Co-Designing Novel User Experiences at a Historic Manor House

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ABSTRACT
In this working paper we describe how we engaged with users in co-design for the Chawton House project. After describing the project and how we proceeded, we will focus on emerging issues for a deeper analysis that concern the co-design of experiences. In the presentation of issues we focus on the issue of co-designing UbiComp scenarios and applications, on exploring a space of opportunities offered by these new technologies, and the challenges we've encountered in doing so.

Author Keywords
Co-Design, User-Centered Design, Ubiquitous Computing

INTRODUCTION
The goal of the Chawton House project/experience has been to develop engaging experiences for visitors to Chawton House, a historic English country estate, which blend into its specific atmosphere and 'natural' experience. Our aim is the development of a ubiquitous computing system that enables visitors to explore the estate on their own, while tapping into the knowledge about the estate held by curators and enabling novel types of experiences of the grounds. These experiences are to be co-designed with Chawton House curators who are eager to tell visitors more about the grounds and to attract further visitors, but lack time to give tours in parts of the estate other than the house. That Chawton House staff are interested in offering such new kinds of experience to their visitors provided a starting point for the project. Our aims were to find out what types they would like to offer, and help to create them.

The project's long-term aim is a persistent infrastructure for long-term use and adaptation by various groups with an interest in 'using' Chawton House, for example coach parties, school children and scholars. By 'persistent', we mean a system that stays in place and that keeps being used, tended and extended by its owners. This poses different challenges to building a system that is primarily a proof of concept demonstrator, requiring system builders to hand over ownership and care at some point to long-term system owners – in our case Chawton House. In order to become owners, users must be able to tend and customise the system, and the system must provide sufficient value to them to justify the effort. Thus, co-design was an essential part of our project strategy, engaging the future owners in development of the system concept and defining its aims. Our interest was furthermore not just to build another museum/site tour guide, where visitors are passive receivers of information. Our vision was to enable Chawton House to offer a variety of experiences to its diverse groups of visitors and to allow visitor groups, respectively representatives of these groups, to design their own specific experiences. We are thus confronted with issues of end-user authoring, and different levels of use and ownership. On another level of reflection, we have come to understand that we are presenting Chawton House staff with a range of opportunities for what they want to offer visitors and how to engage visitors. This is not only an advantage, but also provides challenges for co-design.

The project builds on past work using embedded technologies in outdoor environments for explorative learning activities with schoolchildren (Rogers et al 2005).

Fig. 1. Members of the Farnham Floral Society during a tour of the grounds

We have engaged with Chawton House staff in a number of workshops to develop concepts and content for visitor experiences and discussed the potential use of the system for a variety of purposes. Furthermore, we worked with teachers of a local primary school to develop an educational fieldtrip to the estate. This is to be seen as one instance of further user groups using the grounds and the system for their own purposes. In July 2005, a demonstrator system was employed for an educational experience for schoolchildren on a fieldtrip to the estate. Incidentally this event and first-hand experience of the working prototype helped Chawton House staff to understand the potential of the system, which had remained abstract and non-imaginable to them despite all our prior efforts. Thus, a major challenge of engaging in co-design of UbiComp technologies is that these systems cannot be adequately demonstrated or fully understood until they have been built (at least to the level of a working prototype).

In this paper we will first present the setting of Chawton House and some of our considerations in developing and organizing the experiences. Then we describe how we involved users and stakeholders in co-design, and reflect on emerging themes for further work. We focus on the issue of co-designing UbiComp scenarios and applications, on exploring a space of opportunities offered by these new technologies, and the challenges we've encountered in doing so.

THE SETTING: CHAWTON HOUSE

Chawton House Library, half an hour from Southampton near Alton in Hampshire, is a charitable organisation that has restored and refurbished *Chawton Manor House*, gardens and park to operate as a centre for the study of early English women's writing. The library's core activities are the study of the collection (attracting scholars) as well as seminars, day conferences and cultural events. Where appropriate, the landscape has been returned to its early 19th century design, and it is stated as a goal 'to preserve the peace and beauty of the estate while sharing this heritage with visitors'. The landscape reflects the open landscape ideals of the late 19th century, so signage and visible technology in the grounds detract from the desired impression. The Manor has been in the Knight family since the late 16th Century and at one point was inhabited by Jane Austen's brother Edward Knight. Jane Austen lived in a cottage in the village and was a frequent visitor. This is a part of the house's history and many visitors have specific interest in this aspect. The grounds include a church and churchyard where most of the Knight family are buried.

