

# Visualization of Cultural Heritage Data for Casual Users

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**Abstract**—A small subset of information visualization and the digital humanities focuses on casual users, that is, users in everyday, non-work contexts. The development of digital cultural heritage collections like Europeana.eu for the general public increases the importance of this user group. This position paper reviews parallel findings from both research fields on casual users, their goals and exploration behavior: Casual users often come without concrete information needs, they rather search for something interesting and engaging. They browse through the information until they find something worth exploring in detail. From these characteristic needs and behavior of casual users we delineate design requirements for public information visualizations in the digital humanities. We discuss how further exchange between these two fields of research can bring forward both fields.

**Index Terms**—casual information visualization, digital collections, cultural heritage, digital humanities

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## INTRODUCTION

In a current project, we address the challenge how data from digital cultural heritage collections can be visualized for public use. Web-based databases of museums' and cultural institutions' collections enable quick access to important cultural assets for everyone: Millions of paintings, sculptures, texts, pieces of music, and other artworks can be reached with only a few clicks – at least in theory. Though they *can* be reached by the general public, they often *are not* – as current interfaces do not meet all users' needs: For example, simple search boxes do support experts, but not casual users [1] who require an “alternative way to find what might be available and develop an overview of the collection” (p. 1). More generous interfaces allow browsing the collection and reveal its structure and complexity [2]. We propose that information visualizations can be such an alternative way [3]. But similar to interface development in the digital humanities, information visualization research mainly focuses on experts. Therefore, designing information visualizations for casual users interested in digital cultural heritage collections can be beneficial for both fields.

The development of big cultural heritage databases like Europeana.eu [4] recently also raised interest in non-expert users, their aims and behavior (e.g., [5][6]). Similarly, in information visualization new approaches in casual, non-work settings have been elaborated (e.g., [7]). Such casual information visualizations are defined as “computer mediated tools to depict personally meaningful information in visual ways that support everyday users in both everyday work and non-work situations” (p. 1149).

In this position paper we review existing research on casual users from both fields, show similarities, and delineate design requirements for information visualizations intended for casual users in digital humanities data domains.

## 1 CASUAL USERS

Walsh and Hall [1] describe a casual user as someone “who has just stumbled across [the digital] collection in the same way that they would wander into the CH [cultural heritage] institution's physical space” (p. 1). However, casual users of digital collections do not have the experts' knowledge of the collection and how to navigate or search within. Similarly, users of casual information visualization do not necessarily have expertise in analytic thinking or in reading

visualizations [7]. Therefore, we have to gain a thorough understanding of these users to design supportive information visualizations.

### 1.1 “Tasks” (or Rather Goals)

Typically, information visualizations are designed with a focus on the data, the user, and their tasks [8]. But such typical procedures cannot be applied to casual information visualizations [7]: In the absence of externally defined tasks like in professional work settings, in cultural heritage settings, casual users set their own goals or even act without concrete goals in mind [9]. Therefore, we need other sources to gain guidance for the design of casual information visualizations. As one source we conducted a literature review on casual users' goals and information exploration behavior.

Research on the information needs of casual users of *digital cultural heritage collections* suggests that many visitors come without a clear goal or information need in mind [10]; rather, they are driven by a desire for something interesting or challenging [11]. For example, a frequent motivation to visit Europeana was to browse within a topic (32 %) or to find out what the database is about (30%) [12]. These results are similar to the main motivations to visit real museums, which are to get entertained, as well as to learn something (e.g. [13]). Packer [14] calls this phenomenon, where visitors engage in a learning experience because they value and enjoy the process of learning itself, “learning for fun”.

In their study of *information visualization* use in casual contexts, Sprague and Tory [15] report on the specific motivations of their non-expert participants, which are - similar to those described above - mainly driven by personal relevance: Intrinsic motivational factors are to learn something and to gain a deeper understanding, but also simply to get entertained - either by the content or by the aesthetics of the representation itself. Among the extrinsic factors influencing the use of visualizations, procrastination, the avoidance of boredom, or social pressures, i.e. the necessity to be or get informed, played crucial roles. Nevertheless, casual users also like their observations to add up and make some sense. Sprague and Tory [15] call this behavior “productive relaxation” (p. 120).

