Following this analysis, we try to explain the problems arising in IT implementation in VM in framework of the theoretically set up model. The model fragment is validated if it satisfactory explains the cause of the problem, as well as based on experience of other museums offers an alternative trustworthy way to implement the problematic sub-unit.

### *Ventspils Museum Research Design*

Validation of VM as an institution fitting the museum definition, goals, and functions stated as the base of the research was done primarily in order to find limitations, if any, which

should be applied to the model test, and application. Further we employ the units of information use, and the model developed in the Theoretical Analysis part, to describe the ways of information use in VM, as well as to identify the position of VM in the PERT/CPM based model. The organization of semi-structured interview was planned for every unit of information use following the scheme of description of transitions. We have had possibility to study the VM accreditation files, and development plan, as well as VM exposition, and digital effects, and use the observations and studies done for the preparation of interviews, as well as for discussion of the memory institutions consolidation issue with the Head of Ventspils Library, both, in Latvian memory industry, and in Ventspils case. The visit took place on the 24<sup>th</sup>-25<sup>th</sup> of November 2003.

In addition to the Ventspils phase of the fieldwork, in order to get additional information about VM digital exposition design, acquire the data about the industry, and discuss the theoretically proposed IT Strategy and Implementation model, we have interviewed the provider of digital exposition software for VM, Digitala darbnica Ltd.; the semi-structured interview employed the questions generated for visualisation unit according to the question set generation scheme described in Appendix IV. The visit took place on the 8<sup>th</sup> of December 2003.

### *Latvian Museum Industry Research Design*

Following the SCM data, we have estimated the level of IT implementation in Latvian museum industry in general. Since transitions are different in all museum, the analysis of transitions between nodes for the industry is possible only performing in-deep legislation, and policy examination, which is out of our research scope. The industry overview study pays attention only to the estimation nodes filling degree in different categories of Latvian museums. The PERT/CPM-derived model nodes were shortly described for the industry in whole according to share of museums having a node filled. The position of VM in the industry is shown according to the degree of filling the nodes. The visit took place on December 15<sup>th</sup>, 2003. Consolidation with memory institutions was described based on CCF of Latvia provided documents, and the projects available in the global unstructured network.

### *Ventspils Museum*

#### *Ventspils Museum Profile*

VM is the regional level museum operating in the field of district history. It was founded in 1928, and moved to the current premises of Castle of Livonian Order in 2001. The VM mission statement is formulated as "collecting, preserving, studying and popularising of

material and spiritual (non-material) objects of value and evidences of modern history of the City of Ventspils and region with the aim of presenting the place and contribution of Ventspils city and region in the course of history of Latvia, developing the patriotism in the local community, and cultivating the growth of cultural tourism", and fully reflects the curatorial, professional, and social functions generally stated for a museum. According to the museum stakeholders typology, on-site research, and analysis of VM Application for Museum Accreditation, the major stakeholder groups of VM are VM personnel, museum visitors, higher education students (mostly, University of Latvia), museums of Kurzeme and Zemgale, Latvian Association of Castles and Estates, Latvian Association of Museums, Castle around the Baltic Sea, ICOM, Ventspils Library, Ventspils and nation-wide mass-media, Ventspils secondary school pupils, Ventspils citizens, Ventspils business community, software and art providing firms (currently, Digitala darbnica Ltd.), Ventspils City Council, State Council of Museum, Ministry of Culture, Latvian nation. The list represents most of identified general stakeholders groups, and might be referred to, when analysing the transitions between identified nodes in the PERT/CPM-derived diagram for VM.

VM has two associated branch museums, Open-Air Museum of Maritime Fishing (established in 1954), and Writer H.Dorbe Memorial House (1988). Collection of all three branches consists of over 85 thousand objects altogether; the Castle of Livonian Order branch alone possesses over 62 thousand objects. The fund is divided into ten collections: archaeological (3.2% of total funds), ethnographic (6.3%), numismatic (3.0%), documents (14.6%), printings (24.1%), photographs (23.0%), photonegatives (10.6%), art objects (1.2%), science archive (5.7%), and other objects (8.3%), and might be exposed on the exhibition area of 771.5 sq.m. in the Castle of Livonian Order, 165.6 sq.m. in Open-Air Museum, and 39.9 (in-house) and 577 (garden) sq.m. in H.Dorbe Museum. The total non-exposition area of all museum branches exceeds 10000 sq.m. (Application for Museum Accreditation, 2003, 4-5, 16-17, 67-68).

Concluding on the museum goals and functions, as well as the nature of funds, VM rightly fits the typical institution form put into the base of the model. Therefore, the analysis of the model application might be performed for the VM case without any significant limitations.

## *Uses of Information in Ventspils Museum*

Through on-site observations, and semi-structured interviews with VM staff, we have analysed the employment of each major unit of information use up to the subunit subdivision level. Our brief conclusions are given following the units of information use.

### **Documentation**

Unstructured Data. Most of collection objects are registered in the inventory journal and granted chronological inventory identifiers. The unregistered part of the collections is minor; it is not documented mostly because it has come into the funds very recently.

Structured Data. Most objects are classified according to some typologies. The strict typological form collections, such as numismatic collection, are classified according to commonly accepted principles, while there are some problems with soft typological form collections. The unclassified part of collections is minor; it is not classified in large extent because of lack of knowledge about the objects, but also because of unclear situation with national standards, and problems in development of own soft typologies.

Interrelated Data. Most objects are classified according to several typological inventory identifiers; however, little to no objects are catalogued by other than chronological inventory numbers. Process of interrelated inventory journals creation is planned, but cannot be launched because of insufficient technological park, mostly, lack of collection database.

Theoretical implication. The unstructured data, and structured data subunits are well developed. The process of interrelated data development is delayed because of time and qualified staff deficit; the same problem disturbs completeness of documentation in structured data level. The documentation process currently does not employ any computerization; therefore, all funds will require retroconversion.

### **Visualisation**

Digital Archive. Images of a number of objects in different collections are digitalized; however, they are not placed into a structured system. Possessing a rich document collection, VM also perform some duties of an archive institution. The on-line archive "Ventspils hronika" uses its own digital archive, which is well structured, and consistently maintained. The digital archive of collection funds is used mostly for preservation purpose in form of renovation, and for presentation purpose in occasional events. The digital archive employed for on-line archive maintenance is entirely presentation purposed.

