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A Study of Larchiveum Data Model for the Design of Digital Heritage Museum[1]

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Abstract

This paper proposes an active preservation strategy that enables popular access to digital heritage through exhibition experiences, in the form on larchiveum. Also, it proposes a new form of museum and based on this, establishes a standardized cultural heritage archive data model strategy. In detail, we refer to not only the standardization rules of the Cultural Heritage Administration and the National Museum of Korea but also the data model rules of Europeana and ICOM, thereby allowing for the construction of an internationally understandable model.

Keywords: *digital museum, digital heritage, larchiveum, archiving, archive based exhibition*

1. Introduction

Since the 2000s, there has been worldwide recognition of the interest and need for the role and value of digital heritage, which promotes digital technology to excavate, record, distribute and share cultural heritage. Also, the need and public demand for a complex cultural facility to enable the viewing, experiencing and learning of digital heritage archive or digital contents in a new way, beyond mere preservation, has been dramatically increasing.

Accordingly, cases of digital technologies in recording and preservation of cultural heritage, contents creation and application, and online-offline integrated exhibition cases are increasing domestically. As the ripple effect and positive expectancy effect increase, the need to study and design a complex cultural facility that can more systematically carry this out is also increasing.

However, currently there is a pause at a level of selecting extremely limited information objects among digital heritage, developing and experiencing with exhibition contents in isolation. This study aims to discover a new direction to construct a digital heritage archive that is experienced through two-way communication with the viewer.

2. Digital Heritage Value Chain and Novel Exhibition

2.1. Digital Heritage Definition and Value

From 2000 and on globally, there have been changes of standards in relevant international organizations such as digitization of cultural heritage and the modification of the definition of museum. The UNESCO Executive Board in 2001 dealt with the issue of digital preservation

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drafted by the European Commission on Prevention and Access (ECPA) and released the Charter on the Preservation of Digital Heritage in 2003 based on this discussion[2].

In addition, the International Council of Museums (ICOM) adopted a plan to include intangible cultural heritage in the definition of museum at the General Assembly held in Vienna Austria in 2007, expanding the scope of museum collections. This decision built the groundwork for the appearance of a digital museum that collects, keeps, researches and displays intangible museum collections[3].

In September 2012, the Vancouver Declaration[4] was released after the conference on the topic of "The Memory of the World in the Digital age: Digitization and Preservation". This provided the turning point worldwide that pressed the world on the need for the digitization of cultural heritage and the importance of its sustainability, accessibility and preservation, and thus globally propelled the importance of digital heritage and its digitization.

Digital Heritage is the product of uniquely human intellect and expression. It encompasses digitally generated cultural, educational, scientific, administrative, technical, medical, and legal information. In terms of its existence forms, it not only includes originally analog cultural heritage converted into digital, but also those 'born digital', which would not have existed in any other form than digital.

In other words, one of the factors of the concept of digital cultural heritage includes the digital reproduction of pre-existing works. In this case, text, image and sound are included, but digital duplication often ends in reproducing the original heritage. Another factor includes the types of heritage that only exist in digital form, such as web sites, cyber museums, electronic publishing, multimedia, database containing cultural scientific data[5].

Currently the biggest problem of digital heritage is that the continuous preservation and diverse accessibility in the change of digital environment are not guaranteed. The issue of preserving digital heritage connotes several aspects that were irrelevant in existing cultural heritage. Therefore, digital heritage should take an approach different from what is used for existing relics in its preservation. This broadly implies the following three dimensions[6]:

Table 1. Three Dimensions for Preservation of Digital Cultural Heritage

	Preservation Process
Functions	Data: selection and storage (repositories, archives)
	Maintenance: conversion / migration / emulation
	Services: access and indexing
Actors	Originator (publisher, author)
	Stakeholders (e.g. professional societies, universities)
	Heritage institutions (museums, archives, libraries)
	Service providers

[2] http://portal.unesco.org/en/ev.php-URL_ID=17721&URL_DO=DO_TOPIC&URL_SECTION=201.html, This is a chapter that sets forth scope, access, risk of loss, need for action, protection of digital asset and UNESCO's role regarding digital asset as a public heritage.

