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DESIGN RESEARCH IN THE DIGITAL ERA

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Digital Transformation

Displaying open cultural collections. Interface characteristics for effective cultural content aggregators

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Abstract

In recent years, cultural heritage institutions, such as museums and libraries, are introducing several strategies to enhance access to their collections. The digitization of extensive cultural collections and their release under open licences are fostering the creation of cultural content aggregators, namely Web platforms funded by non-profit organizations to converge digitized cultural collections from multiple cultural institutions. Cultural content aggregators, such as Europeana and Wikimedia Commons, aim to support scholars, writers and artists in their research, dissemination, and artistic activities.

Although cultural content aggregators are adopting performative technologies and rigorous sharing methods, their user interfaces have several usability issues. Thus, part of the digitized heritage seems invisible to the end-user, as if it were a sort of digital depot.

This paper adopts a research through design approach to investigate interface solutions that may foster access, navigation and use of digitized cultural objects within cultural content aggregators.

Introduction

Galleries, libraries, archives and museums (GLAMs) have been digitizing and providing access to their collections for years. This digital transformation is primarily due to the physical limitation of exhibition spaces and the request for remote access to digitized collections by users. Several information systems have been developed in this context to allow users to search and access the catalogue of cultural collections. Recently, cultural institutions

are also releasing part of the digitized cultural objects under open licences to increase usage and awareness of cultural collections.

The availability of open cultural collections – together with richer metadata – is fostering the development of Web-based applications providing digital access to resources that are physically disconnected. These cultural content aggregators, such as Europeana and Wikimedia Commons, mainly address students, scholars and writers (journalists and bloggers) who need digitized artworks for educational, research, artistic or dissemination purposes. Unfortunately, the existing cultural content aggregators have several usability issues. Hence, access to digitized collections is limited.

This paper explores interface characteristics that may foster access, navigation and use of digitized cultural objects – in particular, images – on cultural content aggregators. The aim is to provide guidelines for the design of cultural aggregators. The research question is the following: which interface characteristics can foster access, navigation and use of open digital collections? I conducted a detailed review of the literature, and related studies have been carried out, alongside stakeholders and end-user research, to answer this question.

Open collections and cultural content aggregators

Nowadays, one of the primary responsibilities of a cultural heritage institution is to promote scientific research and education. Several GLAMs are digitizing part of their collections and releasing the related digital surrogates with open licences[1].

The use of open licences – even for a small percentage of digital surrogates – brings several opportunities, such as increased visibility of the cultural institution – as both a resource for a specific cultural sector and distinctive brand identity – and an increase in possible collaborations with other partners using open licences.

The release of digitized collections is also fostering their use by organizations and ordinary people. In addition to common uses – such as reproduction on digital and paper supports – there is the remix, precisely the graphical elaboration of one or more digital surrogates to endow them with new meaning and value. The "remix culture" dominates the 2000s. It is present over multiple cultural sectors, and uses fusions, collages and mashups (Manovich, 2007).

[1] Most of the cultural institutions releasing digital surrogates adopt Creative Commons (CC) and Public Domain (PD) licences.

Finally, the release of digitized collections is fostering the development of cultural content aggregators. A cultural content aggregator is a repository that stores multiple digitized collections contributed by cultural institutions and by the user community. Content aggregators were conceived – by initiatives of non-profit organizations – to facilitate the discoverability of collections. A content aggregator aims to promote crowdsourcing, education and entertainment across multiple collections.

A survey conducted by me among users of cultural content aggregators indicates that the primary audience is made up of journalists, Web writers, bloggers, scholars and volunteers of online communities. The final goal of the users of content aggregators is to find high quality images provided with relevant information and few usage restrictions. The content aggregator audience not only visualizes and shares digitized objects but also uses digital copies to make derivative artworks.

A study of the digitized Tropenmuseum collection on Wikipedia shows that only 10% of the images from the cultural collection is used within Wikipedia articles (Borowiecki and Navarrete, 2016). The other images are ignored. The usage pattern of digitized surrogates presents a long tail where few items are most popular, and the majority of the content remains obscure (fig. 1). Thus, popular items drive the attention of end-users towards certain content, despite others.

Wikipedia articles containing Tropenmuseum digital surrogates

Number of
cultural objects

Cultural collection
Tropenmuseum (category Images from the Tropenmuseum)

Aggregator
Wikimedia Commons

Period
April 2015

Number of Wikipedia articles
(0.3% of the total)*

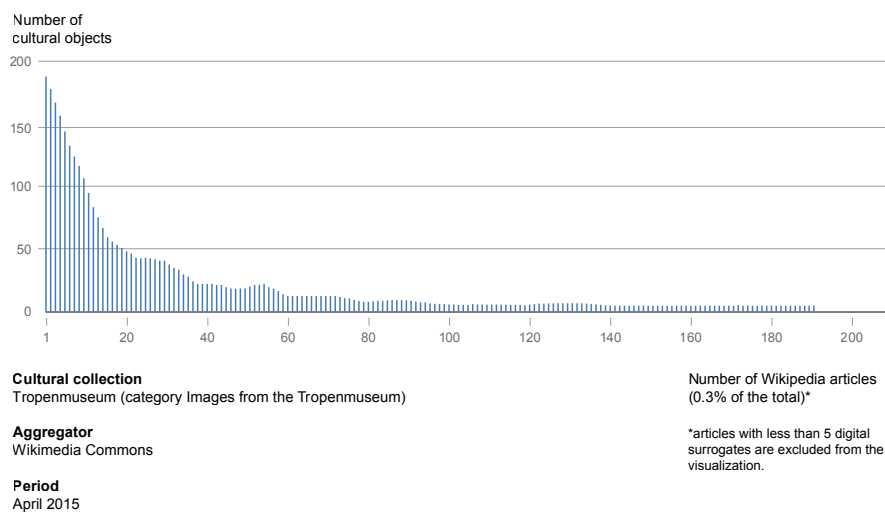*articles with less than 5 digital surrogates are excluded from the visualization.

Fig. 1 – Usage pattern of the Tropenmuseum collection on Wikipedia articles (redesigned by the author).

An in-depth analysis of the literature and of the existing cultural content aggregators reveals that most of them have several usability issues. These reduce the possibility of accessing digitized collections. In this context, design can play an essential role in facilitating access and use of the digitized collections.

Methodology

The thesis defines guidelines to design cultural content aggregators that foster access and usage of digital surrogates. I adopted a research-through-design approach to achieve this goal.

Analysis

The analysis consists of the literature review, stakeholders' interviews and case study analysis. The literature investigates two domains: Information Science (IS) and Digital Humanities (DH). To develop the design project, I also reviewed papers related to the use of cultural content and the building of online communities.

After gathering a theoretical background from the literature review, I interviewed several people working for cultural institutions, including librarians, curators and a digital archive manager. I also interviewed people working and volunteering for Wikipedia. The aim was to gather general information on the cultural heritage system and stakeholders' needs.

The case study analysis aims to identify the features of existing European cultural content aggregators. Every case study is selected according to the following requirements: collect digital images and provide users with a graphic user interface. Fourteen case studies were selected based on these requirements (tab. 1). The goal of the case study analysis is to identify the fundamental interface features of cultural content aggregators.

I investigated three fundamental aspects of the selected cultural content aggregators: access, navigation and use. First, in the access modes analysis, I analyzed interactive tools to access digital surrogates. Then, in the navigation analysis, I used methods from the literature review (Kreiseler *et al.*, 2017) to examine connections among pages of content aggregators and all the navigation tools. Finally, in the usage analysis, I analyzed all the interface tools to organize, edit and share digital surrogates.

Tab. 1 – List of the European cultural content aggregators examined.