Digital Exposition. Digital exposition of VM represents a complex digital exhibit. It is organized in six parts. Among the six parts, the "Ventspils Museum and Exhibition" part

represents the navigator type exhibit, and the "Natural and cultural monuments" part corresponds to informer type. Two more – "History of the Ventspils region", and "The history of the city and port of Ventspils" parts are structured according to sublimator type, while "The Castle of the Livonian Order" part being generally of sublimator type also turns to interpreter type in "The rooms of the castle and their changing function over the course of time" element. The remaining part "People of the region" characterizes the informer-like type archive. A separately installed audio digital module accompanies the digital exposition. Each of the screens is structured in the form of navigator exhibit in the core, accompanied by combination of sublimator and interpreter styled text on the side. The digital exposition is not specific for every exhibit, but unchanged in all vestibules. Besides, VM traditional exposition is supported by digital sound tracks forming sublimator-like audio digital exhibits.

Digital Reality. VM has no digital environment created digital reality exhibitions. However, combination of sublimator-like audio digital exhibits with traditional exposition sometimes forms environment effects turning all together into the integrated environment created digital reality type. In our opinion, this type of exhibition might be perceived in Commendator<sup>5</sup>'s room.

Theoretical implication. Digital archive subunit must be seen in two parts – the one related to the museum funds, and the other one related to the VM functions as the archive institution. The digital exposition, and digital reality subunits are solely used for basic museum functions. The digital archive of the museum funds is seriously underdeveloped compared to continuously maintained "Ventspils hronika" on-line archive purposed digital archive. Digital exposition subunit is moderately developed. The complicated digital exposition functioning in VM includes all types of digital exhibits/expositions mentioned in theoretical analysis, and there are several audio digital profiles available in joint exposition events with non-digital exposition profiles. Nevertheless, the digital exposition sub-unit itself suffers from complicatedness of exposition updates. The digital reality sub-unit is minimally developed.

### **Informatisation**

Collection Database. VM has no collection database in the Livonian Castle department. In the past, there was database software developed for VM collection documentation needs several years ago. However, it was not used due to the fact that database was not customized to Ventspils Museum needs, the software developer had gone bankrupt, and the problems

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<sup>5</sup> Commendator – head of the convent in knights orders (such as Livonian Order)



with providing technical support were foreseen. At current date it should be concluded that there is no collection database in VM. Archive functions of VM are closely related with Ventspils Library, which database is used for maintenance of the on-line archive.

Several Functional Packages, and Integrated Information System. Besides of digital exposition software, which is organized in form of individual program package rather than data file for another specialized presentation software, VM uses specifically designed digital audio tracks playing presentation purposed system, accounting administrative system Apvarsnis, and photo album formation on-line archive editing software ImageASX. Programmes are not customized. Based on the opinion of IT administrator, the level of IT system integration of in VM is low.

Theoretical implication. Collection database module is missing. Use of specialized software is limited, while no specific museum-purposed software is used. Integrated information system module is not reached yet because of general VM informatisation unit underdevelopment.

### **Interrelations**

Internal Network. All computers are connected with cable network, which is a part of the City Council network. The internal museum network is used for resource sharing only. The digital exposition is launched on every presentation computer, and is not transferred through the network; at the same time, sound digital profiles, are intranet-transferred. The City Council network is used for information sharing through maintenance of on-line archive by accessing the database of Ventspils Library.

Unstructured Global Network. VM has a museum-to-public oriented website. The level of integration of the website content into the museum activities is low. The social function fulfilment-oriented website mostly supports the public entertainment museum function, while pays little attention to public education, and preservation of national cultural heritage. No museum-to-professionals functions are supported by the website. Development of the website was a part of digital exposition creation project; according to the developers, the public entertainment function was the major target function planned in the website concept.

Clustered Global Network. VM is a participant of several clusters of all types: professional cluster formed by ICOM, intra-industry regional clusters of Latvian Associations of Museums, Latvian Association of Castles and Estates, and Castles Around the Baltic Sea, as well as region-based inter-industry cluster composed by the e-Ventspils project, and its subdivision in form of memory institutions alliance. The museum staff has memberships in Latvian professional associations and councils of restorators, numismatists, and heraldists.

VM has continuous collaboration with the Chair of Archaeology and History Auxiliary Disciplines in the University of Latvia in academic activities, and local secondary schools in public education. However, e-Ventspils is the only digital cluster VM participates in.

Theoretical implication. The internal network is well established, which validates the assumption made behind the model. The unstructured global network communication is not intensive; the website although properly developed, does not cover all audience, as well as technically might be further optimised for distant users. Therefore, the unstructured global network subunit might be evaluated as averagely developed. Participation in clusters is moderate. The collaboration with professional bodies opens the possibilities for entering the e-alliances in the future. Such an e-alliance already exists with the Ventspils Library.

### **Conclusion**

Based on the analysis, it is impossible to qualify as at least partially filled the nodes representing the collection database, and the integrated information system. Nodes staying for unstructured data, and structured data should be classified as well developed; on-line archive purposed digital archive, and digital exposition nodes are moderately developed, while digital archive of the collection funds, interrelated data, several functional packages, and digital reality nodes are seriously underdeveloped.