### 1.2 Exploration Behavior

Casual visitors without a clear goal mostly interact with a digital collection in an exploratory way [10]: Similar to visitors in a real museum they browse through the information and search for something interesting rather than for specific information. These visitors find pleasure in the search process itself (in a flow-like sense, cf. [11]), rather than following an explicit need for information. “Exploratory search extends the idea of basic lookup into the areas of learning and investigation, which in turn incorporate extended information processing, evaluation and annotation” ([5], p.

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1). Users encounter and engage with interesting information they were not even looking for.

A similar behaviour can be observed with casual users of *information visualizations*: In comparison to experts, they gain different forms of insights [7]: They do not analyse the data in a detailed way, but become aware of basic patterns, gain a feeling for the data, and reflect on its social and personal relevance. Experts and laypeople also differ in how they gain insights: While expert users are driven by hypotheses and are actively hunting for insights, user studies showed that laypeople often gather insights in a more passive and eclectic way by collecting salient pieces of information [16]. Doerk and colleagues [17] call these users “information flaneurs” who look out for something interesting and worth exploring but without a specific goal in mind.

## 2 DESIGN REQUIREMENTS

In the casual use of digital cultural heritage collections, classical information visualization design guidelines cannot easily be applied [7]. As outlined, no predefined user tasks exist; rather users set their own goals and freely explore the collection. The users of digital cultural heritage collections are very heterogeneous, not only in their goals and motivations for use; therefore user requirements for this scenario are rare [18]: Casual users’ predominant “mode of exploratory searching as a means of overcoming uncertainty, developing mental models and exploring concepts about information needs has significant implications for system design” (p. 144).

If we look at the design of existing cultural heritage databases, they were often not created with the general public in mind, but rather as internal documentation [6]. From existing research on casual users we can delineate some design requirements for information visualizations in the digital cultural heritage collections realm:

### 2.1 Providing Conceptual Orientation

Villa and colleagues [10] observed that visitors of a digital cultural heritage collection needed an orientation phase before they started browsing or searching the exhibition. Also, in information seeking orientation, that is a sense of overview and direction, is regarded important ([17], p.1218).

In real museums, conceptual orientation, that is information on the museums’ content and structure, is often provided at the entrance. Such conceptual orientation can support visitors to real museums in their learning [19]. Similarly information on the structure of a database or online collection can support users during digital information seeking [17]. Additionally, knowledge about the metadata and the collection’s structure is necessary for specific or more complex search requests in digital collections [5][6][18].

### 2.2 Supporting Exploratory Search

Casual users often have no specific information need, but still like to engage in a hedonic search process; this mode of exploratory search is an important behaviour in digital cultural heritage collections [10] and casual information visualizations [11][15]. But existing digital cultural heritage collections do not sufficiently support open, exploratory search [1][5].

A recommendation derived from the last Europeana user survey was to better support browsing through the exhibits [12]. An interface for casual interaction with cultural heritage collections has to support gaining an overview and browsing through the topics (what Doerk et al. [17] call horizontal exploration), and also engaging with details in a flow-like manner (vertical immersion).

### 2.3 Increasing User Experience

Digital cultural heritage collections for casual users should provide an entertaining learning experience [5]. Similarly, casual information visualization users search for a hedonistic experience [11][15]. Consequently, “visual information landscapes should be designed to be as inviting, inspiring, and informative as possible” ([17], p. 1222).

### 2.4 Keeping Cognitive Load Low

Museum research shows that only limited cognitive resources are available for exploration [20]. Therefore, interfaces should reduce the cognitive load required for casual users to orient themselves in the digital collection [17] – for example by overviews and tools for arranging objects ([18] p. 143f.). When we can develop information visualizations which users can easily understand and where they can orient themselves without too much effort, enough cognitive resources are available to identify interesting information and to engage deeply with this information.