Name	Website
Archives Portal Europe	www.archivesportaleurope.net/
Culture Grid	www.culturegrid.org.uk/
Deutsche Digitale Bibliothek	www.deutsche-digitale-bibliothek.de/
The European Film Gateway	www.europeanfilmgateway.eu/
EUscreen	www.euscreen.eu/
Europeana	www.europeana.eu/portal/en
Hispana	hispana.mcu.es/es/inicio/inicio.do
Kultur Pool	www.kulturpool.at
Moteur Collections	www.culture.fr/Ressources/Moteur-Collections
SearchCulture	www.searchculture.gr/aggregator/portal
Swiss National Library	www.helveticarchives.ch
The European Library	www.theeuropeanlibrary.org
The National Library of Finland	www.kansalliskirjasto.fi/en
Wikimedia Commons	commons.wikimedia.org/wiki/Main_Page

User research

The user research consists of a survey of cultural content aggregator end-users and the design of a cultural content aggregator.

I conducted the survey to investigate reasons and methods to access content among people who often use cultural content aggregators. The survey is an ethnographic study consisting of a list of questions about the user experience. It is based on literature about Web usability (Krug, 2000) and the System Usability Scale (SUS) (Bangor *et al.*, 2008), a set of questions to measure the usability of an interactive system. I used the survey and the previous analysis to draft a set of design guidelines that may foster access, navigation and usage of digitized collections.

The design of a cultural content aggregator interface is based on a high quality prototype. The design project aims at validating the draft of design guidelines. I used an online survey to gather feedback on the design project. The survey includes open and closed questions about the user's personal information, interface features and other usability aspects.

Synthesis

I defined a set of guidelines for the design of cultural content aggregators. They synthesize the knowledge acquired through research in three main aspects (regarding access, navigation and use). The goal of the design guidelines is to provide designers with instructions on how to encourage access and use of cultural content within cultural content aggregators.

User interfaces for open digitized collections

A cultural content aggregator must provide end-users with tools to access, navigate and use digital surrogates. The following paragraphs show all the tools adopted by European cultural content aggregators.

Accessing collections

The growing volume of content combined with the pressure of time and money makes the need to improve findability of digital surrogates a critical issue (Morville, 2005). Content aggregator user interfaces generally provide end-users with tools to access the collection – on the homepage – and tools to narrow and expand the search in terms of results and single item pages. Literature review and the analysis of cultural content aggregators reveal that access tools belong to three access modes: search, browse and explore (fig. 2). Search mode refers to a search engine that allows users to ask for information by submitting a query. Browse mode refers to several labelled tools that allow users to navigate among content. Explore mode refers to interactive visual representations of metadata collections, such as all authors, places and dates. The main issue related to the access tools is the lack of "generous interfaces", interactive tools that provide users with rich overviews and foster serendipity (Whitelaw, 2012; Whitelaw, 2015).

Tools for searching content were introduced in the '80s as a way to help users answer questions (Bates, 2002) and support decision-making (Fidel, 2012). They consist of both simple and advanced search boxes. Search tools require basic knowledge of the collections and best suit end-users who already know what to look for. Since the search process generates several results, it requires further filtering operations.

Tools for browsing content were also introduced in the '80s. However, the browsing strategy was identified several years before computers began

to be used for information retrieval (Fidel, 2012). Browsing tools consist of several interactive elements, including the list of categories (usually presented through image thumbnails), tag cloud and index of content. These tools require a certain amount of time to reach the content of interest. Hence, they are more suitable for users who do not have a specific goal to accomplish.

Tools to explore content were introduced in the '90s as a set of visual displays to facilitate the visual search mode. At the core of the exploration tools, we find the idea of engaging users (Stiller, 2014) by first providing an overview of the collection, and then presenting the items in detail (Shneiderman, 1996). Exploring tools are mainly 2D or 3D visualizations and visual filters to display and access collection metadata. Visualizations can use both temporal visual models (such as timelines) and non-temporal visual models (including maps, networks and plots) (Windhager *et al.*, 2019).

Since one single visualization of the collection might not be enough to explore every collection's dimension, content aggregators usually make use of multiple views (Dörk *et al.*, 2017; Drucker, 2013; Andrienko *et al.*, 2007).
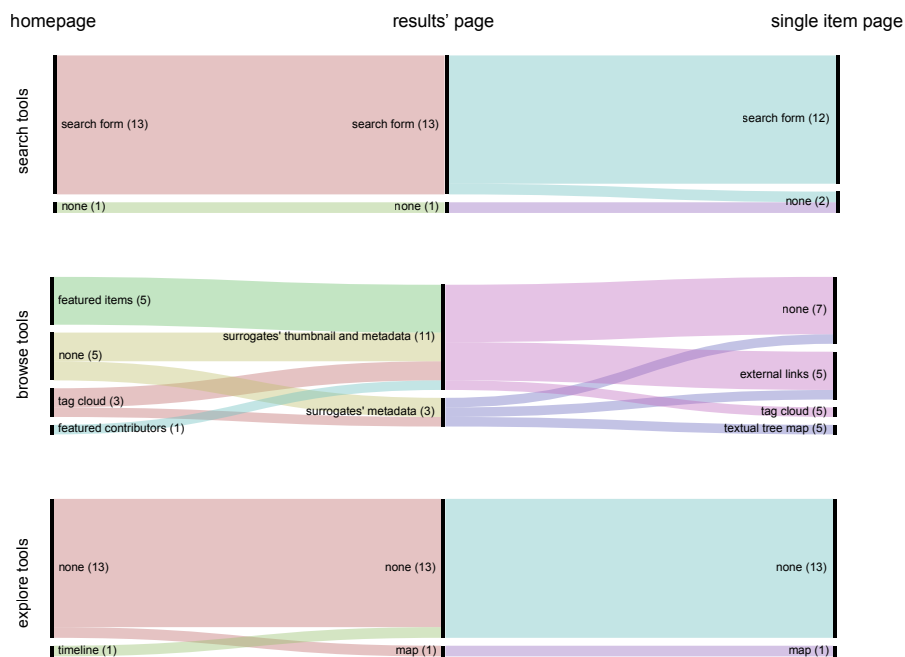

Fig. 2 – Sankey diagrams showing the access tools of a selection of European cultural content aggregators.

Navigating collections

One of the main goals of cultural content is to allow the user to easily navigate among collections. Cultural content aggregators adopt very simple information architecture. This consists of three main pages: the homepage, featuring some digital surrogates, the page with the list of results requested by the user, and the details page. The homepage generally provides all the tools required to explore the collection. The results' page provides the tool to narrow the exploration, and the details page provides the tools to continue the exploration. From the benchmark of European cultural content aggregators, we can identify four typologies of navigation tools. They help end-users to navigate among pages, within a page, within collections and among related content (fig. 3). The main issue related to the access tools is the lack of tools to navigate among digital surrogates.
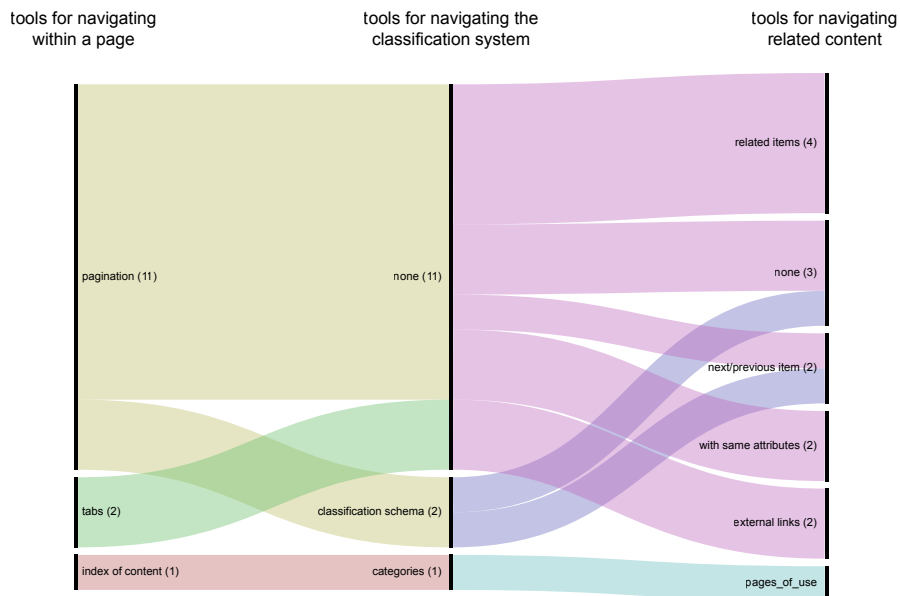

Fig. 3 – Sankey diagram showing the navigation tools of a selection of European cultural content aggregators.