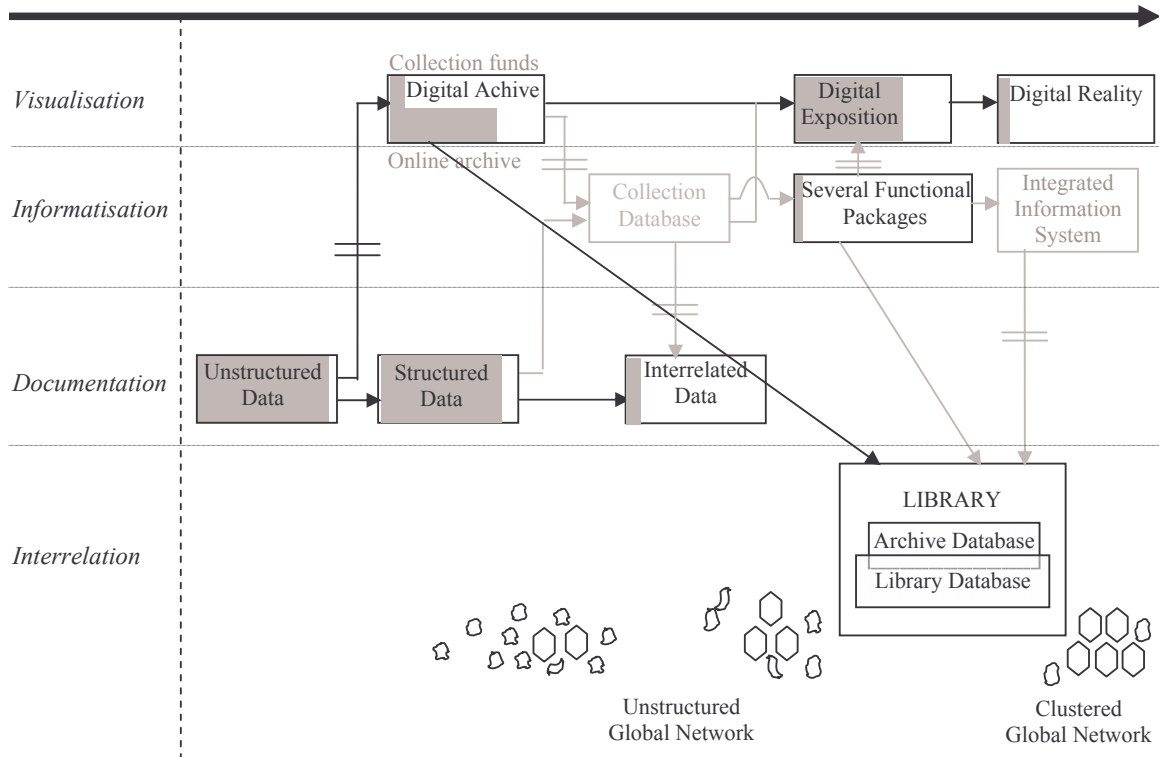
### ***IT Strategy in Ventspils Museum***

VM has well-developed Internal network interrelation subunit generally fitting the technical needs of VM, employs 31 IBM-type computers for the 32 persons of staff (IT administrator, personal interview, 25 Nov 2003; Application for Museum Accreditation, 2003, 10), and has its further development conception, it properly fulfils the assumptions stated developing the model.

### ***Model Examination***

Following the conclusions for each subunit, the model of IT strategy implementation in VM appears as portrayed below (see Fig.3). The grey colour depicted subunits represent the subunits currently absent in VM. The degree of the black colour depicted subunits filling illustrates a qualitative estimation for the degree of completion of the subunit implementation. The transitions unplanned in theoretical model, but realized in VM case are black-coloured. The VM and Ventspils Library inter-industry clustered e-alliance is shown on the figure as the major issue of clustering within the memory institutions consolidation.

Figure 3  
Implementation of the Model of IT Strategy in VM



Following the transition description scheme developed in Theoretical Analysis, we analyse each of transitions observable in the VM case. Comparison with the description of transition in theoretical examination of model concludes every description. The chronology measure could not be referred for the VM case study because of the concept's more illustrative rather than measurable nature.

### **Unstructured Data → Structured Data**

Process definition. Formation of structured data is the first stage of data proceeding in VM. The identification, adaptation, and development of typological models for soft typological model structured data in most cases are shifted into creation of new typology because of lack of national standards (according to VM). Classification of the collections according to created typologies follows, and most of individual collection elements are classified.

Resource planning. Lack of the national classification standards creates for VM a serious problem in structuring and interrelating data, as well as in collection database creation, and entering the memory institutions cluster. A highly qualified specialist without any advanced technological part works with typology and card files; thus, the rate of cards proceeding is the limiting factor of this process.

Process control. No any kind of control, or feedback mechanism exists for data structuring. However, VM recognizes the problem of card file proceeding rate, and, according to its development conception, plan to focus on this issue in the following five years period (Development Conception 2003-2008, 2003, 6).

Theoretical implication. Since there is no single national classification standard for individual collections, the transition should not be started. However, since the importance of this process for museum work is crucial, this creates enormous difficulties for creation of Collection database, Interrelated data, and their common use within Clustered global network. In addition to adaptation of single standard, retroconversion of card files is the factor widening the bottleneck.

### **Unstructured Data → Digital Archive**

Process definition. The process of collections' funds digital archive creation has started without substantial planning, reasons, or selection of typological park. No special technology was applied; the digital high quality photos were taken and stored without much cataloguing. Nevertheless, the archive is usable for both, presentation, and preservation purposes changing the quality of images. In contrast, the digital archive prepared for on-line archive of "Ventspils hronika" was properly planned and well documented in the accreditation materials (Application for Museum Accreditation, 2003, Appendix X). The technological park was carefully selected, and an algorithm of events proceeding exists. The "Ventspils hronika" purposed digital archive is used for its planned purpose even more than digital archive of collection funds.

Resource planning. The technological park for the collections fund digital archive is not specially planned. The technical means includes a digital photo camera, and digital recorder. Highly qualified VM's photographer takes the photographs in a special reserved space with no special technologies. No special digital images storing tools are arranged for this archive. Although underdeveloped, the collections' funds archive is enough for development of outer space representing subunits of interrelation unit. The on-line archive purposed digital archive in addition uses a special image storing database-like software, and photonegative scanner.

Process control. No any kind of control and feedback mechanisms exists for the collection funds digital archive. On-line archive purposed digital archive is not evaluated in any way; however, this option recently became available to the users of unstructured global network through a regional-based inter-industry cluster of e-Ventspils, and might be evaluated later by analysing the public opinion.

Theoretical implication. The collection funds digital archive creation is not a focus issue of the VM. Since digital exposition creation was outsourced, but digital reality, and interrelation needs are satisfied with an existing archive, the bottleneck problem is not crucial. However, if VM were developing additional digital expositions, or dealing with other uses of such archive described in the Theoretical Analysis, it might have face deficit of digital archive elements. The fact that images proceeding phase is the limiting one for work of on-line archive is recognized by VM; therefore, the bottleneck blockage is avoided by regular expansion.

### **Structured Data → Interrelated Data**

Process definition. Currently no systematic proceeding of the inter-object relation formation is possible because of qualified workforce deficit. The registration of inter-object relation takes place during the structured data formation, and, in occasional manner, in later time.

Resource planning. The parametrical search over collections is executable in non-automated manner only. The relationship formation principles are worked out on the skills level rather than in official document form. The rate of file cards proceeding limits formation of the inter-object relations. Lack of retroconverted collection database inhibits inter-objects relation registration.

