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## FINNISH NATIONAL DIGITAL LIBRARY PUBLIC INTERFACE

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**Abstrakt:**

*Finská národní digitální knihovna (NDL) je národní projekt, který zlepšuje online přístup a použitelnost zdrojů digitálního kulturního dědictví ve sbírkách knihoven, muzeí a archívů ve Finsku, a to spojením služeb a sbírek těchto organizací do jednoho univerzálního uživatelského rozhraní zvaného Veřejné rozhraní.*

*Veřejné rozhraní je jednoduchý a efektivní nástroj pro heterogenní digitální zdroje. Architektura je založena na myšlence oddělit uživatelské rozhraní od servisních systémů. Principem je provádění katalogizace dat a digitálních objektů v servisních systémech, zatímco metadata jsou sklížena a indexována do Veřejného rozhraní pro snadné a rychlé vyhledání informací.*

*Při vyvíjení designu bylo důležitým faktorem právě porozumění rozhraní konečným uživatelem. U současných portálů často tento faktor chybí, proto je cílem Veřejného rozhraní vylepšit přístup k digitálním zdrojům zvýšením jejich použitelnosti.*

**Klíčová slova:** *digitální knihovna, architektura, infrastruktura, vyhledávání informací, uživatelské rozhraní, použitelnost, interoperabilita, digitální kulturní dědictví*

**Abstract:**

*The Finnish National Digital Library (NDL) project is a national project which improves online accessibility and usability of digital cultural heritage resources held by libraries, museums and archives in Finland by combining the services and collections of these organisations to a versatile user interface called the Public Interface.*

*The Public Interface is an easy-to-use efficient one-stop shop for heterogeneous digital resources. The architecture is based on the idea of separating the user interface from back-end systems. The operational principle is to keep cataloguing of data and digital objects in the back-end systems while metadata is harvested and indexed into the Public Interface for easy and fast information retrieval.*

*Understanding the end user needs has played a major role during the design process. Since the current portals are usually lacking in usability the aim of the Public Interface is to enhance accessibility of digital resources through high usability.*

**Keywords:** *Digital library, architecture, infrastructure, information retrieval, user interfaces, usability, interoperability, digital cultural heritage*

## **1 Introduction to the Public Interface**

The Public Interface is an easy-to-use and efficient one-stop shop for the digital resources of libraries, museums and archives in Finland. All digital resources on cultural heritage, research and teaching will be supplied to end-users as a single service. The service is based on end-users' needs and constitutes a comprehensive and versatile user interface, meeting end-users' expectations on fast and successful browsing for information. Authenticated end-users will have their own personalised services available anytime and anywhere.

Currently, the end-user has to use several different services when searching for information, and to be able to choose the right service it is essential to know which organisation is providing the information and which collection holds the desired resources. The Public Interface is intended as a replacement for current interfaces to enable users to find the information they need through one interface, irrespective of which organisation is providing the information. Instead of using several parallel interfaces, it will be possible to adopt a single front-end interface to back-end system services. Such back-end systems include library systems, archival systems and museum collection management systems, long-term preservation systems, a metasearch service and digital archives.

Improving the accessibility of the current systems represents a challenge. Since such systems encompass not only user interfaces but also other services, their development in a customer-oriented manner has been difficult. In the Public Interface, the operational principle is to keep the front-end service and the back-end systems separate from each other.

In contrast with the traditional metasearch (real time online search) common in most research portals, the Public Interface service is based on centralised indexing. The index based searches are fast, and the results can be arranged to suit the end-user's needs, for instance, by facets such as content type or organisation. Indexing is supplemented with real time metasearch from remote databases when necessary.

It will be possible to integrate the Public Interface into institutional web pages, portals and other systems. It will also be possible to integrate search functions into electronic learning environments, social network services and other e-Environments. Information retrieval services can thus be offered in customers own virtual working space. Organisations can modify the front-end services to offer various customised views for different user-groups and end-users will also have personalised services. The Public interface also provides social media functionality such as tagging and reviewing. The user interface is initially provided in three languages: The two official languages (Finnish and Swedish) and English.