[3] http://icom.museum/the-vision/museum-definition, It is a concept that broadly sees 'intangible' element and thus includes digital information.

[4] http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/mow/unesco_ubc_vancouver_declaration_en.pdf (2013. 4. 9)

[5] Abdelaziz Abid, Safeguarding our digital heritage: a new preservation paradigm, Preserving the digital heritage Principles and policies.

[6] John Mackenzie Owen, Preserving the digital heritage: roles and responsibilities for heritage repositories, Preserving the digital heritage Principles and policies

Funding responsibilities	Copyright holders
	Government (via heritage institutions)
	Users

One method of breakthrough is the strategy to utilize cultural heritage through the expansion of the active employment, supply, education through digital museums.

2.2. Issue of Preservation and Exhibition of Digital Heritage

Looking at digital heritage with the aforementioned issues under the premise, we can list four components. First, as digital as it may be, digital heritage nonetheless is a physical object in that it is contained in a computer disk or server. Second, it is a logical program such as algorithms understood by the computers and metadata models that promotes the user to use. Third, it is a conceptual understanding of the meaning and measure of practical use that arises when the user approaches. Fourth, it is a cultural code of the complex interaction of the above components.

When looking at such digital heritage as a single exhibit, it needs to be treated as the display of not individual information but of an aggregation (archive, database) of information with context. Thus, we can deduct that the museum itself inevitably is required a new form of display.

In other words, advancement of digital technology goes beyond the conventional way of either showing cultural heritages at the site in their original form or displaying individually selected ones. It now allows people to have new experience or even to create one by themselves.

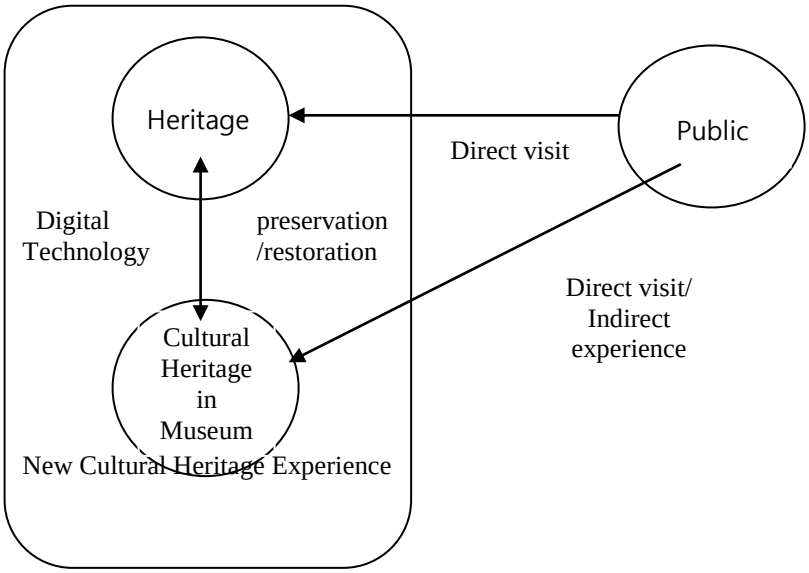

Figure 1. New Experience by the Public Thanks to Digital Technology Advancement

The advancement of digital technology extended the traditional role of museums for it to become an institution and space that services a broad sense of contents including heritage. As

an institution that manages and operates digital heritage contents, the museum needs to consider the following areas of services[7].

- Inter-operation: the sharing and compatibility of metadata and database
- Aggregation: the integration of contents on different databases into a single service
- Cross-search: the service enabling web search on multiple online resources
- Semantic search: the service enabling the search of meaning based on ontology
- Persistent identification: the equally continuous administration and update on identifiers for database compatibility
- Setup services: in the case of newly constructing services, the use of template and tool must be done based on open-source
- Stable platform: securing the stability of platforms
- Scalability: consideration for the growth of the amount of data
- Intellectual property rights and digital rights management: consideration for systematic administration over the intellectual property rights and copyright of data

The rapid development and dissemination of digital technology directly impacts the realm of cultural heritage. Accordingly, the role of digital technology increases in the value chain encompassing the search/study of cultural heritage and its application.