Process control. The process is not controlled by any means.

Theoretical implication. Absence of retroconverted collection database with convenient parametrical search possibilities severely slows down the interrelated data formation process. Therefore, the bottleneck on the previous stage created a delay for further development of documentation. The limiting stage currently goes below its capacity, and, therefore, is not affected. The level of interrelated data node filling although seriously underdeveloped, is surprisingly high taking into account lack of resources to execute the process set up procedures.

### **Digital Archive → Archive Database in a cluster of Global Clustered Network and Several Functional Packages (Integrated Information System) → Global Clustered Network for on-line archive of "Ventspils hronika"**

Process definition. Planning and technical support for this transition was made by Ventspils Library, which provided their database for storage and presentation of the on-line archive.

Resource planning. Outsourcing the storing tools, and employing a maintenance tools through the internal network of the City Council forms the technological park of the transition. Participation of the Ventspils Library in the process from the starting stage substantially simplified the entire resource planning process. The functional packages are not

adapted especially for the VM needs. According to the IT administrator of VM, the level of the museum's Information System integration is low.

Process control. The control mechanism principles are similar to the unstructured data → digital archive transition.

Theoretical implication. Outsourcing the Ventspils Library database, using the on-line archive creation software ImageASX, and the internal resource sharing purposed network, VM reaches participation in clustered global network. Assuming outsourcing from the Ventspils Library all the missing stages, this is a possible way to carry on this task; nevertheless, this is an odd route to operate it further. Creation of own database in VM, and inter-industry software joining the databases of both memory institutions should happen according to both, the theory, and position of the Head of Ventspils Library.

### **Digital Archive + Collection Database → Digital Exposition**

Process definition. A group of designers working in field of traditional, as well as digital exposition creation, formed the digital exposition. The digital exposition conception was planned as a supplementary individual exposition to the non-digital exposition profile. Development of the digital modules, and their interaction took place in non-automated regime; the modules were produced specially for the exposition. The team that developed the joint exposition concept executed compilation of digital, and non-digital exposition profiles into the exposition event. The produced digital exposition functions properly, and attracts the visitors as an individual object.

Resource planning. The presentation purposed digital archive was not available when the development of exposition began; it was created by the exposition design team. No database is put into the exposition structure. The digital exposition was prepared according to pre-stated plan. It was made through flash programming techniques, and functions on the touch-screen IBM monitors with ordinary IBM type computers.

Process control. The digital exposition was granted national Spidola Prize in 2002, and was invited to participate in the Europe e-Culture competition in 2003, which results will be available in a short time.

Theoretical implication. The process of digital exposition creation was executed according to the theoretically proposed scheme with minor differences. Creation of digital archive took place during the exposition preparation stage, as the archive was not available beforehand. Absence of collection database inter-referred with digital archive, according to exposition developers, made the preparation process more difficult than it would be if VM had a structured collection of digital images in advance.

### **Digital Exposition → Digital Reality**

Formation of integrated environment created digital reality has happened occasionally without any planning, resource analysis, or purposed evaluations by supporting the traditional exhibition with sublimator type digital sound exhibit. This proves the possibility of sequent smooth transition to this type of digital reality phenomenon along with the level of exposition integrity. The digital environment created digital reality is not planned in VM.

### *Consolidation with Other Memory Institutions in Ventspils*

According to Kuibishev and Brakker (2000), the first step of consolidation might be introduction in the museum such a database, which will allow having a join catalogue of museum collection, and museum library. Since there is no collection database in VM, listing of the museum library catalogue in the Ventspils Library database is done instead, which is much easier, but not so perspective way from the museum database formation perspective. Joint work of "Ventspils hronika" on-line archive, and the library, on one hand, generally follows our proposed model. On the other hand, both, according to literature review, and the Head of Ventspils Library, the way it was made appears to be rather odd method of clustering, which could cause data consolidation problems in the long-term.

Following the analysis of PERT/CPM-derived model, the consolidation process requires well-developed informatisation unit, including museum collection database, and at least an inter-industry functional package. Currently VM outsource both subunits, which, although is a possible way to consolidate the information resources in the cluster so far, will most probably cause difficulties when registering the collections with different description standards.

According to Kuibishev and Brakker (2000), both memory institutions will benefit if choosing the same software provider for their databases. Currently, there is no clarity about VM collection database design; therefore, this advice might still be realized. Another option is to acquire a standard museum-oriented software package supporting NISO Z39.50 protocol.

### *Model Validation*

**Documentation.** Starting data structuring without meeting the minimal resources needed, according to VM specialists, caused bottleneck for data interrelating, launching of the informatisation unit, and consolidation of data for participating in global clustering, as was predicted by the model. Underdevelopment of the interrelated data subunit is partially caused also by absence of collection database, which, according to the model, should be acquired before, or in parallel to data interrelating.

**Informatisation.** Lack of the first informatisation subunit makes problematic further informatisation unit growth for the VM museum (not archive) functions. Outsourcing the Ventspils Library database for on-line archive eliminates need for inter-industry software; therefore, the second informatisation unit stays undeveloped for the on-line archive function.

**Visualisation.** Successful run of digital exposition might be considered a result of following the best practice that was similar to the model. Nevertheless, lack of digital archive made, according to digital exposition developers, the visualisation process much longer than it would be if electronic images, and their registry, or, collection database, would be available. According to the developers, integration of collection database into the digital exposition software would have been beneficial, but this had not been planned in the VM current digital exposition. The difficulty it caused is impossibility to change the unitary digital exposition, as well as unavailability of separate digital exposition digital modules for separate use. At the same time, the bottleneck occurred during the digital exposition creation, as well as both inconveniences caused by non-employment of the database were pre-eliminated in on-line archive putting emphasis on its regular extending, as the model suggests. Occasional formation of integrated environment digital reality, in accordance to the model, is an effect of professional approach taken to exposition event formation from digital, and non-digital profiles. The former, in combination with Livonian Order Castle created environment effects, formed the right conditions for proceeding the process of third visualisation sub-unit formation.

**Interrelation.** Participation in clustered network, as well as dynamic website maintenance is not realized in the museum; following the model, it is impossible without proper visualisation archive, and collection database establishment. Similarly to informatisation unit, this is avoided, even in an odd way, in on-line archive case.