Tools to navigate among pages are the conventional Web navigation tools, which include the menu, the arrow to go back to the previous page, and the breadcrumbs[2].

[2] Breadcrumbs are a navigation tool indicating the navigation path from the homepage to a specific internal page.

Tools to navigate within a page are used in the results page. They allow end-users to rearrange digital surrogates. These tools include page layout – an interface element that splits the retrieved surrogates into discrete pages – and the list/grid dropdown menu – an element that allows end-users to choose the visual layout.

Tools to navigate the collections are interactive elements that allow the end-user to visually navigate the collections' categories. These tools mainly consist of the classification tree and the list of categories.

Tools to navigate related content allow end-users to continue the exploration of similar items. These tools include the panel with related surrogates.

Using collections

The final aim of cultural content aggregators is to provide end-users with meaningful, high quality images to be used in their studies and publications, and related tools to manage them. From the benchmark of cultural content aggregators, we can identify four typologies of tools, which allow usage of digital surrogates: editing, organizing, generating and sharing tools (fig. 4). The user mainly accesses these tools on the page containing the single image. Unfortunately, most of the content aggregators do not provide enough tools.

Tools to edit content enable users to edit metadata of items or to propose an edit. They consist of online forms, which users can fill in with more accurate or new information. The use of these tools allows ongoing collective improvement of the content.

Tools to organize content allow users to either group or save items. These tools can serve as classification tools or as a bookmarking tool. Classification tools refer to interactive elements that allow the creation of a folksonomy. Bookmark tools refer to interactive elements that allow the creation of personal collections of items. Aggregators use these tools in the form of bookmarks, favourites, watchlists and collections.

Tools to generate content refer to the opportunity to generate, within content aggregators, articles based on the digitized collections. User-generated content not only enhances access to cultural collections but also fosters the discovery and the investigation of new topics.

Tools to share and download content consist of panels containing links to share an item on social networks or other external websites and to download it. Aggregators also containing bibliographic items may provide users with information for citations and with the text-based file format.
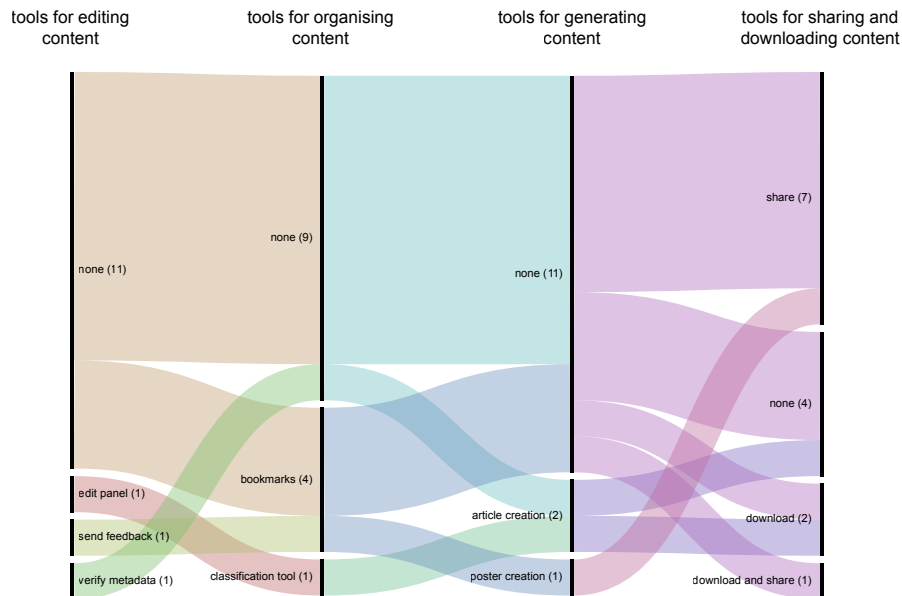
Fig. 4 – Sankey diagram showing the tools to use collections of a selection of European cultural content aggregators.

Designing a cultural content aggregator

I designed a cultural content aggregator to evaluate interface characteristics that might foster access, navigation and use of digital surrogates. Called GLAM Culture Hub (GCH), it is a high fidelity interactive mockup[3] featuring content from both Wikimedia Commons (the ETH-Library collection) and Europeana (fig. 5). It aims at providing users with useful tools for access, navigation and use of digital surrogates. In particular, by applying a draft of design guidelines that erase the previous analysis, it attempts to fix some of the issues of the existing cultural content aggregators.

Regarding the current access issues, due to the lack of rich overviews, GCH coherently integrates tools belonging to three access modes: search, browse and explore. The search box is available on the top of every page. A chart combining two visual models appears in the entire catalogue, on the homepage, and in the individual collections on the GLAM pages. Interactive browsing elements are present on every page.

[3] GLAM Culture Hub is an interactive mockup made with Invision, a prototyping Web application.

GLAM Culture Hub   News   GLAMs   About

Christian Müller
ETH-Bibliothek

Explore, share and use open cultural collections from all around the world

all fields ▾   aviation   🔍   search options

800.000

600.000

400.000

200.000

0

1640 1660 1680 1700 1720 1740 1760 1780 1800 1820 1840 1860 1880 1900 1920 1940 1960 1980 1990

↑ Period ▾   ↻   ↓ Author ▾

Werner Friedl	203.012

Max MArkwalder	13.012
Jack Metzger	13.452
Hans Gerber	12.434
Camille Ruf	12.532
Emis Gassier	12.532
Franz Diethelm	12.022

Walter Mittelholzer	160.421

Others	16.135
G. Nigg	15.342
Johannes Meiner	13.469
Jean Gut and Cie	12.242
Martha Wehrli	10.903
Sigfried Wehrli	10.352
Leonard von Matt	10.689

Leo Wehrli	123.032
Unknown author	13.433
Johannes Barbieri	13.355
Emil Zimmerli	12.012
Max Meier	11.244
Wolf Bender	10.235
B. Streiff	9.242
W. Zollkofer	8.557
Philipp Link	7.789

Featured items

Bassersdorff
Swissair Photo AG
#airplane #city #landscape

Bassersdorff
Swissair Photo AG
#landscape #ground #colors

Ausschnitt Klöti
Swissair Photo AG
#portrait #blackandwhite #hat

Abessinienflug
Walter Mittelholzer
#hourse #man #africa

Schulrates portrait
Rudolf Ganz
#portrait #oldman #sepia

Abessinienflug - monkey
Walter Mittelholzer
#monkey #africa #blackandwhite

Fig. 5 – Detail of the GLAM Culture Hub homepage.

Regarding the current lack of navigation tools, GCH adopts several types of tools, including panels to navigate the various types of related content.

Finally, regarding the current lack of tools to use the collections, GCH introduces a form to propose edits, and adopts a bookmark system.