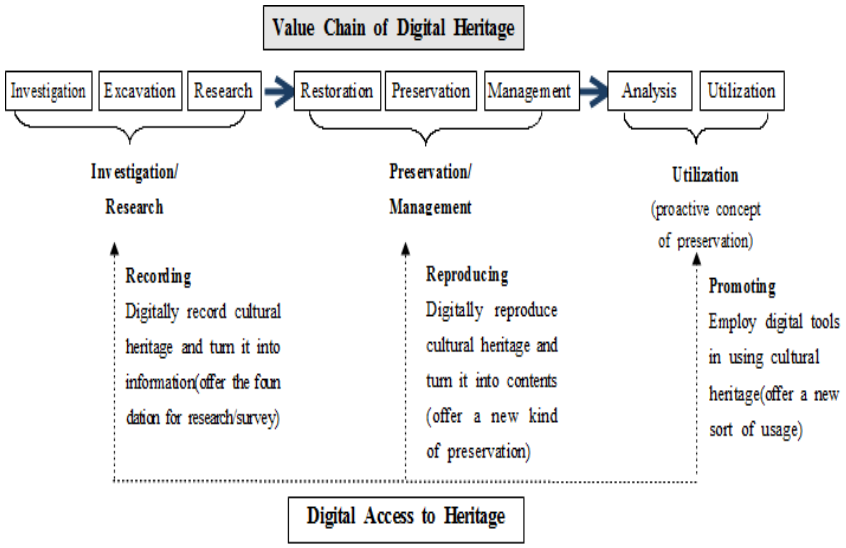

Figure 2. Value Chain of Digital Heritage

Digital technology is being applied in stages of the cultural heritage value chain as the expectation for utilizing digital resources for various purposes and creating value through the digitization of cultural heritage. The first stage of investigation-excavation-research is the informationization stage of digital heritage, in which cultural heritage must be re-encoded into the digital knowledge system. The second stage of restoration-preservation-maintenance necessitates the technology to reproduce secondary information or contents in the context of digital heritage information. The third stage of application-analysis necessitates the technology to utilize digital heritage in education, tourism, merchandize, and industry fields.

[7] DC-NET working group, Service Priorities and Best Practices for Digital Cultural Heritage(2011)

3. A New Strategy of Digital Heritage Exhibition: Larchiveum

3.1. Digital Museums and Digital Archives

Prof. Sakamura Ken who first used the term 'digital museum', asserted as its core embodying elements the following: construction of digital archive and overcoming of the barriers to museum viewing through the opening of the four exhibition elements (time, space, person, medium), experience through the five senses from multimedia presentation, tailored information provided through a personalized museum, dispersed construction of museums for the construction of an ultimately encyclopedic archive[8].

"Digital museum is not creating a virtual museum," mentioned elaborately by Professor Ken Sakamura, "it is rather focused on fully capitalizing on computer in museum in practice. So it is reinforcing the exhibition of actual collections via computer." (Digital Museum Ⅲ) He commented that digital museums contain the following three embodying elements.

(1) Database and archives: the factor that supports the historicity of digital museums; digital storage that enables information preservation and application, hypertext and cross referencing; foundation factor of smart exhibition.
(2) Contents: the factor that embodies the semanticity of digital museums; factor in which two-way interaction, personalization, experience of the five senses, and industrial creation of added value is possible; the operating realm of digital storytelling
(3) Internet: the factor that materializes the communicativeness of digital museums; factor that materializes real-time global communication and multisensory communication, and is the foundation of globally dispersed museums and global inter-museums.

Sakamura Ken believed that through the construction of digital archives, artifacts (cultural heritage) can be documented without loss, preserved permanently, and utilized effectively. He asserted that digital archives are the single practical way to document and preserve artifacts, and the construction of digital archives- by reducing the need to use the actual artifacts- protect artifacts, and simultaneously facilitate their effective use. This position is where the concept of larchiveum as a complex exhibition space can be introduced.