Chawton House is primarily a study centre. This differentiates it from most museums. Seeing it in use gives visitors a sense of how such a house 'might have worked' in the 18th Century. The building and grounds themselves are of interest to visitors, and artefacts within them are part of the space, rather than merely placed within it. Visits need to be arranged on an appointments basis and only groups of certain sizes are accepted. Chawton House is not only a house, but an estate with extensive grounds. Curators give tours of the house and enjoy this, but lack resources to give tours of the grounds on a regular basis. This provides an opportunity for technology support.

We have identified a variety of visitors to the house, such as academics studying at the Centre taking a stroll through the grounds during breaks, coach parties interested in Jane Austen, who want to gain a sense of the environment in which she was creating her fiction; and groups interested in the botany of the gardens or the landscape architecture. Furthermore, groups of schoolchildren can use the grounds for curriculum-based experiences, and curators are interested in establishing collaborations with local schools.

Chawton House staff

As the main function of the Library is a study centre, no-one has the official role of curator, but the staff between them hold much of the information that visitors might wish for. Over time of the project we have come to understand that the term 'curator' is not entirely appropriate for Chawton House staff. They often do not think of themselves as curators, and do not design exhibitions, for example. Yet all of them participate in different ways in shaping the house and how it is experienced by visitors. Several members of staff give tours and act as docents in addition their main responsibilities. The various staff who play a role in this, and whom we have come to work with, include:

- The Acting Director – has general knowledge about the overall goals of the centre along with some specific knowledge of the history of the house.

- The Estate Manager – has specific knowledge of the landscape and architecture through managing the restoration for over 10 years; gives tours of the grounds.

- The Acting Director's Assistant – in charge of organizing and scheduling tours of the house and with more targeted experience of visitor groups.

- The Assistant Librarian – primarily in charge of novels held on site, but with some responsibility for giving tours and with specific knowledge of the period.

- The Gardener – has specific knowledge of the plants and planting schemes of the gardens, and might at some point give specific tours for plant lovers.

These staff members complement each other but none would claim to be able to give the 'definitive' tour to all potential visitors. How to explore and integrate the different stories that they can tell when augmenting the grounds with UbiComp technologies, has been one of the key challenges when developing concepts for a visitor tour system.

PROJECT STRATEGY

Chawton House staff are interested in offering new kinds of experiences to their visitors and in attracting specialized groups of visitors that give publicity to the estate. Our aims were to find out what types of experiences they would like to offer, and to help create them.

Through our experience of previous UbiComp projects, we were interested in exploring conceptual approaches that have the ability to result in something that can be extended over time, that can persist and be of long-term value. Persistence would require that Chawton House staff take ownership of the system, feel responsible for tending it, extending it with content, offering it to visitor groups for use and for appropriation for specific types of experiences. This puts co-design in the foreground. Only with an adequate conception of the long-term use context can we succeed in building something that has real and long-term value, which is appropriated and continues to be used. As stakeholders, the participation of the Chawton House staff was seen as essential both for understanding the use context and for promoting a sense of ownership.

Enabling a variety of experiences

Both in terms of the use context and of research goals we aimed to design a variety of experiences, thereby enhancing the value offered by the system and extending the range of possible users. We were therefore thinking in terms of an 'extensible infrastructure', which would be based on a basic persistent infrastructure that could support the creation and delivery of a variety of content. Extensions could then be made, of two kinds (often in parallel): (1) technology; (2) content.

The infrastructure would be extended to provide different, more specialized experiences for specific user groups e.g. for 'standard' visitors, schools, history societies, Jane Austen enthusiasts etc. We envisage a hierarchy of users with Chawton House creating generic experiences and 'standard' visitor tours, and other 'users', for examples schools, clubs, etc. tweaking and extending these to offer

the results to students, club members etc. The concept is that Chawton takes ownership of infrastructure and content and provides tools to their end users, who can then author their own experiences, with experience designers (us as researchers) taking a facilitating role.