The Ministry of Education of Finland launched the National Digital Library, NDL (Kansallinen digitaalinen kirjasto, 2008-2011) project<sup>1</sup> to improve online accessibility of information and usability of the digital cultural heritage material held by libraries, museums and archives, and to develop long-term preservation solutions. The project was funded by the Ministry of Education. A total of 35 organisations were involved in the project.

The National Digital Library and the European Digital Library Europeana are working in close collaboration. Collaboration ensures that the essential materials in Finnish libraries, museums and archives are available through Europeana and materials in Europeana can also be made available through the Finnish Public Interface.

The planning, procurement and implementation of the NDL Public Interface was completed in 2009-2011. The service is being piloted and should be in production by the end of 2011.

## ***2 Museum, Library and Archive Sectors***

The Finnish library network consists of libraries at higher education institutions (17 university and 26 polytechnic libraries), 20 regional libraries and 342 municipal libraries, 50 major special libraries, the National Library and the National Repository Library.

The National Archives and seven provincial archives comprise the National Archives Services subordinated to the Ministry of Education. Additionally, there is a large group of other administrative, special and private archives. A significant amount of essential cultural heritage is also preserved within collections of private and business archives.

There are three museums at the national level: the National Museum of Finland under the National Board of Antiquities, the Finnish National Gallery and the Finnish Museum of Natural History. Additionally there are 165 professional museums comprising of 22 provincial museums, 16 regional art museums, 14 national specialised museums and various municipal museums.

## ***3 End-user Needs***

The Public Interface End-user-groups include, for example: general public, professionals, the educational sector, artists, authorities and the media. Based on questionnaires, interview studies, usability tests and statistics made in recent years the end users are not satisfied with our current library, archive and museum systems

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<sup>1</sup> <http://kdk2011.fi/en>

and services<sup>2</sup>. Services should be organised in a more customer oriented way and easy to use.

In our experience, several IR-services in use require the customer to take a training course before they can use these services. Beside this they have to use many different user interfaces and they actually have to know which organisation is providing the service and collections. Commercial search engines are preferred to library search services, since the former are usually easier to use. The JISC findings on the Google generation stereotype also seem to suggest this<sup>3</sup>.

Due to heterogeneous user-groups, the Public Interface users have varied expectations and needs. But they do share some common expectations, such as usability, reliability, wide range of content and relevant search results. However, individual user-groups have specific needs that are not necessarily relevant to other user-groups. These may include, for example, easy integrability of commonly used network environments to the Public Interface, customisation of the service to meet their own preferences and the opportunity for social content production.

End-users have different information needs and motives to use the Public Interface. These include searching for specific information, getting a comprehensive picture of a given theme, or a desire for social interaction. A single user may use the Public Interface in several roles: between scientific searches, a researcher may get acquainted with materials relating to his leisure interests.

The basic idea behind the Public Interface design is to attain maximum accessibility and usability for end-users. Enhancing the electronic resource services will improve the prerequisites and the quality of research<sup>4</sup>.

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- 2 Lukkarila, S.: The Usability of the Nelli IR Portal in Supporting the IR –Process of Research – Nelli-tiedonhakuportaalin käytettävyys ja hyödyllisyys tutkimustyön tiedonhankinnan tukemisessa [in Finnish]. (2005)  
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  - Riikonen, J.: The Usability of the Nelli IR Portal in the Public Library Sector – Nelli-tiedonhakuportaalin käytettävyys ja hyödyllisyys yleisen kirjaston asiakkaan tiedonhankinnassa [in Finnish]. (2006)  
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  - 3 Information Behaviour of the Researcher of the Future. A CIBER Briefing Paper, JISC. (2008)  
<http://www.ucl.ac.uk/infostudies/research/ciber/downloads/ggexecutive.pdf>
  - 4 Vakkari, P.: Perceived influence of the use of electronic information resources on scholarly work and publication productivity”. In: Journal of the American Society for Information Science and Technology 59(4) pp. 602–612 (2008)

#### 4 Functional Principles – harvesting, normalising and indexing

Public Interface architecture is based on the idea of separating the user interface from back-end systems. This will make it possible to develop the front-end service independently and regardless of the development of the back-end systems. The front-end service will interact with the back-end systems via harvesting and web service open APIs.