3.2. Archive-based Complex Exhibition Space: Larchiveum

Now it is necessary to review the model of complex exhibition based on such archives. In the setting for such needs we can consider the 20th century digital revolution. As all information was converted from analog to digital, museums, libraries and archives came to share information in identical form. The concept of Larchiveum, in which the functions of libraries, museums and archives were merged, was applied to digital heritage museums based on the virtuous cycle process of the cultural heritage value chain.

Larchiveum is a combination of library, archives and museum. It was first proposed by Professor Megan Winget of University of Texas at Austin as a new type of a multidisciplinary collecting institution. The idea is a multicultural institution that integrates the functions of the three traditional cultural information facilities and removes their duplications while adding

[8] Noboru Koshizuka, Ken Sakamura, 「Tokyo University Digital Museum」, 2000, pp.1-4. http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.33.7954, (2013.5.11)

new functionalities. She proposed it as an institution of a completely new dimension, that collects, manages and uses multiple, complex past and future materials[9]. According to current studies, the concept of larchiveum is a concept of convergence that originated from the sphere of library information science. Meanwhile, it can be said that discourse is made from a viewpoint of museum information science for MLA (Museum + Library + Archives). While the former discussion is centered on American archive researchers, the latter discussion is driven by British and Japanese museum researchers. So the difference between the two is who is the main information player. The best practices in this respect are as follows:

Table 2. Best Practices of Larchiveum

Country	Title	Details	Features
Canada	LAC(Library and Archives Canada)	Integrated the British Library and the National Archives Opened in 2004	Integrated library and archives
UK	Museums, Libraries and Archives Council (MLA)	Integrated the Museums and Galleries Commission and the Library and Information Commission in 2000. Consolidated archives functions later	Museum-centered library. Integrated archives
France (Nimes)	Mediatheque	Extended library functions (education service, citizens community, arts contents experience, festival event etc)	Expanded information delivery of a library
Japan (Sendai)			
Korea (Gwan gju)	Asian Culture Information Agency	Designed a facility in 2011 for the total collection and usage service of Asian cultural information (built Preparatory Hall in 2012)	Consolidated library, archives and electronic cultural map

[9] Kuzyk, R. (2008,6.30). LJ talks to Megan Winget, who studies preservation of online games. Library Journal, Retrieved from http://www.libraryjournal.com/article/CA6582968.html

Korea (An dong)	Gyeongbuk Creative Contents Agency	Opened a larchiveum equipped with reference library, interactive display and high-tech media hall in 2013	Small-scale contents library and citizens community
Korea (Sejong City)	Presidential Archives of Korea	A user-friendly independent multicultural center equipped with various cultural facilities like library, exhibition hall, research center	Reinforced archives-centric exhibition and research functions

In the end, it is proposed as a multicultural institution that integrates the functions of the three traditional cultural information facilities based on the identical digital information-styled foundation, removed with their duplications and added with new functionalities. She proposed it as an institution of a completely new dimension, that collects, manages and uses multiple, complex past and future materials.

The important concept of larchiveum above all stretches beyond the effective browsing and exhibition of digital heritage information and to designing the pivot of the enjoyment of cultural arts, the seeking of global communication, regional communities, and global network integration. If this concept applies to Digital Heritage Museum, We can design the functional space satisfying various audiences' demand by extending function of the exiting museum.

Reviewing existing research, from the traditional functions of the three facilities of the archive as the matrix in addition to the library and museum, we can draw the common function of the larchiveum and the basic conditions of future space design[10].

Table 3. Function and Space of Larchiveum

Function of Larchiveum	Detailed Function	Larchiveum Space
Integrative Services Information	Research, Aggregation, Documentation, Preservation, Accumulation	Archive
	Browsing, Searching	Library/ Ubiquitous
	Showcasing, Exhibition	Display, Museum
Promotion of Intellectual Contents	Public Education, Professional Education	Educational Space

[10] Young-sil Choi et al, 'Function planning of the larchiveum an integration of the library, archive and museum'(2013)

	Cooperative Research and Survey	Research Laboratory
	Content Creation and Provision	Studio, Ubiquitous
	User Created Contents (UCC)	
Extension of Cultural Utilization	Cultural Catalyst of Regional Information Dissemination	Community Space
	Sociocultural Enjoyment Experience	Theater, Performing stage, Gallery
	User Segmentation	Space for the young and disabled
	User Convenient Facilities	Restaurant, Convenience store
	PR activities support	Marketing-related space

Digital heritage archives become the setting of a display as big data that is gathered and built worldwide for preservation purposes. Various cultural contents experience and use can take place based on this. So a measure must be sought accordingly to establish archives in line with its long-term use strategy.