Creating a Persistent and Extensible System

A second key challenge is more technical. UbiComp projects that 'instrument' public spaces are often heavyweight research efforts that are one-offs, depending on a team of skilled developers. Any maintenance or change has to be carried out by this team. This means that persistence is a crucial issue: there need to be ways that the technology can remain in situ, at least partly maintained or changed by its users. The specific issue to be addressed by the Chawton House project is how curators can be encouraged to engage in 'co-authoring': working with developers to create visitor experiences.

We also conceive of 'persistence' in a second sense: continuous use of the system, because it is meaningful and valuable to its users (the curators and their visitors). We are therefore exploring how we might enable curators to continue authoring tours and furthermore, to hand over authoring to other stakeholders to create specialized experiences and activities for specific visitors. We can also imagine visitors contributing, for example by telling their own stories and sharing their knowledge with future visitors.

CO-DESIGNING EXPERIENCES AND UNDERSTANDING THE SETTING

The co-design of the visitor experiences and our efforts at understanding the settings are tightly connected. Insights into how Chawton House is managed, which specific roles, responsibilities and perspectives the different people involved have, what are future plans for the estates management and what cold be of interest to visitors, unfolded over time, contributing to mutual understanding and building relations.

In addition to organising a range of co-design workshops with three staff members (the acting director, the assistant librarian and the estate manager), we have interviewed several other staff members (e.g. the housekeeper, the gardener, a horseman, the acting director's assistant), taking advantage of non-busy days, and observed several groups of visitors during house and garden tours.

As a first cut into the large solution space of possible visitor experiences we decided to focus on designing concepts for visitor tours of the grounds with Chawton House staff and an educational experience with teachers. Visitor tours using our system could become the standard offer of the house for visitors, in case staff cannot spare to time to give tours. The educational experience is one potential instance of experiences specifically designed for special interests groups, where the teachers become authors (and users of our system) while utilizing some content provided by

Chawton House and the school children are the 'end users' of this experience.

Understanding the Setting

Interpreting and living the house

In addition to observing tours, we were given tours of the grounds during one of our workshops (described later). From this personal experience, from observing tours for other visitors and from discussion with staff we learned a range of important lessons.

The visitors' experience of the house and its grounds is actively created in personalized tours of the grounds. The staff 'live the house' both in the sense that it is their life but also that they want to make it come alive for visitors. Giving tours is a skilled, dynamic, situated and responsive activity: no two tours are the same (although material may be common to different tours), and depend on what the audience is interested in. They are forms of improvisation constructed in the moment and triggered in various ways by locations, artefacts and interaction with visitors. Docents want to 'enthuse' visitors, transfer their own enthusiasm for the estate onto them and attend in their interactions or choice of topics to subtle cues in body language and engage in conversations. The information they give is not a formalized body of knowledge that could be made immediate use of for digitally augmented tours. Information is of many types – factual, speculative, anecdotal. It is embedded in the house and grounds and situationally constructed.

House and grounds are interconnected in a variety of ways. Thus artifacts or areas cannot be considered in isolation. There are many stories to be told and different perspectives from which they can be told, and these stories often overlap. Thus information exists in several layers and is usually not conclusive. This is reflected by curators of historic houses talking about 'interpreting historic houses' (Waterson 2004). In addition, pieces of information, for example about a particular location like the 'walled garden', can be hard to interpret in isolation from information about other parts of the estate – there is a complex web of linked information.

Every docent tells a different set of stories, yet they share stories that they pick up from each other and that develop a life of their own. Visitors will also engage in very different ways during tours. For example, when observing a visitor tour of the grounds we found that some visitors stayed next to the docent and listened to him, while others remained further away, engaging in social conversation or being interested in aspects of the gardens that the tour did not cover (in this case, the flowers and plants).

Our design conclusions

The basic issues for us for developing a guide system thus were: (a) how to preserve the human agency and skill that is intrinsic to current experiences of the estate; and (b) how to abstract these things and make them work digitally, in ways that don't 'put us out of a job' (one curator's concern) or create sterile experiences for visitors.