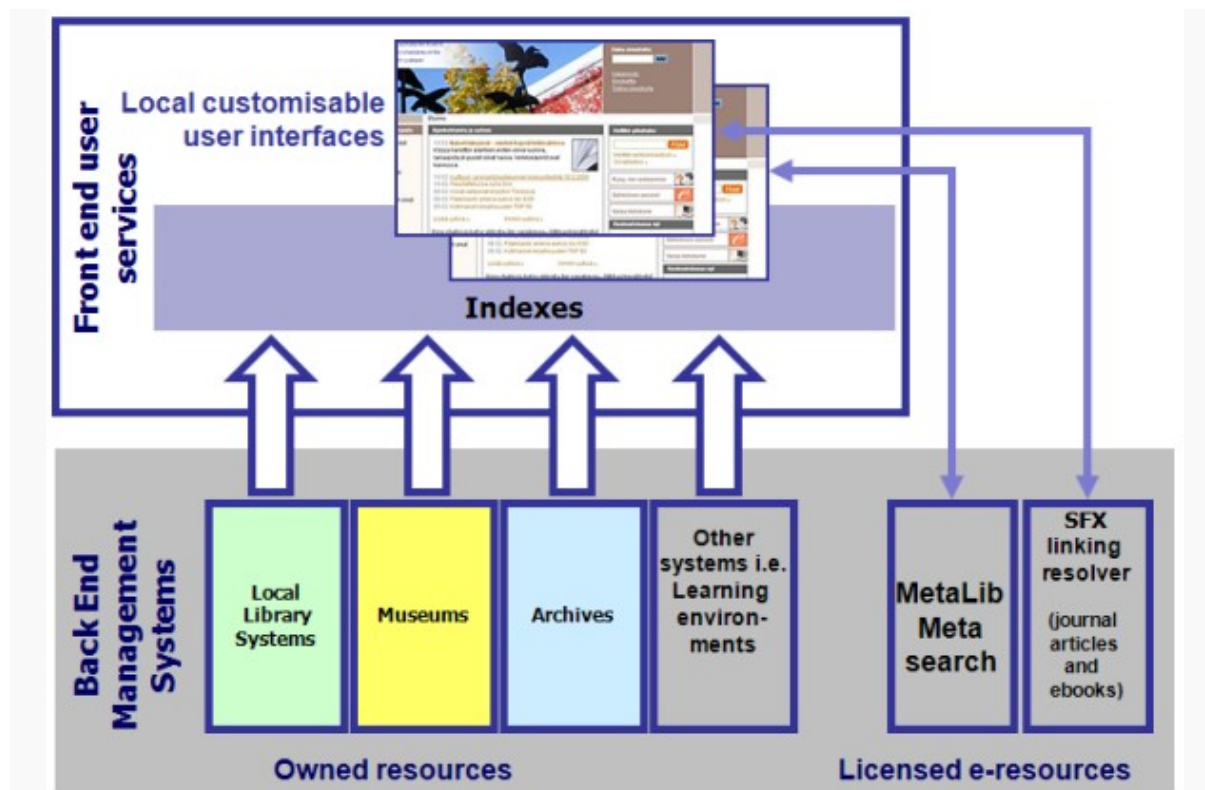


Fig. 1 Functional principle and architecture of the Public Interface; the user interface separated from back-end systems

The operational principle is to keep cataloguing data and documents in the back-end systems. Metadata is automatically harvested from the back-end systems, normalised and indexed in the Public Interface to enable easy and fast retrieval (Figure 2.).

Harvesting is based on standard interfaces, such as OAI-PMH, and additional interfaces can be built between different systems when necessary. In order for the searches to function, all harvested metadata must be normalised into an internal metadata format. The normalisation of all harvested metadata to a single internal format is a challenging task since the participating libraries, museums and archives use various standardised and non-standardised metadata formats which are extremely heterogeneous. Each different metadata format requires its own

normalisation schemas and rules. Even systems using same formats sometimes require their own normalisation rules because different cataloguing rules have been used. After the normalisation schemas and rules have been built for each individual format and system, harvesting and normalisation functions automatically and the index will be updated. Since the search index of the Public interface is up to date the customer can access the most current information content and services.

It is not possible to index licensed electronic materials, e.g. e-journals etc. due to licensing restrictions. Instead, licensed electronic resources will be used via a centralised hosted index. The Finnish libraries use Primo Central Index by Ex Libris for this purpose which is integrated into the Public interface. E-resources which cannot be indexed will be retrieved using metasearches (also called federated searches).

