Human-Computer Interactions in Museums

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ISBN: 978-3-031-01097-2 paperback
ISBN: 978-3-031-02225-8 hard cover
ISBN: 978-3-031-00205-2 ebook

DOI 10.1007/978-3-031-02225-8

A Publication in the Springer series
SYNTHESIS LECTURES ON HUMAN-CENTRED INFORMATICS, #42

Series Editor: John M. Carroll, Penn State University
Series ISSN: 1946-7680 Print 1946-7699 Electronic

Human-Computer Interactions in Museums

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SYNTHESIS LECTURES ON HUMAN-CENTRED INFORMATICS #42

ABSTRACT

Museums have been a domain of study and design intervention for Human-Computer Interaction (HCI) for several decades. However, while resources providing overviews on the key issues in the scholarship have been produced in the fields of museum and visitor studies, no such resource as yet existed within HCI. This book fills this gap and covers key issues regarding the study and design of HCIs in museums. Through an on-site focus, the book examines how digital interactive technologies impact and shape galleries, exhibitions, and their visitors. It consolidates the body of work in HCI conducted in the heritage field and integrates it with insights from related fields and from digital heritage practice. Processes of HCI design and evaluation approaches for museums are also discussed. This book draws from the authors' extensive knowledge of case studies as well as from their own work to provide examples, reflections, and illustrations of relevant concepts and problems.

This book is designed for students and early career researchers in HCI or Interaction Design, for more seasoned investigators who might approach the museum domain for the first time, and for researchers and practitioners in related fields such as heritage and museum studies or visitor studies. Designers who might wish to understand the HCI perspective on visitor-facing interactive technologies may also find this book useful.

KEYWORDS

HCI, museums, interaction design, digital heritage, heritage technology, museum installation, informal learning

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Acknowledgements

We wish to acknowledge the support of Diane Cerra and Jack Carroll at Morgan & Claypool, the valuable feedback of the reviewers Rachel Clarke and Michael Twidale, and the contribution of the illustrators Caroline Claisse and Katharina Bartholomäus. We give our thanks to the people who kindly granted permission to use their images for this book: Gabriela Avram, Loraine Clarke, Nick Dulake, Jane Finnis and Culture24, Valérie Maquil, Christian Moll, Holger Schnädelbach, and Dirk vom Lehn. Luigina Ciolfi wishes to thank Gabriela Avram, Daniela Petrelli, Nick Dulake, Laura Maye, Mark Marshall, Marc McLoughlin, and Liam Bannon for all the joint work done together in museums over many years; thanks also to Jenny Kidd for the many extensive discussions about digital heritage that contributed to the development of this book. Eva Hornecker thanks Loraine Clarke and the MeSch project partners for the joint work on cultural heritage and museums.

Introduction

With the proliferation of technology being utilised in museums, museums have become a fertile research ground for Human-Computer Interaction (HCI) research and technology deployment. Museums are places for the exploration of ideas and the creative display of artefacts and information resources. Also, in aiming to attract visitors and to be seen as innovative and modern, museums often experiment with new ways of presentation. Because of this, they often are among the first venues for novel interactive technologies to be utilised and experienced by the general public (e.g., the first multi-touch tables), and can be a great testbed for trialing such technologies. Furthermore, museums provide a space other than research labs where a substantial number of users can be studied as they interact with digital devices and content. Being semi-public environments, they enable this by still making it possible for researchers to manage and control such trials.

All these reasons make museums and galleries an attractive context for HCI research. Moreover, it has become easier to generate computer-supported interactions due to the availability of archived digital content and supporting infrastructures for digitization and digital content management that can interface directly with digital interpretation means.

On a more general level, museums have been an important domain to be studied within HCI from the point of view of challenging assumptions with the notion of "use" and "interaction": some early studies captured and argued for the need to consider nuanced phenomena of interaction such as "legitimate peripheral participation," and the importance of social and collaborative interaction around digital systems. In this respect, museums have been key to the historical evolution of HCI as a discipline.

There has been a lot of recent work in related areas: "virtual museums" (which exist mainly online, but for some institutions are becoming digital extensions to "brick and mortar" museums—as well as archives and libraries—in order to widen their audience and complement physical exhibitions), digital humanities (usually data-based, including digitised text, images, 3D models, etc.), and supporting curation and data management for heritage archives.

However, in this book we focus on visitor interaction *within* physical museums. Our goal is to provide an introduction to this field for researchers and students new to this field of work, where relevant literature is otherwise dispersed across disciplines and practices.

The focus on visitors is important from our point of view so as to present a human-centred perspective on the challenges of adopting and using digital technologies in the heritage sector for interpretation and engagement purposes. We also wish to consolidate the body of work in HCI conducted in the heritage field, and integrate it with insights from related fields and from digital

heritage practice. As our focus lies on visitor interactions in museums, we will not discuss at length other forms of digital strategy that heritage institutions adopt, such as social media or crowdsourcing campaigns mainly aimed at online engagement with visitors and other communities of interest.

We do, however, discuss the relationship between HCI researchers and museums as organisations, in terms of their attitudes, practices, policies, strategies, and expertise. No two museums are the same when it comes to how they engage their visitors and present their collections. In-house expertise can also be varied. Here, we shall usually employ the term "curators" for the cultural heritage professionals who decide what goes into an exhibition, and how the overall narrative or message is to be conveyed. Nevertheless, this is a complex professional category, including figures trained in archival science, archaeology, and other sciences relevant to the collection (e.g., history, but also biology and material science), or conservation, but also in museology, pedagogy, communication, and design. The expertise and knowledge that each museum offers is an important aspect to consider when designing interactive exhibitions. Besides curators, for example, there will be interpretation officers who develop textual resources, information panels, and self-guided tours, staff with a more pedagogical background who organise activity packs for schools and special activities or events for families, marketing experts dedicated to reaching out and engaging new audiences, and sometimes technical staff knowledgeable about digital platforms and tools. The role of HCI experts might therefore vary and need to be negotiated differently according to the skills, knowledge, and roles present.