GCH also adopts some interface features that have already been introduced on other generic content aggregators, digital archives and Web applications. These features include the horizontal bar containing filters to provide more space to the surrogates (existing cultural content aggregator display filters in a column) and several types of featured items.

A set of 18 people interacted with GCH and answered an online survey about their user experience. Subjects were aged 25-64 years, and all of them had attained a Master's Degree. They were professionals working for cultural institutions (33%), designers (33%), photographers (11%) and other professionals (11%). Questions that included textual responses were converted into a range of values ranging from 1 (not useful/disagree) to 5 (extremely useful/strongly agree) to facilitate result analysis.

The GCH survey detected a general appreciation of design by users. The access tool considered the most useful is the search form. It was deemed extremely useful by 43% of respondents (with an average of 3.1/5). Browsing tools recorded an average of 2.4/5, while explorer tools recorded an average of 2.3/5. Regarding features that allow users to navigate content, it emerges that it is particularly important for content aggregator end-users to navigate among similar items. The navigation tool considered most useful was the adoption of favourite items (2.2/5).

The survey detected that content aggregator users need easy-to-use tools to organise, edit and download collections. The respondents of the survey liked the downloading panel (3.1/5), the forms for suggestions (2/5) and editing, and the form to add tags to the picture (2/5).

Design guidelines

A set of design guidelines has been defined, following the GLAM Culture Hub design and the collection of feedback from end-users. Guidelines are a tool to support the design of cultural content aggregators. In particular, they aim to foster access, navigation and use of digital surrogates.

Guidelines are meant to suggest design strategies to be adopted to meet end-user needs. Their implementation can positively impact on the activities of cultural institutions, communities and end-users.

Providing several access points

The research shows that only one access mode for collections is not sufficient. This is because end-users have a different level of knowledge of the platform and goals. Thus, a cultural content aggregator should allow users to access digitized collections, from distinct and maybe unfamiliar viewpoints (Thudt et al, 2012), through an integrated model consisting of search, browse and explore tools (fig. 6). Information architecture should be based on three main interconnected page templates: the homepage, the list page and the surrogate page. The homepage must provide access tools belonging to the three modes. The list page features the results according to a user request. Thus, it should provide direct access tools to narrow the user's search (search tools). The surrogate page features a single item, and it should provide access tools to expand the search (explore and browse tools).

Since search tools provide direct access to content, they must be placed in a prominent position. Explorer tools can remain on a secondary level, but they may require a vast space. Tools to browse the content can have a secondary role as well, and be spread over the user interface. Both tools belonging to the search and explore mode may need textual or visual filters to narrow the search. These filters may be shared among the two modes.

In the proposed integrated model, tools belonging to different access modes can coexist within a unique access tool.
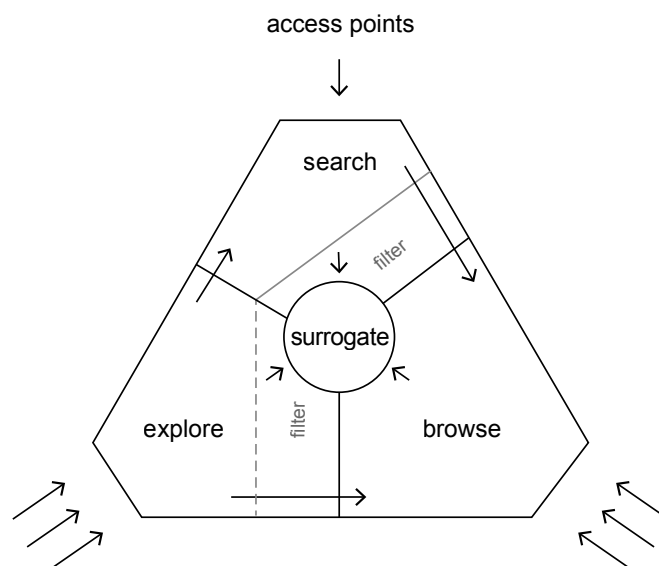

Fig. 6 – Diagram of a proposal for an integrated access model.

Making connections among content

The GCH survey shows that content aggregator end-users need to navigate among similar items while rapidly looking for surrogates. Thus, navigation tools may cope with this requirement by visualizing relations among items. Due to the complexity of relationships (fig. 7), there are several ways to display their connections. We can split the strategies into two levels: the general level – related to the overall set of surrogates – and the detail level – related to a single item. The aim of both levels is to foster the collection's exploitability.

In the general level, the design should reveal relationships among all contents. Interactive tools should allow the creation of sets of surrogates according to their attributes, such as sets of items grouped by place, author, date and subject. The homepage should feature a network as a visual model to show the connections among surrogates. The interface might also provide end-users with tools capable of generating new connections among surrogates.

In the detail level, the user interface should encourage pivoting. Interactive elements should allow users to move between sets of items, which share the same attributes. For instance, metadata values can become a query for a new search. The "related items" are some of the most common interactive elements to continue exploring the collection. Looking into the details, other possible design solutions to foster pivoting might be the use of surrogates over multiple pages through the creation of user-generated content, and the integration of content from other related and relevant online sources.
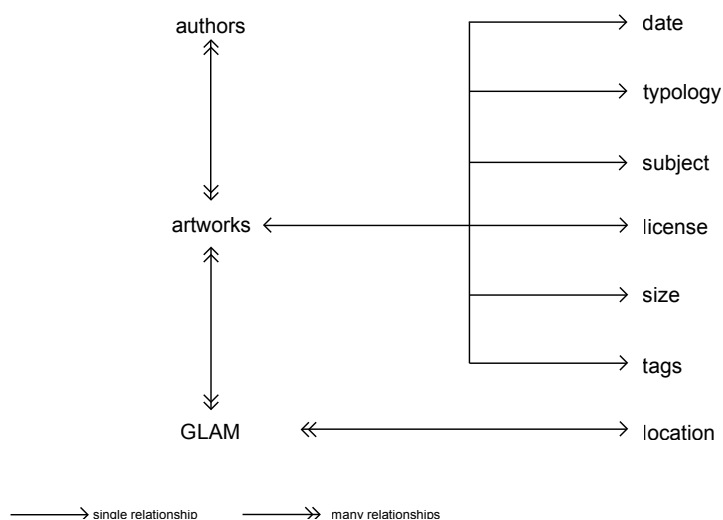

Fig. 7 – Diagram of relationships among surrogate metadata.

Support the use of surrogates

The user research shows that the end-users of content aggregators need easy-to-use tools to organise, edit and download items. Cultural content aggregators should be considered as working tools. Thus, the design of the content aggregator should provide users with tools that both allow and guide the use of digital surrogates (fig. 8). Regarding the individual item, the interface must feature elements that allow users to rapidly understand, share and download the surrogate. Related information may include where the artwork was used, such as temporary or permanent exhibitions and author biographies. Concerning the collection, the interface must provide users with bookmarking tools that allow the management of sets of surrogates. These tools aim to allow users to organize content for future usage. Bookmarking tools should make it easy to add personal notes to single or multiple surrogates, add labels to multiple sets of items, aggregate elements and eventually provide batch download options.
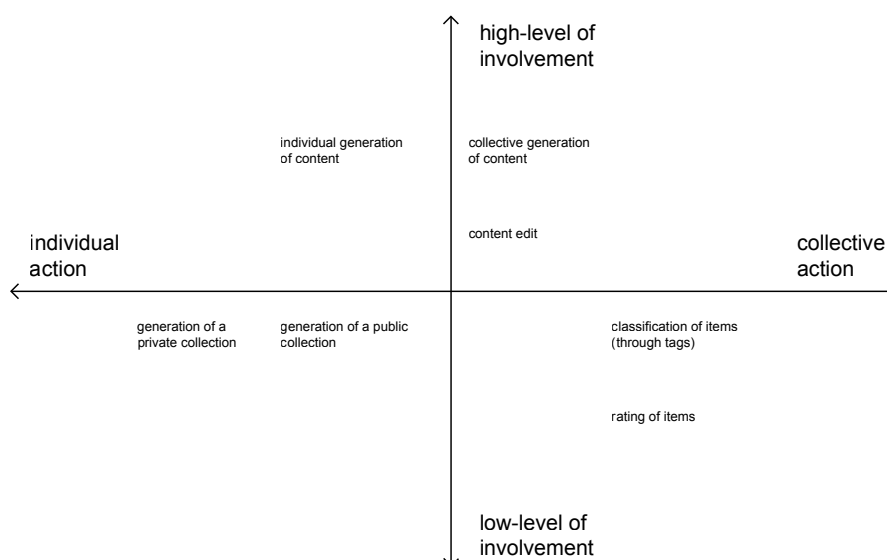

Fig. 8 – Diagram of the possible actions users can perform within a cultural content aggregator.