**Conclusion.** As it is illustrated by the unit summaries, the theoretical model succeeds in explaining the problems appeared. Similarly, problem-free transitions are realized without



principal differences from the way the model proposed. Therefore, based on the validation rule stated in methodology part, we consider the model fragments tested in VM case justified. This actually means justification of the entire model, as integrated information system stage being undeveloped, when introduced properly won't harm the mechanism.

### *Recommendations to Ventspils Museum*

Three major recommendations were produced to VM following the theoretical analysis.

First, proceeding of digital archive should be intensified. This not only provides the images for upcoming collection database, but also helps to solve the digital exposition outdated threat mentioned by VM (Vijups, 2002; Vijups, 2003). Besides, it will provide the modules for creation of simple digital expositions produced for a specific exhibition event.

Second, creation of collection database should be put as the top priority of VM. This will facilitate creation of interrelated data formation, as well as intensify research activity, and make easier creation of small supplementary digital expositions.

Finally, consolidation with other memory institutions in Ventspils is impossible until VM has its own database. Although, the on-line archive database already exists, the local on-line archive database should be produced in order to prevent further system complexity. According to both, the model prediction, and the head of Ventspils Library, the local on-line archive database should become one of two search hosts of the cluster-joining inter-industry database search engine. The latter remark is valid for the museum collection database yet to be created.

### *Overview of Museum Industry in Latvia*

#### *Uses of Information*

According to the SCM division, there are three types of museums in Latvia, based on the legal status of the founder: state-founded, local authority-founded, and private or juridical person-founded museums. In total, state-recognized museums are amounted to 37 units in state-founded, 96 in local authority-founded, and 3 in private or juridical person-founded museum groups. The 96 local authority-founded museums are of four major types: region (3), city (36), district (13), or civil parish-founded (44) museums (SCM Annual Report 2002, 2002, 16, 38-42). The statistical data of computerization in museums first time is collected in a centralized way in year 2003 only (results available in February 2004). Thus, it is not possible to make in-deep review into the museum computer literacy in Latvia. Nevertheless, there are several regularities mentioned by the Head of SCM.

Most of the museums employ some IT. Nevertheless, the level of IT employment, similarly to the quality of performing the collection study work, is generally higher in state-founded museums, about 80% of which employ computer for performing some museum-specific work. Among the local authority-founded museum, the region, city, and district museums are much ahead of the civil parish-founded ones; about a half of the former use IT for some industry-specific purpose. The worst situation is observed in the civil parish-founded museums. The private or juridical person-founded museums mostly are not state-recognized; therefore, it is difficult to overview the situation in this segment.

**Documentation.** Among the four units of information uses, this unit is generally the most developed one in all Latvian museums. Unstructured data, as well as data structuring is required to exist in all museums according to chapters 35-37, and 49 of the Rules on the National Museum Collections. The interrelated data section is rarely reached. The documentation unit development in the VM case is comparable with average national industry level.

**Informatisation.** Collection database creation is started in many museums of those using IT for special museum purposes; the others are waiting for the Nation-wide Museum Joint Catalogue project initiation to start the database creation. According to the available information, no functional packages are used in any museum except for administrative purposes. The national strategy of museum informatisation assumes creation of whole-industry funds catalogue (Nation-wide Museum Joint Catalogue Conception, 2000, 4), which requires retroconversion of the collection catalogue. Evaluating informatisation unit development, it might be concluded that VM is lagging behind the general industry level.

**Visualisation.** Digital archive creation is assumed to happen in every museum, as it will form a part of industry funds database according to Nation-wide Museum Joint Catalogue Conception (2000, 16). Several museums currently form their digital archives; however, it is impossible to evaluate the share of these museums now. As far as we learned, there is no launched digital exposition in any other museums in Latvia, except VM. Level of visualisation unit development in VM is substantially higher than generally in the industry due to its functioning digital exposition.

**Interrelation.** Internal network existence was a parameter currently impossible for us to estimate. Fifteen museums of different types are referred as having a website by Latvian Association of Museums (Latvian Museum Web Pages); nevertheless, we doubt the realisticity of this number. Clustering is common for all Latvian museums. Collaboration takes place with academic and public bodies, and other museums. Because of reliable data

unavailability on two subunits, and generally fully employed third subunit, it is impossible to judge the VM position in the industry for the unit. However, it could be presumed that the VM level of development in this unit is at least the same as average in the industry, or even higher, taking into account its consolidation process with other memory institutions in Ventspils.

### *Consolidation with Other Memory Institutions*

Memory institutions consolidation in Latvia started in 2002 when CCF of Latvia, and Library Information Network Consortium initiated the project competition "BAM". The projects were required to promote formation of consolidated information system, and support of national, regional, or local importance information digitalisation projects involving libraries, archives, and museums (CCF Council. Contest Regulations. 2002). According to the competition results, twelve projects, including Ventspils' one, were supported (CCF Council. Protocol. 2003). The second launch of the competition was planned in 2003; however, it was not yet launched until the end of December. Overview of the CCF Council approved projects implementation shows that the project realized by Ventspils memory institutions is one of the most complicated of all successfully realized ventures.

## 4. Conclusion

Following case studies presented to the professional public, we have identified four major areas of IT use in modern-day museum, namely, documentation, visualisation, informatisation, and interrelation. Each of these units is classified into two further levels. Subunits arranged in a rational order on a cross-unitary basis, represent a PERT/CPM type-derived model of IT strategy and implementation in a museum, where nodes represent the steady states of unit development, and arcs stay for transitions between two stages. Describing each PERT/CPM type diagram arc in framework of process definition, resource planning, and process control, as well as adjusting the relative process chronology, we produce theoretical justification of the model before going for field test. Applied to the Ventspils Museum case, the model succeeds in explaining the problems emerged.

Based on the model standing, several recommendations were given to Ventspils Museum. First, digital archive creation should be intensified, as this not only ensures retroconversion of collection images, but also prevents the digital exposition outdated threat. Second, collection database creation should become the main concern, as lack of it delays interrelated data formation, research activity, and possibility of supplementary digital expositions creation. Finally, the way of consolidation currently realized in memory institutions of Ventspils is inefficient, and will cause unjustified system complexity in further activities. According to the model, consolidation is impossible until the memory institutions have their own databases joined with clustered search engine.

According to the review of Latvian museum industry, the level of documentation unit development in Ventspils Museum is comparable to average level for the industry, while informatisation unit is lagging behind, and visualisation unit is substantially more advanced than average in the industry. Besides, Ventspils memory institutions are among the few starting the consolidation process; this places Ventspils Museum among the leaders in interrelation unit.