We, the authors of this book, have accumulated 35 years of experience in this field when adding together our respective track records, and have worked on 12 major funded projects (and various small projects with students) involving a variety of heritage institutions and professionals from several countries. We come from overlapping and complementary backgrounds. Hornecker has a more HCI, evaluation-oriented perspective, with a focus on visitor engagement and informal learning; Ciolfi comes from a humanities-oriented and social science perspective, and specialises in participatory approaches to design. Both of us study the social and collaborative context of museum technologies, have worked on the tangible and embodied aspects of museum technologies, and proposed approaches to their design that take into account the material and embodied aspects of experiencing heritage. In addition, we have collaborated on a major EU project aimed at exploring physical-digital interactions in museums and enabling museum professionals to author installations themselves.

In supervising students doing HCI research related to museums and in reviewing and evaluating countless papers and proposals on these topics, we had come to realise that there is no single core resource for getting started in this field. We hope that this book will fill this gap. We are writing this book mainly for students and early career researchers in HCI or Interaction Design, but we believe that it will be useful also for more seasoned investigators who might approach the museum domain for the first time, and for researchers and practitioners in related fields such as

heritage and museum studies or visitor studies, as well as designers, who might wish to understand the HCI body of work and perspective on interactive museum technologies and to engage with development and evaluation of visitor-facing interactive technologies.

In the chapters to follow, we mention various examples, but these are by no means all those that exist in relation to a certain topic. Rather, we selected representative instances that either yield important contributions in advancing the field, or that are particularly illustrative. We also refer liberally to our own work, as we know intimately how it addressed core issues. Our reliance on projects, institutions, and locations that we know by virtue of our personal experience means that a majority of examples in the book refer to work done in Northern Europe and North America. We have extensively researched both research and practice beyond these geographical areas and included mentions of work beyond these geographical boundaries. Despite this, we are conscious that a strong focus on Europe and North America remains. This can also be due to more established traditions of digital museum applications in these regions where museums have been open to experimentation for longer and have therefore led to several pioneering projects.

We are aware that in fields such as HCI and interactive technologies, innovations and advancements of the state of the art occur rapidly. While some of our examples might age a little as the book ages, we are confident that they will remain effective examples for illustrating key concepts, approaches, and concerns, as well as showcase of the history HCI in museums.

Readers should note that this is not a research methods or HCI handbook, as we only touch upon the role of certain models and methods in the context of evaluating or designing interactive technologies in museums. For more in-depth information, readers should refer to foundational HCI literature and to the research methods literature—as each model, method, or approach, especially with evaluation techniques, requires careful preparation and training.

OVERVIEW OF CHAPTERS

Chapter 1 discusses key themes relevant for understanding the field, including the institutional context of museums, practical and professional concerns of heritage professionals, situational characteristics of the museum visit, visitor characteristics and motivations, and much more. In this chapter, we try to provide an overview of central discussions and insights from the literature on visitor studies, heritage studies and informal learning in museums.

Chapter 2 investigates what we term "interaction frames": that is, different configurations of devices, input and output mechanisms, and the relationship of interaction with the physical context of the museum. We discuss standalone installations, assemblies of interconnected components distributed over a site, and mobile interactions. We also discuss different types of augmentation, such as embodied and embedded interactions, extended reality (including Virtual and Augmented Reality), and multisensory interactions.

Chapter 3 discusses approaches for visitor participation and the inclusion of visitor-generated content and contributions in exhibitions. In recent years, there has been increased effort to adopt participatory approaches, which give visitors a voice in the design of exhibitions, enabling them to comment or generate content for others to see. We discuss approaches from bespoke interactions on site in museums and the use of crowdsourcing and social media platforms in relation to gallery visits.

Chapter 4 gives an overview of development approaches and methods in the creation of museum installations. We discuss the role of user-centred design and how to adapt it to the museum context, and of participatory approaches, where either visitors or cultural heritage professionals (or in some cases both) are crucially involved in the design process. We also discuss the growing area of Do-It-Yourself tools that allow cultural heritage professionals and other non-technology experts to build interactive installations. Finally, we discuss some critical concerns that need to be kept in mind during the development process, regardless of its approach.

Chapter 5 deals with evaluation approaches and techniques for evaluating interactive installations. We discuss mixed-method vs. single-method studies, providing examples of how methods can complement each other, and then discuss various popular methods, from timing and tracking approaches, interaction logs, over questionnaires, interviews, and observational approaches, to fine-grained video and conversation analysis. We also discuss methods aimed at assessing visitor learning and conclude with pointers on evaluation from a practitioner's perspective.

Finally, Chapter 6 touches on how ongoing changes in how museums position themselves challenge and iinfluence how the design of museum technologies should be approached, and how people's evolving relationship with technology in their daily life changes expectations and behaviour. We return to the tension between whether museums should be seen as a space for experimentation for HCI or whether they should be treated as application partners that have their own requirements and goals, where ideally HCI research work contributes to museums' long-term strategies and development. We conclude with our own lessons learned over the course of our career, doing research in and with museums, all of which writing this book gave us a welcome chance to reflect upon.