Our personal experience of both being given and observing tours led us towards the idea of re-using 'real stories' told by the docent during actual tours, that were categorized according to rough topics. Visitors would be able to state what they are interested in and then wander freely, listening to clips. Contextualisation and personalization would thus not only refer to tailoring content to visitors interests. Curators would actually be re-presented in audio tours and visitors could share the experience of previous visitors (from when the clip was recorded) hearing the birds, the wind, and people walking on gravel. Instead of seeing this as an impediment to the 'perfect tour', we feel that this is a quality, providing a sense of intimacy, authenticity, and an 'unofficial' feel. Working with curators taught us that they can only authentically tell stories when giving tours and walking the grounds; these stories are their creations and should be represented rather than replaced. Taking content from actual tours and not needing to transcribe it or have it redone by professional speakers would have a second advantage: if curators are to take ownership and to extend this content, we must enable them to do so. The simplest and most natural way for them is to tape the tours they might give in person once in a while, and select sections, to build an oral archive of knowledge for their own and visitors' use.

Other projects whose goal is to develop museum guide systems have repeatedly reported that acquisition, tending and redevelopment of content are substantial issues, with most systems quickly becoming out of date, as the effort and cost of creating new content is too high (often requiring professional actors for voice recordings) (discussion from the Re-Thinking Technology in Museums workshop 2005). Our simple approach could alleviate this problem.

The invisible side of the house

While, in the beginning phases of the project, we were mostly engaging with those staff members that participated in workshops and had contact with visitors, over time we came to appreciate and understand more of what happens 'behind the scenes' and forms an essential part of life at Chawton House. There are in total fifteen staff members plus part-timers and voluntary helpers for the gardens. Staff members include, for example, two female 'horse-men' that care for and train five shire horses which in the future will do work on the fields and may tow a carriage for visitors at special events. The fields and the kitchen garden are being converted to support organic farming. Other staff members besides gardeners and librarians include a carpenter and two housekeepers. For most of these staff members, contact with visitors is not part of their job and is only of mild interest to them.

Talking to staff members also made us aware of changes that were not explicitly discussed with the entire team but only within the team responsible for the management or

Figure 2. First curator workshop: telling stories around a map.

device. The two teachers from a primary school in Southampton were interested in using Chawton House for fieldtrips with children for literacy education and creative writing. The rich atmosphere and history of the house and landscape is valued as inspiring and providing context. The teachers were interested in creating an experience specifically for gifted children, that would be able to motivate

that were slowly emerging and therefore not mentioned during workshops. Visitor tours are arranged and scheduled by the acting director's assistant. Aiming for scholarly recognition and press coverage, the house is increasingly being used for special events by scholarly and professional societies that are of interest for the estate, for example a dinner for the Royal Society of Architects and the annual meeting of the Jane Austen society. Furthermore, the library participates in making literature accessible to the blind.

The importance of visitors to the house seems to be an issue which is currently being re-assessed. On first contact by our project partners, Chawton House was seen primarily as a library and there was some unease about how public the house should be. Willingness to accept visitors has increased since this this contact, with visitors being seen both as a source of income to pay for renovations, and as a means of gaining increased public interest.

Co-Designing Experiences

As stated, we decided to focus on designing concepts for visitor tours of the grounds with Chawton House staff; and an educational experience with teachers. Workshops with Chawton House staff focused on understanding their work and the setting, developing visions of possible visitor tours and collecting content that could be used for tours. Workshops with teachers were concerned with understanding how fieldtrips are organized and what their aims are, and designing a fieldtrip that would employ our

and challenge them.

Workshops and Engagement with Chawton House staff

We held a serious of workshops with staff members. In the first workshop we aimed to have them generate stories about the grounds, which could be digitized for later use in the system, and to identify themes. We printed a large map and populated it with 3D models of core buildings (Figure 2). The map was designed to provide a shared reference for discussions, to trigger stories (represented with post-its on the map) and reflection on the practice of giving tours. We also hoped the map would provide an anchor for talking about possible types of tours. The workshop gave us insight into what different docents like to talk about, and sparked their imagination on what the devised system might do for them. We found, consistent with the notion of a 'web' of information, that stories were partial, overlapping and hard to categorize. Yet docents were not used to telling stories when not being on location and discussion tended to move to more general issues.