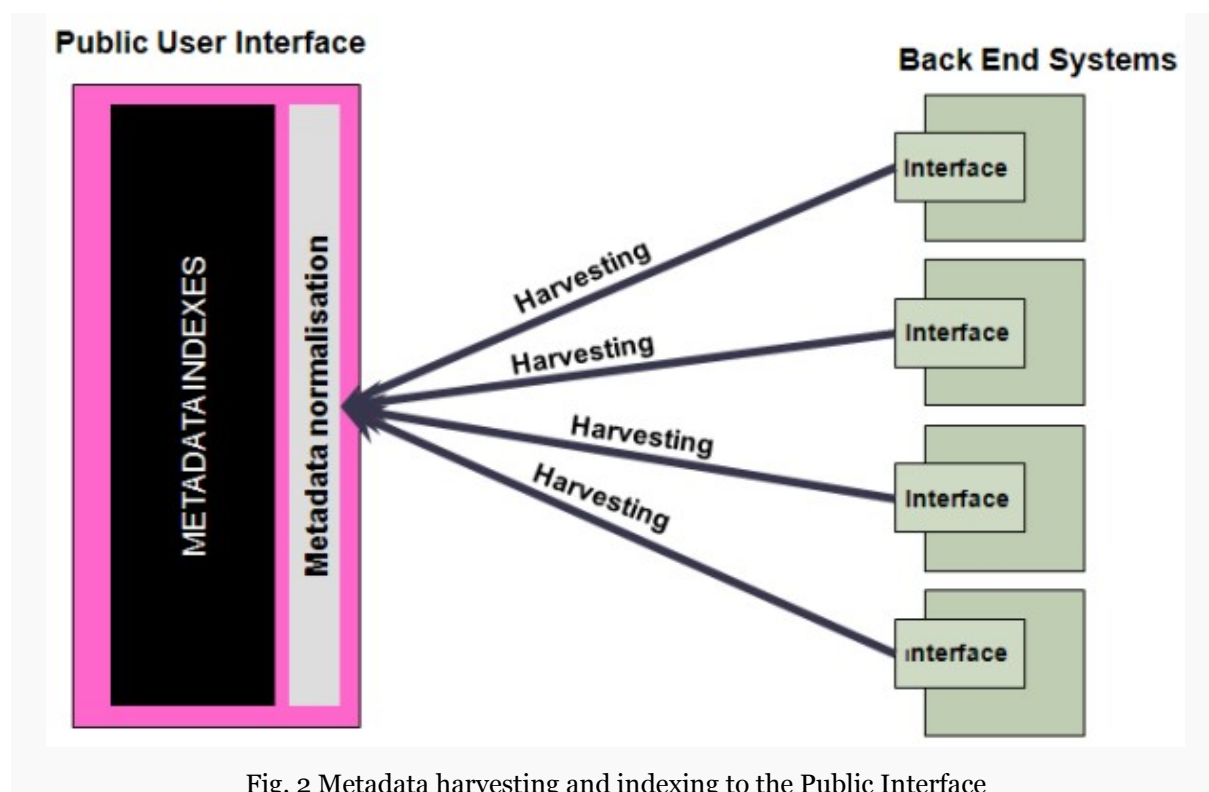


Fig. 2 Metadata harvesting and indexing to the Public Interface

### **5 Integration, Customisation and Authentication**

The Public Interface facilitates access to the diverse resources and services of libraries, museums and archives for research, teaching and other information acquisition.

Services provided by back-end systems (e.g. loan renewals and image and hold requests) are being integrated into the Public Interface but this requires separate APIs both on the front-end and the back-end systems (Figure 3). We expect these

features to conform to the DLF's ILS-DI specifications<sup>5</sup>. Other external third party services can also be integrated into the Public Interface. Records can be enriched via book cover images from Google Books and LibraryThing and customers can create reference lists with an integrated reference management tool (RefWorks, Zotero etc.). Records and record lists can also be exported to virtual learning environments.