Conclusions

The research showed that providing users with multiple access points and visual models showing the connections among surrogates may increase the use of digitized collections within cultural content aggregators. The proposed

guidelines provide designers with design strategies to facilitate surrogate access and encourage the use of content. They can also provide designers with useful tips to redesign current cultural aggregators. The design guidelines are not meant to be the final outcome of the research on cultural content aggregators but, instead, an open document that can be further developed.

A limitation of the guidelines is that they have not been validated through a redesign of the cultural content aggregator. However, each guideline is based on multiple evidence that emerged from the literature review and from in-depth empirical research.

Future works related to the research include validation of the design guidelines through a new design project and dissemination within the design and GLAMs communities. Furthermore, I intend to expand the research on design practices to foster spreading and usage of open cultural collections.

In conclusion, opening cultural collections and technological advancement is leading to reconceptualization of cultural content aggregators. The design of these platforms should be based on real end-user needs. Cultural content aggregators should not be considered static searchable databases but dynamic research and dissemination tools.

Acknowledgements

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Windhager, F., Federico, P., Schreder, G., Glinka, K., Dörk, M., Miksch, S., and Mayr, E. (2019). Visualization of cultural heritage collection data: State of the art and future challenges. *IEEE Transactions on Visualization and Computer Graphics, 25*(6), 2311–2330.

Finally, the release of digitized collections is fostering the development of cultural content aggregators. A cultural content aggregator is a repository that stores multiple digitized collections contributed by cultural institutions and by the user community. Content aggregators were conceived – by initiatives of non-profit organizations – to facilitate the discoverability of collections. A content aggregator aims to promote crowdsourcing, education and entertainment across multiple collections.

A survey conducted by me among users of cultural content aggregators indicates that the primary audience is made up of journalists, Web writers, bloggers, scholars and volunteers of online communities. The final goal of the users of content aggregators is to find high quality images provided with relevant information and few usage restrictions. The content aggregator audience not only visualizes and shares digitized objects but also uses digital copies to make derivative artworks.

A study of the digitized Tropenmuseum collection on Wikipedia shows that only 10% of the images from the cultural collection is used within Wikipedia articles (Borowiecki and Navarrete, 2016). The other images are ignored. The usage pattern of digitized surrogates presents a long tail where few items are most popular, and the majority of the content remains obscure (fig. 1). Thus, popular items drive the attention of end-users towards certain content, despite others.

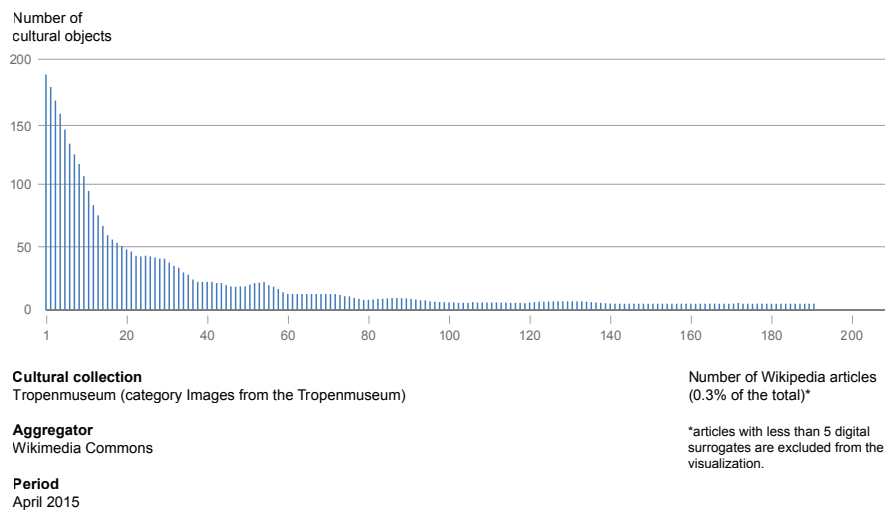Wikipedia articles containing Tropenmuseum digital surrogates

Cultural collection
Tropenmuseum (category Images from the Tropenmuseum)

Aggregator
Wikimedia Commons

Period
April 2015

Number of Wikipedia articles
(0.3% of the total)*

*articles with less than 5 digital surrogates are excluded from the visualization.

Fig. 1 – Usage pattern of the Tropenmuseum collection on Wikipedia articles (redesigned by the author).

An in-depth analysis of the literature and of the existing cultural content aggregators reveals that most of them have several usability issues. These reduce the possibility of accessing digitized collections. In this context, design can play an essential role in facilitating access and use of the digitized collections.

Methodology

The thesis defines guidelines to design cultural content aggregators that foster access and usage of digital surrogates. I adopted a research-through-design approach to achieve this goal.

Analysis

The analysis consists of the literature review, stakeholders' interviews and case study analysis. The literature investigates two domains: Information Science (IS) and Digital Humanities (DH). To develop the design project, I also reviewed papers related to the use of cultural content and the building of online communities.

After gathering a theoretical background from the literature review, I interviewed several people working for cultural institutions, including librarians, curators and a digital archive manager. I also interviewed people working and volunteering for Wikipedia. The aim was to gather general information on the cultural heritage system and stakeholders' needs.

The case study analysis aims to identify the features of existing European cultural content aggregators. Every case study is selected according to the following requirements: collect digital images and provide users with a graphic user interface. Fourteen case studies were selected based on these requirements (tab. 1). The goal of the case study analysis is to identify the fundamental interface features of cultural content aggregators.

I investigated three fundamental aspects of the selected cultural content aggregators: access, navigation and use. First, in the access modes analysis, I analyzed interactive tools to access digital surrogates. Then, in the navigation analysis, I used methods from the literature review (Kreiseler *et al.*, 2017) to examine connections among pages of content aggregators and all the navigation tools. Finally, in the usage analysis, I analyzed all the interface tools to organize, edit and share digital surrogates.

Tab. 1 – List of the European cultural content aggregators examined.

Name	Website
Archives Portal Europe	www.archivesportaleurope.net/
Culture Grid	www.culturegrid.org.uk/
Deutsche Digitale Bibliothek	www.deutsche-digitale-bibliothek.de/
The European Film Gateway	www.europeanfilmgateway.eu/
EUscreen	www.euscreen.eu/
Europeana	www.europeana.eu/portal/en
Hispana	hispana.mcu.es/es/inicio/inicio.do
Kultur Pool	www.kulturpool.at
Moteur Collections	www.culture.fr/Ressources/Moteur-Collections
SearchCulture	www.searchculture.gr/aggregator/portal
Swiss National Library	www.helveticarchives.ch
The European Library	www.theeuropeanlibrary.org
The National Library of Finland	www.kansalliskirjasto.fi/en
Wikimedia Commons	commons.wikimedia.org/wiki/Main_Page

User research

The user research consists of a survey of cultural content aggregator end-users and the design of a cultural content aggregator.