With the staff members we agreed that a potential way of collecting stories that addresses these issues would be to have them tell stories in-situ. In the second workshop we were taken on separate guided tours and taped these. In early May we went off with three docents who had decided on a loosely defined set of themes to be addressed (the landscape, Jane Austen, characters from the Knight family).

Figure 3. Second curator workshop: touring the grounds on three guided tours and taping them.

We videotaped these tours to select stories for reuse in audio tours (Figure 3). We ourselves attempted to ask questions to trigger desired stories and turn this into a natural situation, but to refrain from interruptions. This delivered a wide range of stories in different voices from different points of view that were richer and more detailed than those generated by the first workshop. For us as researchers the videos further provided us with insights into how docents interact with the environment and how stories are triggered by locations. On listening to these tapes we decided to use these recordings instead of re-recording the stories, as curators became very lively in their story-telling and we found this authenticity intriguing and valuable (as described previously).

A third workshop presented the docents with the collected stories and deepened the conceptual discussions. Our attempts to categorize the collected stories together with curators failed. At this point, they were mostly concerned with the correctness of stories and felt that we as researchers could equally well sort stories according to topics. A successful part of this workshop was a walk along the house front carrying a laptop and playing some of the audio snippets, to give an idea of how these snippets could be used during a tour. Here docents were confronted with their own voices being reused, but becoming mingled with snippets from other docents, and had a first impression of how visitors might experience the tours. An interesting incident was that the way we had arranged audio snippets and walked around the house had docents realize that tours of the grounds could take a different order from what they were used to. Yet it still seemed difficult for docents to imagine how the system would work and the aim of having Chawton House staff tend the system and author new content was distant.

A few further visits to the house when working with teachers and setting up the technology on the grounds provided further opportunity for more informal interaction with some of the staff that on these occasions happened to be around. For the school fieldtrip we invited docents to observe the event, as this would provide them with direct experience of the system in action and thereby spark their imagination on possible uses. Two of the docents were present at the event and curiously observed and followed the schoolchildren. A senior project member that had not been involved in workshops afterwards interviewed them about their impressions of the events, their ideas and visions, and asked for feedback on how the collaboration with us had developed. At a last workshop so far, we presented staff members a video from the school fieldtrip, discussed future plans, and walked with them around the house, handing them the device with the content used by the children.

Workshops with Teachers
The aim of the first session with the teachers was to give us insight into how teachers go about designing fieldtrips. We

Figure 4. Second workshop with teachers, designing the structure of the fieldtrip, using the map

then started to design a rough structure for the actual fieldtrip in July, using a map of the grounds to help the teachers remember the features of the gardens that they had visited a while ago. We also discussed the value of fieldtrips, usual practices in organizing these and other questions.

The large map focussed discussion about the fieldtrip's overall structure and led to some discussion of how different groups of children might be distributed around the estate, and which paths to take. Aspects of the final fieldtrip that were designed at this stage include having two phases in which children explore the grounds, the first being more discovery-driven and having them explore many places and the second round focusing on a limited number of locations and starting with the conceptualisation of stories in-situ. Because the Chawton fieldtrip would focus on creative writing, the teachers wanted the experience to be character-driven and open-ended, the house providing atmosphere and context.

During the second workshop with teachers we revisited their initial sketch and refined it. We used the map again, placing notes at places where events could happen and instructions be given and writing these on the notes. At this point we could present audio snippets from the docents that might be used for the children's experience and did have an overview of what kinds of stories docents could tell. This led to a redesign of the fieldtrip's detailed structure.

Their initial idea was that children would meet characters associated with the house in the grounds, who tell the children about their lives. These could include historical figures, for example members of the Knight family or their staff. These characters would provide background for the stories to be written. We jointly decided that the characters from the house would not connect with the children's imagination. Yet some of the more anecdotal stories by docents, for example about the church burning down or about 18th Century ladies pretending to be in a real wilderness and feeling brave when walking through the

designed wilderness (a small forest) would spark imagination.