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## Appendix I. Glossary of Terms

- Administrative functional package – a functional software package aimed to assistance in performing administrative functions
- Acquisition – formation of the collections through buying new objects, administrating donations from private or state donators, or other ways
- Cataloguing – assigning the object to the proper categories of classification system, and maintaining the classification system itself
- Clustered global network – a stage of interrelation ensuring the all-to-all communication type in structural global information space organized by the cluster; such communications increase the probability of fruitful contact comparing to one possible in all-to-all communications in unstructured global information space
- Collection – a unit of collections, consisting of objects having something of importance in common, such as numismatic collection, or bird's eggs collection
- Collection database – a functional software package aimed to performing of curatorial functions and parametrical search over collections
- Collections – all collected objects of a museum
- Curatorial functional package – a functional software package aimed to assistance in performing curatorial functions
- Curatorial function – museum function covering direct primary work with objects; the major sub activities of this function are Acquisition, Preservation and Cataloguing
- Digital archive – a bank of structured or inter-structured non-textual data, which contains the visualisation-purposed data about the real objects from the museum collection, and is stored in digital form
- Digital environment type of digital reality – a complex set of environment-making digital effects realized by use of special devices forming visual, sensorial, and other types of experience specific for the exposition environment and created individually for every visitor
- Digital exposition – virtual effects created through engaging the presentation type digital archive into exposition formation in form of exhibits
- Digital profile – digital information compiled into a monolithic unit, which supplements the traditional, or non-digital, part of a combined exposition event; software code ensuring performance of digital exhibiting event
- Digital reality – a level of visualisation, either only digital, or combined, which assumes creation of environment characteristically for the exposition
- Display – presentation of objects without significant interpretation added;
- Edutainment – a process fulfilling jointly the public education, and public entertainment functions
- Exhibit – presentation of localized grouping of objects and interpretive materials that form a cohesive unit within an exposition space;
- Exhibiting event – presentation of museum collection in display, exhibit, or exhibition level, either in traditional, or in digital form;
- Exhibition – presentation of comprehensive grouping of all elements that form a complete public presentation of collections and information for the public use; it creates an environment characteristic for the objects exhibited;

- Exposition event – exposition of display, exhibits, or exhibition level, which consists of traditional, or non-digital, exhibiting event, or profile, and of digital exhibiting event, or profile
- Extender type digital exhibit/exposition – a type of digital exhibit supplementing an ordinary museum exhibition with environment-making digital effects, such as video, sound, light, or climate regime, and creating a streaming context of the cultural phenomenon
- Identification type archive – a digital archive including information needed for unique identification of objects, which either at the given stage of cataloguing, or in general, is impossible to describe precisely, or which are of wide professional interest of the professional public for everyday use in presentation type digital archive purposes
- Information sharing purpose internal network – an internal network, planned and used for ensuring a shared access to the information sources, such as collection database, or digital archive
- Informer type digital exhibit/exposition – type of digital exhibit giving scientific expertise in a form of classified and typologed information with appropriate references and credits
- Integrated environment type of digital reality – a traditional museum exhibition supplemented by a digital exhibit of extender type
- Integrated information system – a stage of the software complexity assuming only one single software system employed by museum, which ensures use of all necessary functional software groups, and forms the information environment for being considered a homogenous micro-cluster forming a node of global clustered network
- Inter-industry functional package – a functional software package purposed to inter-industry communication, such as educational activities, or integration with other memory institutions
- Internal network – the inner computer network of the museum; the intranet
- Interpreter type digital exhibit/exposition – a type of digital exhibit describing the part of exposition that is problematic for visitor's perception, such as alien or discrepant cultural phenomenon
- Interrelated data – a data gathered into clusters, which allows executing complicated parametrical search involving metadata, synonyms, conceptual references, and other complex structures
- Intra-industry regional clusters – a cluster including the similar profile institutions situated, and therefore, joined by the same place of location, such as regional associations of museums
- Inventory card – the first step of the museum documentation process unified for objects of museum collections
- Keeping the national cultural heritage – providing proper conditions for storing and exhibiting the objects forming the cultural richness of the nation
- Knowledge database – a database structure, joining both, object focused collection database, and typology focused collection database, by employing structured tables for Structured Query Language operations, and classified interrelated collections and classes of objects for Object Query Language operations; formation of knowledge database is more likely to happen with formation of interrelated data sub-unit
- Memory institutions – historically, information storing institutions, including archives, libraries, and museums

- Module – visual information, including text, about an object, or a group of objects, in museum collection, which may be used preparing digital profile of an exposition event without substantial additional editing
- Museum-to-professionals communication type – an all-to-all type communication type targeted to fulfilment of museum's professional functions; since curatorial functions could rarely be seen separately, we treat these functions similarly to professional ones
- Museum-to-public communication type – an all-to-all type communication type targeted to fulfilment of social functions of a museum
- Navigator type digital exhibit/exposition – a type of digital exhibit assisting a visitor to orientate him or her in the exposition, and to get preliminary impression about what he or she is going to view and percept
- Non-digital profile – exposition of display, exhibit, or exhibition type involving use of museum collections presented in an exhibiting halls; technical part of traditional, or, non-digital, exhibiting event
- Object focused collection database – an object-based Object Query Language database, which is appropriate for increase of data abstraction level (Date, 1998, 600), and is convenient for direct realization of conceptual models (Hansen and Hansen, 1999, 556), and gives good possibilities for inventorying diverse collections, such as memorial museum collections, where the objects are kept together on base on reference to another object, or event, rather than on typological attribution
- Participation in academic education and network – taking part in preparation of academic training courses for specialists related to the museum profile, and providing the sources for realizing and sharing of purposed academic studies
- Participation in museum education and network – taking part in training of curatorial personnel, and sharing experience and collections resources with organizations of similar activity profiles
- Presentation functional package – a functional software package, most often represented by digital visualisation packages, and exposition planning and logistics software
- Preservation – keeping the collections in proper order, including the system of collections locations, proper micro-climate conditions, and other factors
- Presentation type digital archive – a digital archive formed by data needed for creation of digital exhibits, use on the web site, or in other illustrative purposes, containing the records of average quality, which makes easier data transfer process
- Preservation type digital archive – a digital archive consisting of extremely high quality data created for ensuring safety of the object preservation, and typically employed for being an etalon for condition control indicators during a time period or outer exhibiting, renovation purposes, as well as given to the criminalists and art experts in case of judging on authenticity of stolen objects
- Professional clusters – a cluster uniting the institutions having the same interest of expertise over the world, such as museum networks
- Professional function – museum function dealing with academic issues of collections studies, and training of the curatorial personnel; the major sub activities of this function are Research and interpretation, Participation in academic education and network, Participation in museum education and network
- Public education – creating general knowledge among the public society about the exhibited collections