I conducted the survey to investigate reasons and methods to access content among people who often use cultural content aggregators. The survey is an ethnographic study consisting of a list of questions about the user experience. It is based on literature about Web usability (Krug, 2000) and the System Usability Scale (SUS) (Bangor *et al.*, 2008), a set of questions to measure the usability of an interactive system. I used the survey and the previous analysis to draft a set of design guidelines that may foster access, navigation and usage of digitized collections.

The design of a cultural content aggregator interface is based on a high quality prototype. The design project aims at validating the draft of design guidelines. I used an online survey to gather feedback on the design project. The survey includes open and closed questions about the user's personal information, interface features and other usability aspects.

Synthesis

I defined a set of guidelines for the design of cultural content aggregators. They synthesize the knowledge acquired through research in three main aspects (regarding access, navigation and use). The goal of the design guidelines is to provide designers with instructions on how to encourage access and use of cultural content within cultural content aggregators.

User interfaces for open digitized collections

A cultural content aggregator must provide end-users with tools to access, navigate and use digital surrogates. The following paragraphs show all the tools adopted by European cultural content aggregators.

Accessing collections

The growing volume of content combined with the pressure of time and money makes the need to improve findability of digital surrogates a critical issue (Morville, 2005). Content aggregator user interfaces generally provide end-users with tools to access the collection – on the homepage – and tools to narrow and expand the search in terms of results and single item pages. Literature review and the analysis of cultural content aggregators reveal that access tools belong to three access modes: search, browse and explore (fig. 2). Search mode refers to a search engine that allows users to ask for information by submitting a query. Browse mode refers to several labelled tools that allow users to navigate among content. Explore mode refers to interactive visual representations of metadata collections, such as all authors, places and dates. The main issue related to the access tools is the lack of "generous interfaces", interactive tools that provide users with rich overviews and foster serendipity (Whitelaw, 2012; Whitelaw, 2015).

Tools for searching content were introduced in the '80s as a way to help users answer questions (Bates, 2002) and support decision-making (Fidel, 2012). They consist of both simple and advanced search boxes. Search tools require basic knowledge of the collections and best suit end-users who already know what to look for. Since the search process generates several results, it requires further filtering operations.

Tools for browsing content were also introduced in the '80s. However, the browsing strategy was identified several years before computers began

to be used for information retrieval (Fidel, 2012). Browsing tools consist of several interactive elements, including the list of categories (usually presented through image thumbnails), tag cloud and index of content. These tools require a certain amount of time to reach the content of interest. Hence, they are more suitable for users who do not have a specific goal to accomplish.

Tools to explore content were introduced in the '90s as a set of visual displays to facilitate the visual search mode. At the core of the exploration tools, we find the idea of engaging users (Stiller, 2014) by first providing an overview of the collection, and then presenting the items in detail (Shneiderman, 1996). Exploring tools are mainly 2D or 3D visualizations and visual filters to display and access collection metadata. Visualizations can use both temporal visual models (such as timelines) and non-temporal visual models (including maps, networks and plots) (Windhager *et al.*, 2019).

Since one single visualization of the collection might not be enough to explore every collection's dimension, content aggregators usually make use of multiple views (Dörk *et al.*, 2017; Drucker, 2013; Andrienko *et al.*, 2007).
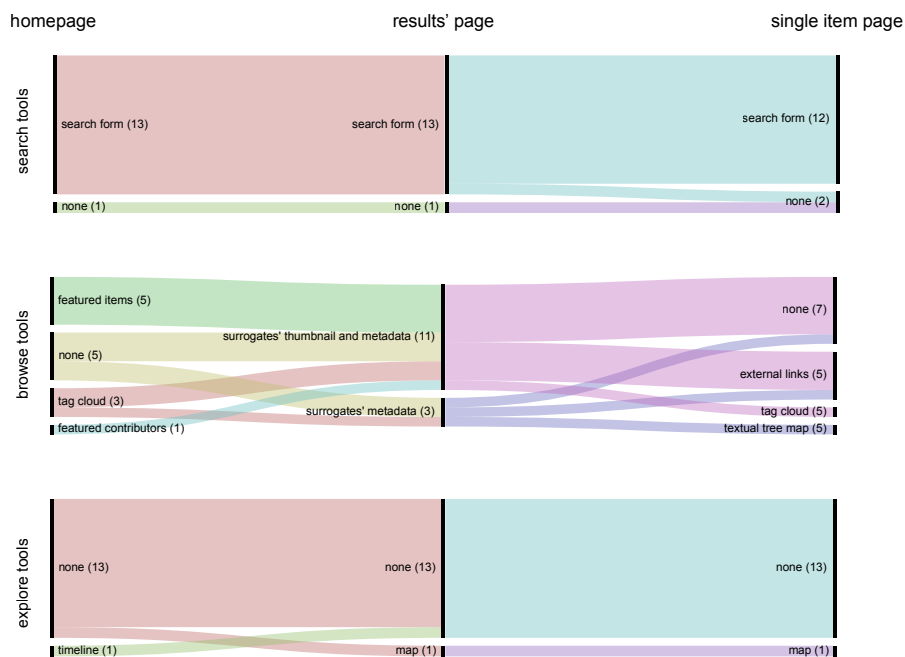

Fig. 2 – Sankey diagrams showing the access tools of a selection of European cultural content aggregators.

Navigating collections

One of the main goals of cultural content is to allow the user to easily navigate among collections. Cultural content aggregators adopt very simple information architecture. This consists of three main pages: the homepage, featuring some digital surrogates, the page with the list of results requested by the user, and the details page. The homepage generally provides all the tools required to explore the collection. The results' page provides the tool to narrow the exploration, and the details page provides the tools to continue the exploration. From the benchmark of European cultural content aggregators, we can identify four typologies of navigation tools. They help end-users to navigate among pages, within a page, within collections and among related content (fig. 3). The main issue related to the access tools is the lack of tools to navigate among digital surrogates.
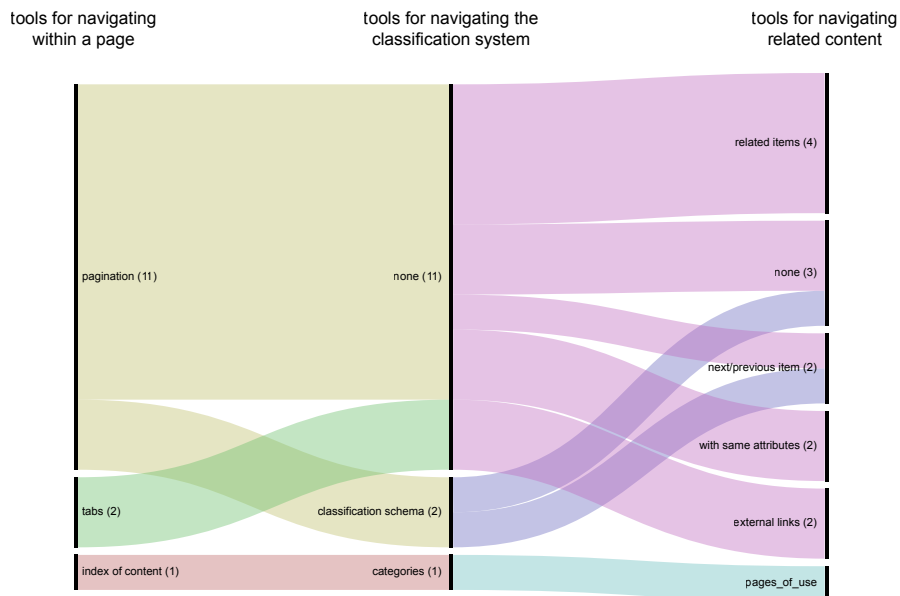
tools for navigating within a page   tools for navigating the classification system   tools for navigating related content

Fig. 3 – Sankey diagram showing the navigation tools of a selection of European cultural content aggregators.