The overall design of the fieldtrip then looked as follows. After a guided tour of the house that focuses on its inhabitants (owners and servants), the children are introduced to the devices. In pairs they visit locations in the grounds where they hear introductory descriptions and are given simple tasks, e.g. to record an enactment of a conversation (using the device) or to generate descriptions of the location or just to think about a question. Then they meet with the entire group again and share their experiences. Groups then decide on a character they want to write about and two locations for a second round, which provides them with instructions that have them start devising a story, and thinking about characters and settings. To review their collection and start writing a story, they return to the house. When it came to thinking about the concrete activities that children would be asked to do in certain locations, the teachers became hesitant in designing instructions, as it had been quite a while since they visited Chawton House. It was therefore decided to meet for a third workshop on the grounds.

The meeting at Chawton House provided an opportunity for a short introduction of teachers to the curators. The main part of this meeting consisted of walking the grounds and the teachers brainstorming ideas for activities and instructions, at times assisted by us with background information and an overview of which audio clips could be played at locations. Back in the house, some ideas were selected from the brainstorming and written down as well as a plan for the timing of phases made. We had to think, for example, of how long children should stay at each location and how the device could sequence instructions and remind children to carry on. Further collaboration consisted of sending the notes around, writing the actual text that would appear on the device and deciding on concrete time frames for the sequencing of events.

The final event
The final event itself, the school fieldtrip, was in effect designed and orchestrated by all the groups involved. The docents gave an initial tour of the house that gained the children's interest and curiosity. Their hospitality created a good atmosphere and enabled the event to take place. The teachers facilitated the children's group interaction and gave them very clear instructions. The two groups of researchers ensured that the system was running, helped in case of problems, observed the event and filmed everything. Describing this event and reflecting on it is beyond the scope of this paper. Here we want to focus on issues of co-design.

DISCUSSION: EMERGING ISSUES
In reflection of the process we've undergone and the challenges we encountered, a number of issues have gained our attention. Currently we have just started identifying and labeling these, analyzing our data for support of our inklings and untangling issues.

A moving target
Both our own conception of what the system is to support and the official and unofficial versions of what Chawton House *is* are continually evolving. There is not a tightly defined mission for the estate, and, as stated earlier, aims and visions are in development and influenced by new experiences and options. Furthermore staff members are not always explicitly communicating their visions to everyone and there seems to be value in keeping this deliberately open, as the estate's identity needs to be negotiated with the fund that owns it. The willingness to accept visitor groups has increased steadily over the last year and staff have come to see visitors as an asset that provides them not only with additional funding, but also adds to their reputation. Now, with the experience of the fieldtrip focused on literacy and creative writing, it seems that Chawton House staff start to imagine offering such kinds of experiences to schools and colleges, as it fits well within their profile/identity.

Our own understanding has changed rapidly through our involvement. We have described how being given tours by docents influenced our ideas for a guide system and motivated us to use docents' real voices from actual tours, deviating from the usual design of audio guides (that typically use professional actors' voices). Being given tours and observing tours furthermore led us to discover that it is not only historical issues which are of interest to visitors, or that docents enjoy telling stories about. In fact it is the very business of managing the estate that provides a wealth of interesting stories and that gains visitors' attention.

Over time we have also come to understand better how the house works, how staff juggle their multiple responsibilities and the different perspectives of different members of staff.

Bootstrapping the design relationship
The limited time frame for the project required us to start designing both the technology and the experiences from the very start. We thus started very early with workshops with our users, jump-starting the development of personal relationships and our understanding of the setting. Thus some of our early preconceptions proved to be false and in retrospect we would organize most of our workshops in a different way. Yet it was only through the discussions at these workshops that we achieved a deeper understanding of curators' work practices and came to develop a shared language with them. Naturally, it would have been better to start slowly, using more informal forms of engagement, spending time around the house, interviewing people and observing work practices. In this case this was impossible within the given time constraints. We therefore tried to utilize opportunities around workshops for ethnographically-oriented background work.