3.3. Strategies to Build Digital Cultural Heritage Archives

A clear archive design strategy has to be established to construct a larchiveum-type digital museum incorporating the characteristics of digital cultural heritage. In order to do so, we should examine a strategy of standardizing cultural heritage that will drive the compatibility of cultural heritage. Standardized integration of digital heritage assets would provide a synergy effect to the re-creation of added values for knowledge resources and offer physical infrastructure later for developing high-quality display contents.

Henceforth, we need to seek ways to construct archives accordingly with such functions and long-term utilization strategies of spatial strategies. In order to do this, we can establish a strategy in which digital heritage information resources are collectively managed as digital sets, and information is serviced in stages. Digital sets are composed of basic resource, process resource and interpretation resource.

- Basic resource: key resource that can directly explain and reproduce the pertinent cultural resource. For example, primary information object such as photos, videos, or music about the cultural resource.
- Process resource: resource that provides the expression behavior of the basic resource or provides the context for the production, collection and process of the

expression. It mainly refers to the investigation, research, records or contents about the pertinent cultural resource.

- Interpretation resource: academic, research records and contents resources on cultural resources that was formed outside of the cultural resource maintenance process.

Future use of archives is possible when digital resource production and management process by types of cultural heritage is specifically systematized. In parallel, mandatory provisions in each process must be established and become uniformed.

Next, it is necessary to develop a standard for the maintenance of digital heritage resources. A standardized system and process is needed in order to jointly access not only the proprietarily constructed information data of the digital heritage museum but also those possessed by the Cultural Heritage Administration and those to be obtained in the future.

Domestically, we adhere to the data classification system of the Cultural Heritage Administration and the National Museum of Korea, but there is a need to introduce an advanced model of cultural heritage information network that can be referenced in the process of designing a new data model for the application of digital museums in the future. Firstly we can refer to LIDO (Lightweight Information Describing Objects) and EDM (European Data Model). LIDO is an XML-based schema designed for cultural heritage information technology set by the International Council of Museums (ICOM)[11]. Information structure of LIDO is as follows[12]:

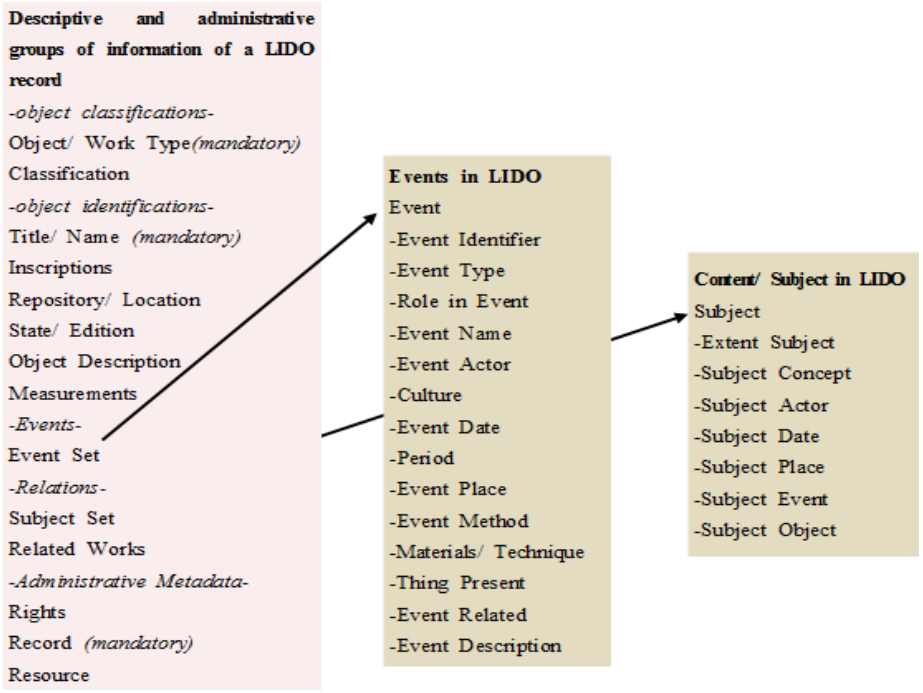

Figure 3. Information of a LIDO Record

[11] http://network.icom.museum/cidoc/working-groups/data-harvesting-and-interchange/what-is-lido/

[12] Lightweight Information Describing Object(LIDO) - The International Harvesting Standard for Museum, p.42, ATHENA WP3 Working Group(2010)

EDM is a semantic web and LOD-based data model used in Europeana, the European cultural heritage integration portal[13].

Further tasks to be regarded in the establishment of archive data models is the research on category-specific and device-specific display interface that restructures and reproduces information according to the demand of the viewers.

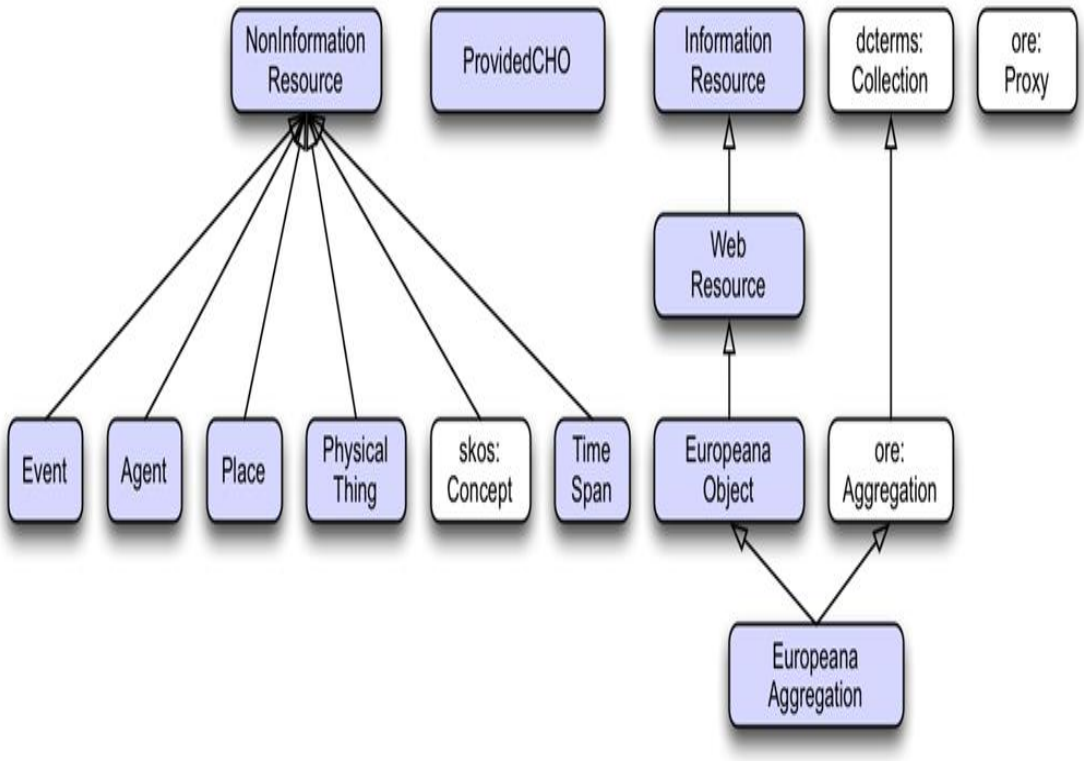

Figure 4. EDM Main Classes

4. Conclusion

We start from the premise that the digital heritage museum should differ from the strategy for exhibition of physical cultural heritage. We seek to systemize the information flow and content structure as a 'digital' heritage museum and thus enable more diverse experiences.