Tools to navigate among pages are the conventional Web navigation tools, which include the menu, the arrow to go back to the previous page, and the breadcrumbs[2].

[2] Breadcrumbs are a navigation tool indicating the navigation path from the homepage to a specific internal page.

Tools to navigate within a page are used in the results page. They allow end-users to rearrange digital surrogates. These tools include page layout – an interface element that splits the retrieved surrogates into discrete pages – and the list/grid dropdown menu – an element that allows end-users to choose the visual layout.

Tools to navigate the collections are interactive elements that allow the end-user to visually navigate the collections' categories. These tools mainly consist of the classification tree and the list of categories.

Tools to navigate related content allow end-users to continue the exploration of similar items. These tools include the panel with related surrogates.

Using collections

The final aim of cultural content aggregators is to provide end-users with meaningful, high quality images to be used in their studies and publications, and related tools to manage them. From the benchmark of cultural content aggregators, we can identify four typologies of tools, which allow usage of digital surrogates: editing, organizing, generating and sharing tools (fig. 4). The user mainly accesses these tools on the page containing the single image. Unfortunately, most of the content aggregators do not provide enough tools.

Tools to edit content enable users to edit metadata of items or to propose an edit. They consist of online forms, which users can fill in with more accurate or new information. The use of these tools allows ongoing collective improvement of the content.

Tools to organize content allow users to either group or save items. These tools can serve as classification tools or as a bookmarking tool. Classification tools refer to interactive elements that allow the creation of a folksonomy. Bookmark tools refer to interactive elements that allow the creation of personal collections of items. Aggregators use these tools in the form of bookmarks, favourites, watchlists and collections.

Tools to generate content refer to the opportunity to generate, within content aggregators, articles based on the digitized collections. User-generated content not only enhances access to cultural collections but also fosters the discovery and the investigation of new topics.

Tools to share and download content consist of panels containing links to share an item on social networks or other external websites and to download it. Aggregators also containing bibliographic items may provide users with information for citations and with the text-based file format.
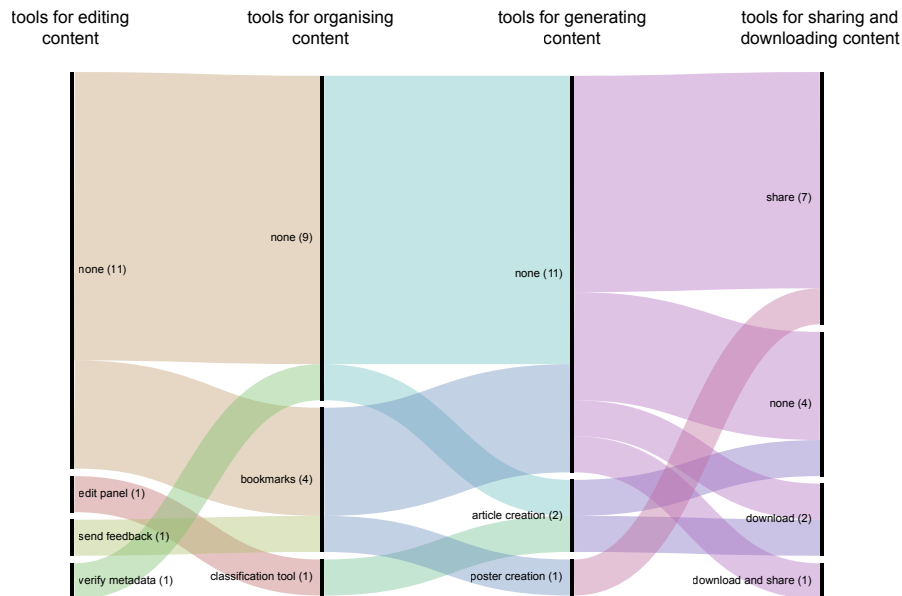
| tools for editing content | tools for organising content | tools for generating content | tools for sharing and downloading content |

Fig. 4 – Sankey diagram showing the tools to use collections of a selection of European cultural content aggregators.

Designing a cultural content aggregator

I designed a cultural content aggregator to evaluate interface characteristics that might foster access, navigation and use of digital surrogates. Called GLAM Culture Hub (GCH), it is a high fidelity interactive mockup[3] featuring content from both Wikimedia Commons (the ETH-Library collection) and Europeana (fig. 5). It aims at providing users with useful tools for access, navigation and use of digital surrogates. In particular, by applying a draft of design guidelines that erase the previous analysis, it attempts to fix some of the issues of the existing cultural content aggregators.

Regarding the current access issues, due to the lack of rich overviews, GCH coherently integrates tools belonging to three access modes: search, browse and explore. The search box is available on the top of every page. A chart combining two visual models appears in the entire catalogue, on the homepage, and in the individual collections on the GLAM pages. Interactive browsing elements are present on every page.

[3] GLAM Culture Hub is an interactive mockup made with Invision, a prototyping Web application.

Fig. 5 – Detail of the GLAM Culture Hub homepage.

Regarding the current lack of navigation tools, GCH adopts several types of tools, including panels to navigate the various types of related content.

Finally, regarding the current lack of tools to use the collections, GCH introduces a form to propose edits, and adopts a bookmark system.

GCH also adopts some interface features that have already been introduced on other generic content aggregators, digital archives and Web applications. These features include the horizontal bar containing filters to provide more space to the surrogates (existing cultural content aggregator display filters in a column) and several types of featured items.

A set of 18 people interacted with GCH and answered an online survey about their user experience. Subjects were aged 25-64 years, and all of them had attained a Master's Degree. They were professionals working for cultural institutions (33%), designers (33%), photographers (11%) and other professionals (11%). Questions that included textual responses were converted into a range of values ranging from 1 (not useful/disagree) to 5 (extremely useful/strongly agree) to facilitate result analysis.

The GCH survey detected a general appreciation of design by users. The access tool considered the most useful is the search form. It was deemed extremely useful by 43% of respondents (with an average of 3.1/5). Browsing tools recorded an average of 2.4/5, while explorer tools recorded an average of 2.3/5. Regarding features that allow users to navigate content, it emerges that it is particularly important for content aggregator end-users to navigate among similar items. The navigation tool considered most useful was the adoption of favourite items (2.2/5).

The survey detected that content aggregator users need easy-to-use tools to organise, edit and download collections. The respondents of the survey liked the downloading panel (3.1/5), the forms for suggestions (2/5) and editing, and the form to add tags to the picture (2/5).

Design guidelines

A set of design guidelines has been defined, following the GLAM Culture Hub design and the collection of feedback from end-users. Guidelines are a tool to support the design of cultural content aggregators. In particular, they aim to foster access, navigation and use of digital surrogates.

Guidelines are meant to suggest design strategies to be adopted to meet end-user needs. Their implementation can positively impact on the activities of cultural institutions, communities and end-users.

Providing several access points

The research shows that only one access mode for collections is not sufficient. This is because end-users have a different level of knowledge of the platform and goals. Thus, a cultural content aggregator should allow users to access digitized collections, from distinct and maybe unfamiliar viewpoints (Thudt et al, 2012), through an integrated model consisting of search, browse and explore tools (fig. 6). Information architecture should be based on three main interconnected page templates: the homepage, the list page and the surrogate page. The homepage must provide access tools belonging to the three modes. The list page features the results according to a user request. Thus, it should provide direct access tools to narrow the user's search (search tools). The surrogate page features a single item, and it should provide access tools to expand the search (explore and browse tools).