- Public entertainment – creating enjoyment and impression from perception of the exhibited collections
- Region-based inter-industry clusters – a cluster joining the institutions by the specific region preference, such as an e-city project
- Research and interpretation – purposed academic studies of the collections, and utilizing the information extracted from these studies along with information obtained from other sources into producing the complex explanation of explored phenomenon
- Research card – the second step of museum documentation process, varies depending on a collection
- Research functional package – a functional software package purposed to proceeding and numerical, i.e. structural, statistical, or other mathematical analysis of data provided by technical auxiliary disciplines of humanities
- Resource sharing purpose internal network – an internal network, planned and used for ensuring a shared access to hardware, such as presentation, light or climate regulating, or sound devices, or software packages, either office systems, or functional packages
- Retroconversion – conversion of card file information from a paper bearer to an electronic bearer
- Several functional packages – a level of the software complexity, when the employment of specialized software is utilized; operation and office systems, such as FreeBSD, and TeX, are not considered here to be functional packages
- Shared type digital archive – a several purpose digital archive, such as preservation and presentation type joint archive, used when collection should be exhibited only in digital archive form because exhibiting of real object will harm the object; the combinations of such digital archive functions might vary significantly
- Social function – museum function concerned with museum activities that are of general interest of the outer society; the major sub activities of this function are Public education, Public entertainment, Keeping the national cultural heritage
- Soft typological form – a locally developed typological model, which is varying, incomplete, or individual for different documenters, and is used in limited area only
- Strict typological form – a commonly accepted typological model used globally with minor changes for classification of a certain collections
- Structured data – the organization of data pieces in a way that data can be conveniently stored and retrieved in an organized manner for further operations
- Sublimator type digital exhibit/exposition – a type of digital exhibit supplementing context of museum exposition with comparative and analogous information revealing cultural identity and integrity
- Technological park – tangible, and intangible tools required for performing the transition
- Typology focused collection database – a table-based Structured Query Language relation database, which is suitable for inventorying of well-developed typology collections, such as numismatic, or herbarium
- Unstructured data – a set of data having internal structure only, while there is no organization applied to the data pieces, and no opportunity exists to execute a parametrical search
- Unstructured global network – a stage of interrelation ensuring all-to-all type of communications in unstructured global information space

## Appendix II. Museum Stakeholders

### *Classification of Museum Stakeholders Subject to Museum Functions/Activities*

Activities	Supply	Demand
<b>Curatorial function</b>		
Acquisition	Academic researchers, museums, memory institutions, industrial clusters, regional clusters, public community, state, business community	Specialists, academic researchers, public community, state
Preservation	Specialists, support staff	Specialists, academic researchers, public community, state
Cataloguing	Specialists, academic researchers, regulatory bodies	Specialists, academic researchers, museums, memory institutions, industrial clusters, regional clusters
Museums, memory institutions, industrial clusters – as expertise providers		
<b>Professional function</b>		
Research and interpretation	Specialists, academic researchers, museums, memory institutions, industrial clusters	Specialists, academic researchers, museums, memory institutions, industrial clusters, regional clusters, public community, state
Participation in academic education and network	Specialists, administrators, support staff, museums, memory institutions, industrial clusters	Specialists, academic researchers, industrial clusters, regional clusters, state
Participation in museum education and network	Specialists, administrators, support staff, museums, memory institutions, industrial clusters	Specialists, administrators, support staff, museums, memory institutions, industrial clusters
Academic researchers, regulatory bodies – as expertise providers		
<b>Social function</b>		
Public education	Specialists, administrators, support staff, academic researchers, memory institutions, industrial clusters, regional clusters	Regional clusters, public community, state
Public entertainment	Specialists, administrators, support staff	Public community
Keeping the national cultural heritage	Specialists, administrators, support staff, academic researchers, museums, memory institutions, industrial clusters, regional clusters, regulatory bodies, state	State
Museums – as expertise provider; Industrial clusters, regional clusters – as public edutainment		
<b>Administration function</b>		
Administration	Administrators, support staff, regulatory bodies	Specialists, administrators, support staff
Industrial clusters, regional clusters, business community – as cooperation organizations		

## *Explanation of Stakeholders Groups*

### Museum personnel

- Specialists – museum personnel mainly working with the objects from the museum collections, such as curators, keepers, or restorators
- Administrators – museum personnel mainly engaged in management of the museum, such as directors, or heads of departments
- Support staff – museum personnel mainly fulfilling the technical needs of the museum, such as IT administrators, or accountants

### Professionals

- Academic researchers – professionals active in academic sphere related to one of the museum, such as biologists, archaeologists, or art historians
- Museums – other professional bodies of the same industry
- Memory institutions – memory institutions networked with the museum
- Industrial clusters – clusters uniting the institutions working in the same academic sphere as the museum

### Society

- Regional clusters – clusters uniting the institutions working in the same geographical area as the museum
- Public community – general public of the same geographical area with the museum
- Business community – business public of the same geographical area with the museum

### State

- Regulatory bodies – state institutions responsible for state policy administration in the museum administration
- State – abstract entity, representing government long-run policy in cultural heritage

### Appendix III. Museum Performance Indicators

**Note.** Introduction of units mentioned under *change-causing unit(s)* title causes change in indicator by facilitating the process the indicator controls; however, change in indicator might be caused by reasons other than IT, and, therefore, such a change cannot be exclusively treated as evidence of the specific unit introduction. The entries listed below represent a selection of general indicators measuring the museum performance; quasi-evaluation question should be referred for the individual transition control.

$$\text{Capacity utilization} = \frac{\text{Total annual attendance}}{\text{Area (sq.m.) of exposition accessible to the public}}$$

*Change-causing unit:* Visualisation (Digital exposition, Digital reality)

$$\text{Collection use} = \frac{\text{Number of collection objects exhibited}}{\text{Number of objects in collection}}$$