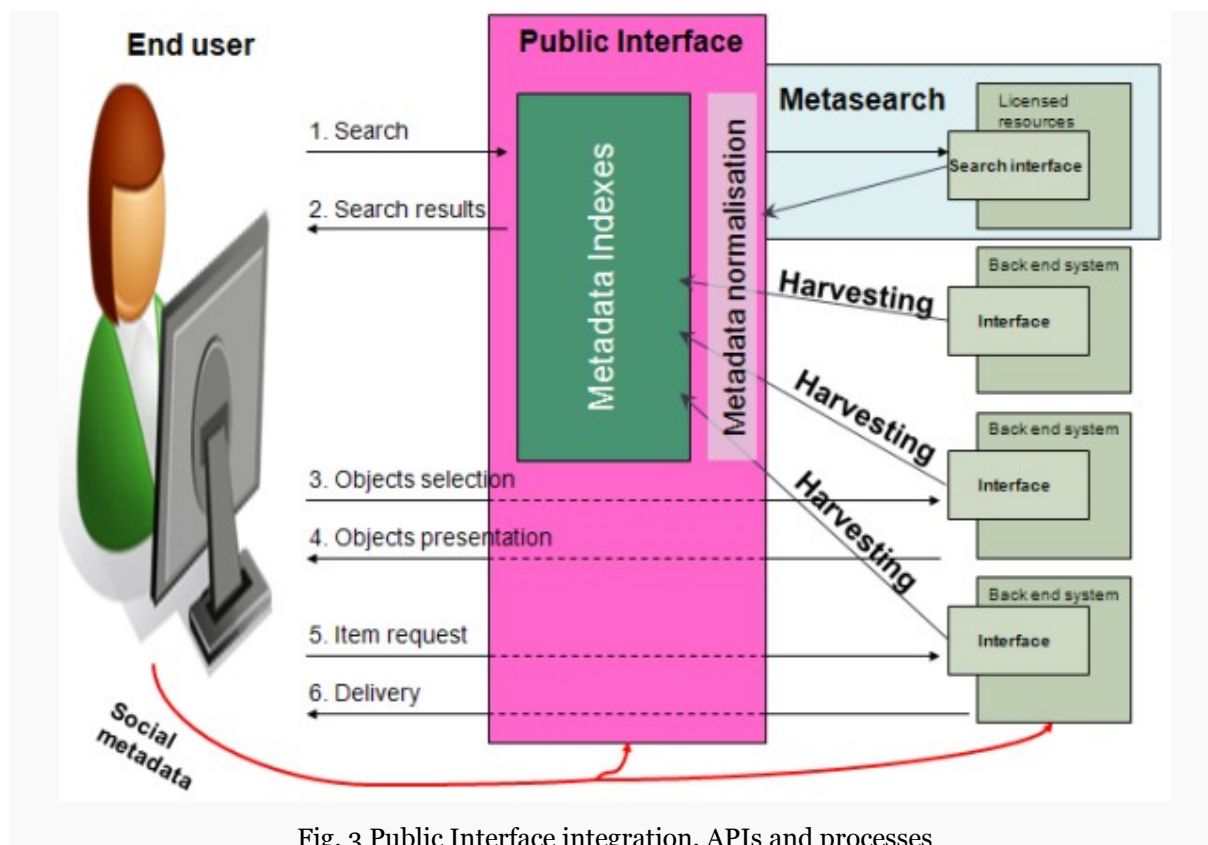


Fig. 3 Public Interface integration, APIs and processes

Organisations will continue to be responsible for the production (acquisition, licensing and digitisation), cataloguing and management of their own digital resources in their own back-end systems.

There is a single installation of the software with institution-specific views. Institutions will be able to customise the Public Interface for their own unique requirements – they can add and organise their own resources and impress their brand by logos and colours. Accessibility has been taken into account by implementing the Web Accessibility Initiative recommendations.

The Public Interface can be integrated with the everyday working environment of the end-user (e.g. virtual learning environments and other network applications). The

5 <http://old.diglib.org/architectures/ilsdi/>



services of the Public Interface can be reached through the learning environment by providing direct access to the resources.

The Public Interface can utilise existing and future infrastructures, such as authentication, the online payment system, the Ask a Librarian service, and research infrastructures.

There are three levels of user identification in the Public Interface: anonymous use without requiring the user to log in, weak identity (e.g. OpenID) and strong identity authentication service that can verify the end-user's identity.