Since search tools provide direct access to content, they must be placed in a prominent position. Explorer tools can remain on a secondary level, but they may require a vast space. Tools to browse the content can have a secondary role as well, and be spread over the user interface. Both tools belonging to the search and explore mode may need textual or visual filters to narrow the search. These filters may be shared among the two modes.

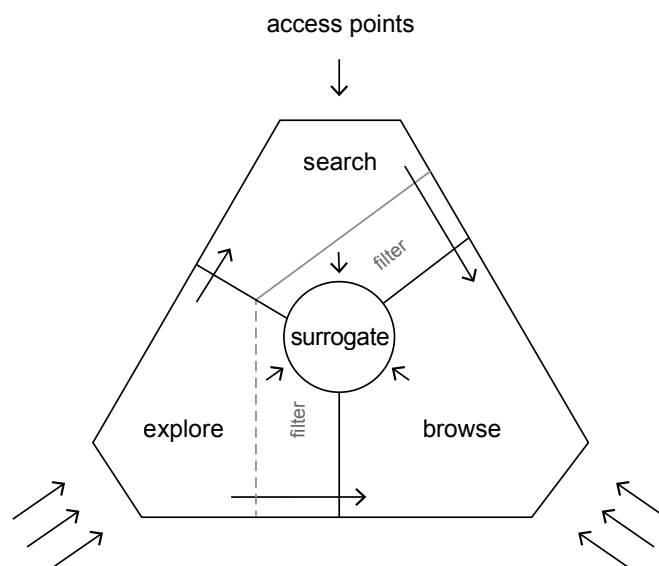In the proposed integrated model, tools belonging to different access modes can coexist within a unique access tool.

Fig. 6 – Diagram of a proposal for an integrated access model.

Making connections among content

The GCH survey shows that content aggregator end-users need to navigate among similar items while rapidly looking for surrogates. Thus, navigation tools may cope with this requirement by visualizing relations among items. Due to the complexity of relationships (fig. 7), there are several ways to display their connections. We can split the strategies into two levels: the general level – related to the overall set of surrogates – and the detail level – related to a single item. The aim of both levels is to foster the collection's exploitability.

In the general level, the design should reveal relationships among all contents. Interactive tools should allow the creation of sets of surrogates according to their attributes, such as sets of items grouped by place, author, date and subject. The homepage should feature a network as a visual model to show the connections among surrogates. The interface might also provide end-users with tools capable of generating new connections among surrogates.

In the detail level, the user interface should encourage pivoting. Interactive elements should allow users to move between sets of items, which share the same attributes. For instance, metadata values can become a query for a new search. The "related items" are some of the most common interactive elements to continue exploring the collection. Looking into the details, other possible design solutions to foster pivoting might be the use of surrogates over multiple pages through the creation of user-generated content, and the integration of content from other related and relevant online sources.
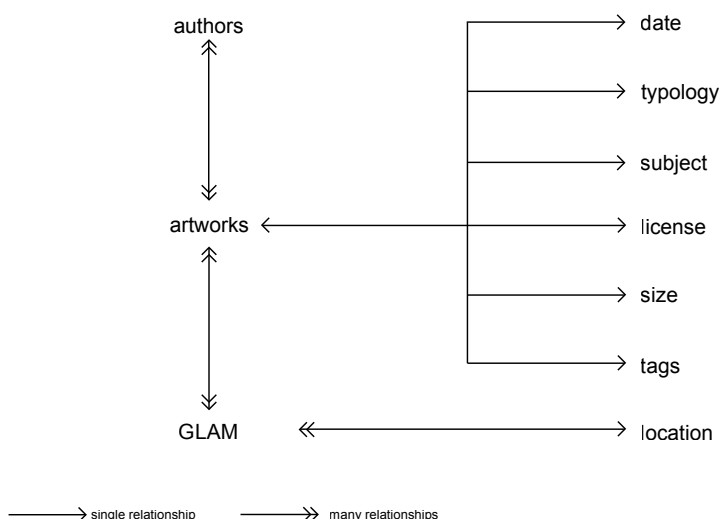

Fig. 7 – Diagram of relationships among surrogate metadata.

Support the use of surrogates

The user research shows that the end-users of content aggregators need easy-to-use tools to organise, edit and download items. Cultural content aggregators should be considered as working tools. Thus, the design of the content aggregator should provide users with tools that both allow and guide the use of digital surrogates (fig. 8). Regarding the individual item, the interface must feature elements that allow users to rapidly understand, share and download the surrogate. Related information may include where the artwork was used, such as temporary or permanent exhibitions and author biographies. Concerning the collection, the interface must provide users with bookmarking tools that allow the management of sets of surrogates. These tools aim to allow users to organize content for future usage. Bookmarking tools should make it easy to add personal notes to single or multiple surrogates, add labels to multiple sets of items, aggregate elements and eventually provide batch download options.
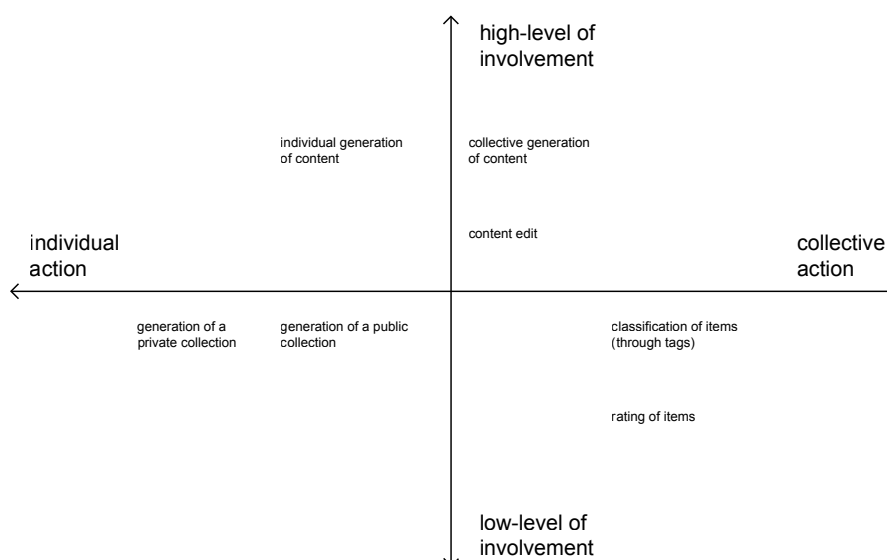


```
                          high-level of
                          involvement


            individual generation      collective generation
            of content                 of content

                                       content edit
individual                                                    collective
action                                                        action

        generation of a    generation of a public      classification of items
        private collection collection                  (through tags)


                                                       rating of items



                          low-level of
                          involvement
```

Fig. 8 – Diagram of the possible actions users can perform within a cultural content aggregator.

Conclusions

The research showed that providing users with multiple access points and visual models showing the connections among surrogates may increase the use of digitized collections within cultural content aggregators. The proposed

guidelines provide designers with design strategies to facilitate surrogate access and encourage the use of content. They can also provide designers with useful tips to redesign current cultural aggregators. The design guidelines are not meant to be the final outcome of the research on cultural content aggregators but, instead, an open document that can be further developed.

A limitation of the guidelines is that they have not been validated through a redesign of the cultural content aggregator. However, each guideline is based on multiple evidence that emerged from the literature review and from in-depth empirical research.

Future works related to the research include validation of the design guidelines through a new design project and dissemination within the design and GLAMs communities. Furthermore, I intend to expand the research on design practices to foster spreading and usage of open cultural collections.

In conclusion, opening cultural collections and technological advancement is leading to reconceptualization of cultural content aggregators. The design of these platforms should be based on real end-user needs. Cultural content aggregators should not be considered static searchable databases but dynamic research and dissemination tools.

Acknowledgements

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