In that regard, the role of digital technology in a cultural heritage value chain in digital era and its foundation, informatization system give implications as to the direction and functionalities of a digital heritage cinema. It can be illustrated in the following diagram:

[13] Introduction to the Europeana Data Model (EDM), EUROPEANA v1.0 WP3, p.13.

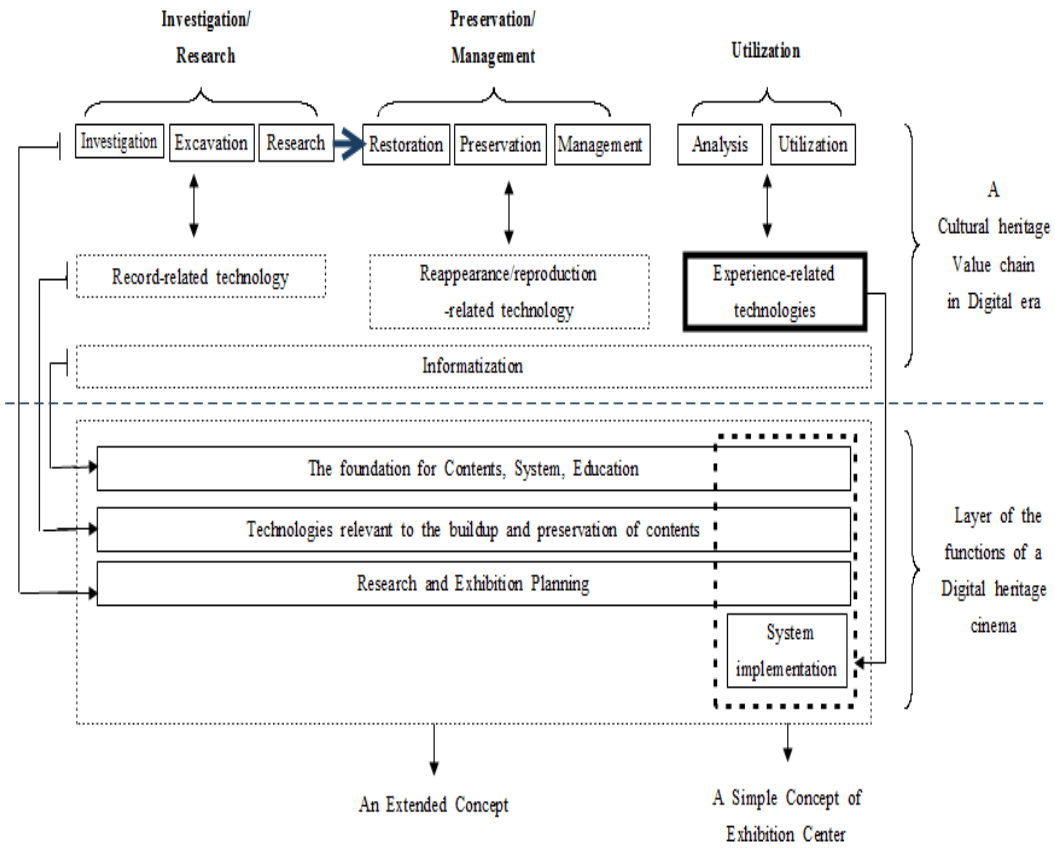

Figure 5. Diagram of the Relationships between a Digital Cultural Heritage Value Chain and Digital Cultural Heritage Museum Functions

Digital heritage museums need not be limited to the concept of exhibition through experiential technologies at the final stage of the cultural heritage value chain; rather, it needs to be recognized as an extended concept where informationization throughout the overall value chain becomes the basis for content construction, system operation, and education and, based on specialized research on each stage, exhibition planning, content construction and operation is accomplished.

Lastly we can extend the boundaries of digital heritage museum and develop it into the larchiveum form that aims for communication of analog-excavated research information, two-way experience and user-tailored education. This study accordingly advanced contemporary research that constructs the digital museum, adopts the larchiveum form to expand various experience forms, and establishes an informationization strategy for a complex cultural space that accommodates the possibility as an active education center.

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