The current and future authentication and authorisation infrastructures will be used: HAKA<sup>6</sup> national authentication federation at higher education institutions, VIRTU<sup>7</sup> for authenticating public administration officials, and VETUMA<sup>8</sup> for authentication and payment system for ordinary citizens. The project follows closely the Finnish Ubiquitous Information Society projects and the development of the future national federation networks.

## **6 Contents of the Public Interface**

The content available through the Public Interface consists of the digital resources of libraries, museums and archives. Content can be digitised or born-digital objects (images, texts, sound files, video clips, e-publications) or reference data on physical objects (e.g. artefacts, museum objects, books, works of art, geographical locations) or other reference data stored in databases.

The Public Interface provides unrestricted material for all users. It also provides restricted access materials subject to user authentication, such as licensed materials (e.g. e-journals), archive materials with restricted viewing and use, legal deposit copies and other materials subject to copyright. Each organisation is responsible for ensuring that their materials made available via the Public Interface are used in accordance with copyright.

The use of unrestricted material on the Public Interface does not require user authentication while the various types of restrictions placed on restricted content are managed through user authentication.

The service will initially contain 50 million database references, hundreds of thousands of museum objects and photographs, more than 1.3 million newspaper pages, over 20,000 scientific journals, over 300,000 e-books, hundreds of thousands

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6 <http://www.csc.fi/english/institutions/haka/index.html>

7 [http://www.vm.fi/vm/fi/04\\_julkaisut\\_ja\\_asiakirjat/03\\_muut\\_asiakirjat/20080421Virtu/01\\_virtu-saml-20080418.pdf](http://www.vm.fi/vm/fi/04_julkaisut_ja_asiakirjat/03_muut_asiakirjat/20080421Virtu/01_virtu-saml-20080418.pdf)

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of documents and several million pages of digitised archive materials. The service content will grow through future acquisitions and their digitisation.

### **7 *Services of the Public Interface***

The Public Interface is a one-stop shop allowing end-users direct access to the resources of libraries, museums and archives. Search functions are the framework of the Public Interface into which other services are integrated. A simple Google-type search (free text search) provides an easy way for the end-user to get started. Customers are able to limit the search by collection, archive and organisation, focusing the search on the selected targets. Queries can be refined by subject or time period, for example, allowing the user to sort the query results and find the relevant documents from the massive amounts of data.

Depending on the material, the end-user is provided with different navigation paths from reference data to full texts, images, videos, availability data of physical materials (e.g. books), image requests etc. The metadata can be enriched during the harvesting and normalization process and the search results can be enriched with data retrieved from external sources, such as book cover images or tables of contents. The end-user may see a thumbnail image, and having seen it he may decide to order a high-quality digitised image from the museum. It is also possible to integrate other types of services supported by the back-end systems with the Public Interface. The Public Interface connects the right kind of back-end services depending on the reference retrieved.