### 2.5 Enabling Intuitive Modes of Interaction

For the interaction with casual information visualization, “simplicity, natural metaphors and intuitiveness will be important aspects” ([21] p.123). Such intuitive modes of interaction should build on the users’ prior knowledge [22]. This is especially challenging if interfaces are designed for a broad user group [23] as is the case with digital cultural heritage collections.

## 3 DISCUSSION & CONCLUSIONS

Our review showed that research on casual users of digital cultural heritage collections and on casual information visualizations addresses similar questions and gained similar results on their goals and exploration behavior. Therefore, we contend that exchange between these two fields of research could be extremely fruitful: We found that research on casual user characteristics and behavior seems to be more advanced in the digital humanities, whereas the design of interfaces is more advanced in casual information visualization research.

We discussed two prominent characteristics of casual users, namely the absence of tasks and their exploratory search behaviour and what requirements can be delineated for design. In museum research, the visual attraction power of exhibits is an important factor in guiding visitor exploration. Therefore, we assume that information visualizations can support casual users of digital cultural heritage collections in their exploratory search behaviour: They can provide a visual overview on the collection’s content and structure and thereby facilitate conceptual orientation. From this overview users can interactively explore the collection and engage with interesting information more deeply. To meet the needs of casual users, the design of such information visualizations should also take care that it is high in user experience, that is does not require too much cognitive load, and that it builds on intuitive modes of interaction.

Currently we are not aware of interfaces that meet all of these criteria. Possible approaches include narrative interaction systems [22], that is, systems that build on users’ existing cognitive scripts and activate a narrative mode of thought. Such interfaces can be processed in a more intuitive way; thereby cognitive load is lower and user experience is higher. However, the amount of user control has to be carefully selected, to allow sufficient free exploration behavior. Though storytelling is an emerging topic in information visualization [24], there were not many implementations of information visualizations in the cultural heritage realm yet [25].

A different design approach are multidimensional visualization tools such as the space-time-cube [3], that provide an overview on multiple data dimensions and thereby conceptual orientation in an engaging way. But in addition to providing an overview, these visualization tools should also enable browsing the collections. To our knowledge, the space-time-cube was not yet implemented as navigation tool for information exploration. Also, though existing user studies on this visualization method are promising, they are rare and do not cover the setting of casual information exploration.

An important design question for casual settings is the amount of guidance given [26]: How much guidance do casual users need? In real museums, users can stroll around superficially guided only by the museum’s layout, they can take in as much guiding information as possible by reading the introductory texts and exhibition leaflets, or follow a guided tour through an exhibition. Similarly, for digital

cultural heritage collections, guiding interfaces like adaptive recommender systems [27] or guided tours [18] do provide different degrees of guidance. What is the right amount of guidance for casual users? We think that too much guidance does not meet the casual user's need of free information exploration. But with too little guidance they cannot orient themselves in the collection and will not be able to explore the information. Therefore, a certain degree of guidance should be provided, but still the user should be sufficiently free to explore interesting information in depth. However, the actual amount of guidance needed will likely depend on certain user characteristics like the existing prior knowledge or preferred information processing strategies.

We contend that many questions remain to be solved for casual information visualization of digital cultural heritage collections. As outlined in the beginning of this paper, the typical design procedure of information visualizations along with users' tasks [8] is not viable in casual settings. Therefore, we first conducted a literature review on the user group's intentions and information exploration behaviour. In addition, we propose a user-centred design process for casual systems [28], as innovative designs meeting the requirements of casual users should be developed in close collaboration with users. Novel information visualizations for digital cultural heritage collections should not only address typical elements of user interaction, such as attractiveness and ease of use, but also incorporate elements that help to reduce cognitive load and enable browsing and in-depth exploration of detailed information alike. Though information visualizations designs cannot be aligned with user tasks, they can be aligned with their typical behaviours and goals. Iterative usability and user-experience engineering processes allow continuous checking whether the designs inspire casual users, help them in orienting themselves in the collection and support their exploration behaviour. Only if we observe casual users in their natural environment and better understand their goals and exploration behaviour, we will be able to develop better information visualizations for digital cultural heritage collections for actual use by the general public.

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