*Change-causing unit:* Visualisation (Digital exposition, Digital reality)

$$\text{Financial self-reliance of education} = \frac{\text{Education fees, grants, and restricted endowment income}}{\text{Education budget}}$$

*Change-causing unit:* Informatisation (Collection database, Several functional packages)

$$\text{Publicity effectiveness} = \frac{\text{Number of unpaid media exposures}}{\text{Total publicity budget}}$$

*Change-causing unit:* Interrelation (Unstructured global network, Global clustered network)

$$\text{General accessibility} = \frac{\text{Average number of hours open per week}}{\text{Average number of hours open per week other than 9am-5pm Monday-Friday}}$$

*Change-causing unit:* Interrelation (Unstructured global network, Global clustered network)

$$\text{Exhibit maintenance capability} = \frac{\text{Exhibit maintenance staff}}{\text{Exhibit area (sq.m.)}}$$

*Change-causing units:* Visualisation (Digital exposition, Digital reality), Interrelation (Global clustered network)

$$\text{Staff intellect to field} = \frac{\text{Number of advanced degrees}}{\text{Total staff financial total expenses}}$$

*Change-causing units:* Documentation (Structured data, Interrelated data), Informatisation (Collection database, Several functional packages), Interrelation (Clustered global network)

$$\text{Contribution to field} = \frac{\text{Number of external publications this year}}{\text{Total staff}}$$

*Change-causing units:* Documentation (Structured data, Interrelated data), Informatisation (Collection database, Several functional packages), Interrelation (Clustered global network)

## Appendix IV. Interview Designs

Note. Questions were planned in Russian, and translated in Latvian during all interviews.

### *Fieldwork in Ventspils Museum and Library*

The semi-structured interview questions set generation scheme was employed for every unit of information use following the transition description scheme developed during the theoretical examination of the model. The questions were planned to cover all chronological dimensions, i.e. past, present, and future development of an individual sub-unit. If relevant, the questions were asked without a reference to a highly probably answer awaited. Questions on inter-industry collaboration were focused on technical information standards, and issue of joint projects with VM, rather than on the transition description. Some questions were asked to find out the museum staff interpretation and implementation of the newest concepts, such as CRM, or knowledge society. In total the number of questions for semi-structured interviews covered all four units exceeded two hundred. The total number of staff interviewed was eight people in VM, one in Digitala Darbnica Ltd, and one in Ventspils Library.

The sample questions below are presented for every stage of the question set generation scheme. The sample questions on quality control are given in generalized form, as these questions remain unchanged for all units.

#### Sample questions of process definition

*Problem identification* is represented by the transition title; therefore, there were no questions generated in this subdivision.

#### *Determination of possible solutions*

How did you choose the classification schemes for collections, which do not have commonly accepted standards?

What was the purpose of making digital photos of the museum collection objects?

#### *Selection and design of the solution*

What was the reason to collaborate with "digital darbnica", not other company?

How did you develop the digital exposition concept? Who did what?

#### *Implementation of the solution*

How do you set up and launch the digital exposition after receiving it from "digitala darbnica"?

What is the software for maintenance of the on-line archive in the Ventspils Library database?

#### *Quasi-evaluation question*

Is it possible to use the digital photos for restoration of objects?

Is it possible to search for specific object in the card file catalogue if we do not know its inventory number?

#### Sample questions of resource planning

#### *Minimal resources to start the transition*

What do you need in order to attribute an object to a typological classification?

What resources did you have starting making the digital photos of collections objects?



*Technological park*

- What hardware and software do you use for maintaining of on-line archive?
- Does the digital exposition require somehow unusual computers?

*Limiting stage*

- What is the longest part of the classification process?
- What is the cause of the delay with making digital photos of all collection?

*Capacity*

- What determines the speed of the classification process?
- How long time does the digital photographing process take?

*Balance of capacities over the PERT/CPM network*

- If you do not classify the objects, what problems will arise?
- If the internal network does not function, what problems will arise?

Sample questions on process control*Stakeholder groups*

- Who will benefit from proper fulfilment of the process?

*Performance indicators*

- Is the process controlled by any numerical means (plans, indicators)?

Unclassified sample questions

- Why have you decided to make the digital exposition?
- Do you plan to make the digital photo archive of all the objects in all museum collections?
- Do you plan further digital exposition development to digital reality, virtual excursions, etc?
- Did the inventory cards appear from the very beginning of the documentation process in VM?
- On your opinion, is the information system in VM secure and reliable?
- How do you see the knowledge society in museums? In VM?

Sample questions to inter-industry

- What is currently done in framework of VM and Ventspils Library consolidation?
- What is necessary for the memory institutions consolidation process?
- What is the difference in use of NISO Z39.50 and NISO Z39.85 standards?

***Fieldwork in State Council of Museums***

The semi-structured interview questions were planned in order to clarify the state museum informatisation policy and level of computerization in different groups of Latvian museums, and, to learn about comparative development of every unit, and, if possible, subunit of information use. Several other questions were dealing with issues we found to be unclear during the case study, such as classification standards, or Conceptual Reference Model. Total number of questions exceeded forty; all questions were asked to one person.

Sample questions on general museum informatisation issues

- What is the state policy for IT and computers employment in museums?
- Is there any dependence between the type of a museum and level of IT employment there?

How big share of Latvian museums of each type use computers for museum-specific uses?

Sample questions on units/subunits of information use

How big share of Latvian museums have inter-object relation reference catalogue?

How big share of Latvian museums have functioning a digital exposition?

What is the involvement of Latvian museums in museum networks?

What is the involvement of Latvian museums in education activity?

Sample questions of other issues

Are there any collection classification standards in Latvia?

What do you know about Conceptual Reference Model? Is it used somewhere in Latvia?

***List of Persons Interviewed***

Ventspils Museum, November 25, 2003

- Dr.A.Vijups, Assistant Director for Scientific Work
- G.Damberg, Director
- I.Strumfa, Senior Curator
- A.Strumfs, IT Administrator
- S.Silina, specialist
- M.Davide, specialist
- L.Kamzola-Ozolina, painter
- V.Sproge, custodian

Ventspils Library, November 25, 2003

- M.Marcinkevica, Head of the Library, former Director of the Latvian Information Network Consortium of Latvia

Digitala darbnica Ltd, December 9, 2003

- J.Mitrevis, Director

State Council of Museums, Republic of Latvia, December 15, 2003

- Dr.J.Garjans, Director

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