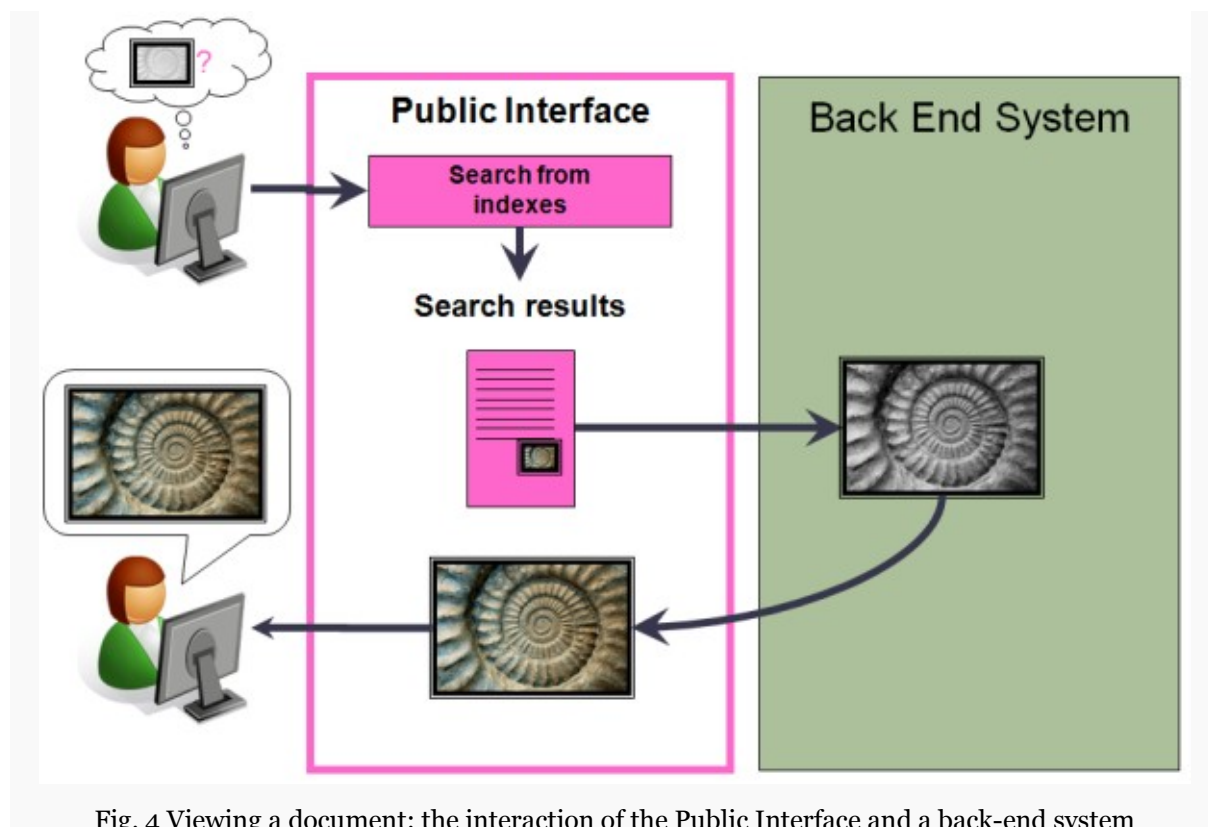


Fig. 4 Viewing a document: the interaction of the Public Interface and a back-end system

The Public Interface provides direct access to multiple services that have traditionally been accessed through separate collection management systems or library systems in different organisations. In libraries, these services include the renewal of loans and holds, and fee handling. In museums, the corresponding functions are the electronic purchase of a permission to use a copyrighted photograph. As for archives, the end-user could, for example, submit an electronic request to gain access to restricted archive material. With one login and single authentication throughout the Public Interface the end-user has access to several accounts and services in different organisations.

These services are usually produced in the back-end systems. The aim is to integrate these services so that the end-user gets them through the Public Interface, but the actual technical implementation of the service remains in the back-end systems (service through APIs). Actually the customers do not even realise when they are using front-end services or back-end services – the customers only see the public interface which delivers these services.

A use case example of an integrated service: an end-user does a query using the Public Interface and requests photographs from a museum, and then orders and pays them through an integrated online payment service (a back-end system service and third party service integrated through an API).

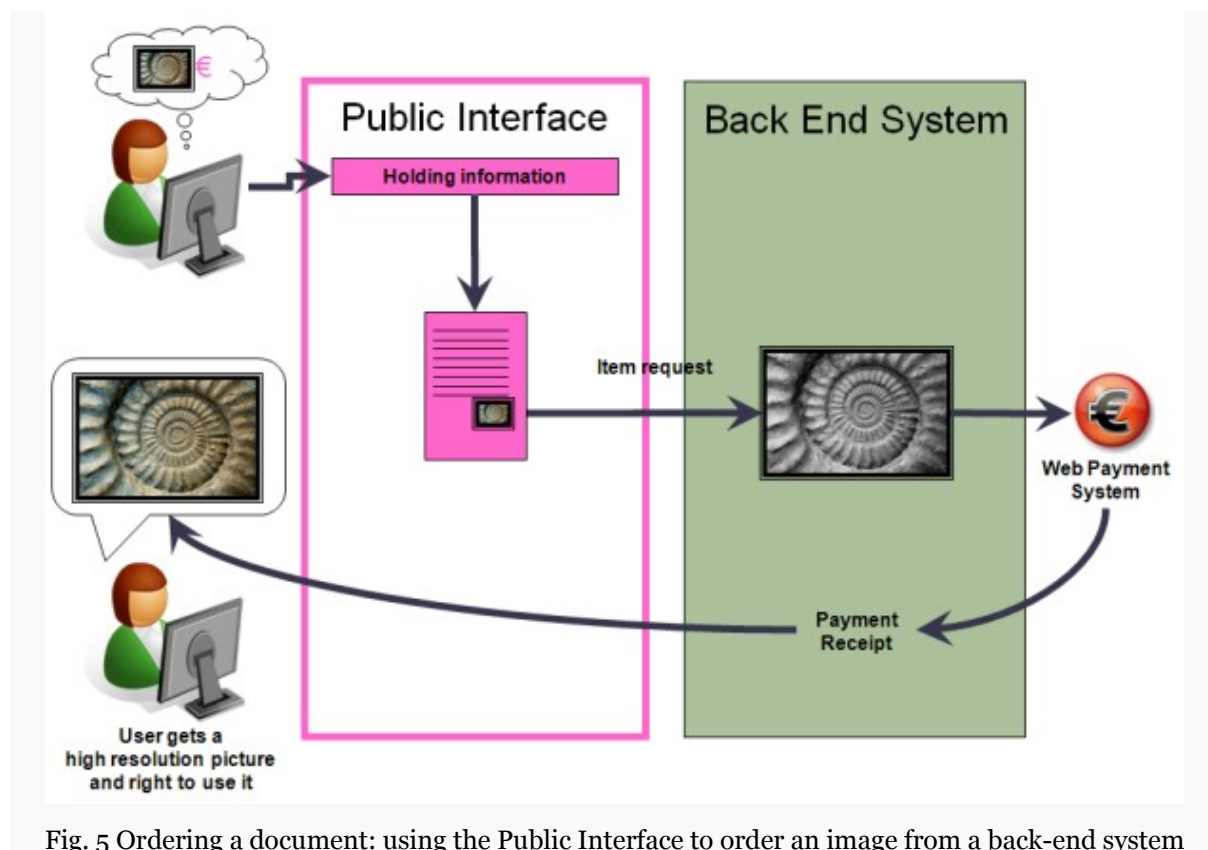


Fig. 5 Ordering a document: using the Public Interface to order an image from a back-end system

End-users can enrich the metadata in the Public Interface by adding comments, reviews and tags to a record. Such social metadata can be used to support the retrieval functionality and selection and recommendations of references. By analysing end-user behaviour, the Public Interface service will be able to provide suggestions and alternative references in search results. End-users can also provide the organisations with additional information and feedback on organisations' cataloguing data concerning possible defects or errors in the metadata. This social data production will provide continuous improvement to the reliability and value of the metadata. It will also be possible to use the metadata of the public interface in other services, and to import social metadata from other systems.

## 8 Conclusions

The National Digital Library is an exceptional nationwide project and first of its kind in Finland, since it is a co-operative undertaking and provides the combined services and collections of the Finnish museums, archives and libraries for everyone through one versatile user interface. In our opinion, the Public Interface is a real one-stop shop. During the development all three sectors have embraced co-operation and

worked together to provide users a comprehensive new service to answer their information needs.

Understanding the end user needs and expectations has played a major role during the design process. Current portals are usually lacking in usability. Thus, our aim is to enhance the accessibility of resources through high usability. Using the Public interface service will be effortless since it can be localised to suit the varying needs of heterogeneous user groups. Available views of the user interface can be tailored to provide desired services, resources and automatic functionality for handling and analysing the search results and related services. The aspect of social media has also been taken into account by providing the users the possibility of improving the content by adding social metadata.

Accessibility and high usability improve information retrieval and the use of personal working environment of researchers, students and the general public and will increase the access and visibility of online cultural heritage materials.

The focus of this project is initially on the traditional text information retrieval of resources. In the future we envision the development of additional IR functionality to the Public interface. Possible future functionalities could be a CLIR (Cross Lingual Information Retrieval) solution between Finnish, Swedish and English<sup>9</sup> and CBMR (Content Based Music Retrieval) tools, such as those developed in the Finnish C-BRAHMS project<sup>10</sup>: future services that answer the ever-changing customer needs even better.

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<sup>9</sup> Hedlund & al. 2000

<sup>10</sup> <http://www.cs.helsinki.fi/group/cbrahms/>

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