As it turned out later-on, for both groups of users (Chawton House staff and teachers) it had been confusing to have a

part of the research team (responsible for the User-Centered Design part) enter the process at a time when they had already talked with other members of the research team about initial ideas. Coming in later, we had to repeat some of this in order to understand the setting and the users. Some parts of the workshops were therefore experienced as repeating topics, yet this was indispensable, as an understanding of the setting could not simply be transferred from one member of the research team onto another. These repetitions as well as the difficulties of users to envisage the future technology required a lot of patience from them in following us through workshops.

For this, building up personal relations and showing real interest in their work was essential. Mutual understanding and engagement with Chawton House staff was in large part based on enthusiasm about the house. Fostering personal relations (e.g. by thank you notes via emails) and interviewing other staff members made us more competent as discussion partners.

Co-Designing with busy users
Another aspect that contributed to the challenge of bootstrapping the design was that both of our user groups are busy people for whom a two hour workshop is a significant time investment. Coming to the school for one of the teachers' workshops eased these time constraints somewhat and also allowed us to experience the school and its pedagogical ethic. With three staff members taking part in workshops at Chawton House, it was even more difficult to find times when all were available. When working with busy users, we need to make sure that their investment of time is worth it and that we are as professional in conducting workshops as they are in their work. This conflicted with the experimental stance of our project, that made it difficult to provide a concrete conception of what the design outcome might be, and the jump-starting of the design relationship described in the previous paragraph.

Trigg (2005) recommends sticking around when doing participatory design with busy users and using any occasional chance for discussions, even if they last only a few minutes. Some of the strategies we developed over the course of the project do accord with this recommendation. For example we tried to stick around after a workshop and asked whether anybody from the staff would have time for a short informal interview, taking advantage of some staff members watching over the main office when their task would mainly involve taking up phone calls and opening the main gate, chatting with us whenever there was no demand from outside the office. We also relied increasingly on email for informal questions and checking on curated content for the guided tours.

Co-Designing What? An opportunity space instead of a problem space
The proposition of doing co-design with users sounds easier than it is and we need to ask whether we are actually doing users a favour if we ask them to engage in co-design. We found that Chawton House staff were happy to provide us with stories and to discuss visitor groups that may use the devised device, while being much less interested in actually designing the concept for a tour guide. One of the reasons that contributes to this is that they are busy people. Another major reason is that there is no real need that we address and no perceived problem to be solved. Instead with our project we have been offering a space of opportunities.

This means for stakeholders that there is no problem analysis to be done that motivates a further engagement, and that the effort invested in future opportunities must be weighed against current responsibilities and potential negative effects of involvement. Changes of practices around visitors of the estate are taking place evolutionarily in small steps, whereas taking part in our workshops required a longer-term commitment with the actual work required being unpredictable upfront.

For the teachers, we were also offering an opportunity space, but they seemed to perceive a greater need to exploit this, as there issues that could be addressed through the Chawton House project. The teachers were very interested in offering something to the gifted children at school who tend not to be challenged enough by existing activities. As one of the teachers is responsible for literacy education, they were also very motivated to experiment with novel approaches to literacy.

Building on existing practices
To our surprise, it was easier to design the fieldtrip with teachers, despite the fact that this had quite a complex structure and required e.g. the sequencing of events, than to devise concepts for guided tours with the device with the curators. Teacher workshops were very focussed on designing the fieldtrips, whereas workshops with Chawton House staff often tended to deviate into more general discussions. The main difference in working with these groups of stakeholders was that with the fieldtrip, teachers could build on their existing practices. The docents could only relate our technology to museum audio guides and wands (e.g. at Stonehenge) that they had experienced elsewhere, but could not readily imagine how these could be used on the estate and agreed with us that visitors should not become distracted from their actual surroundings by an audio guide and that it should not be an abstract, impersonal voice speaking to visitors.

While teachers had difficulties in understanding what the device would be able to do, they had an existing model of how to design a fieldtrip, whish we were able to make use of as we scaffolded them in terms of what the device could do. Once they had understood the basic possibilities of the device in recording audio, giving instructions, sequencing and timing them, and logging interactions, they extended their repertoire of what the children could do quickly. Being used to integrating old and new technologies in school (the primary school they work at is very innovative and well equipped) they also freely mingled use of our device with

paper technologies the children are used to, such as a booklet for taking notes.

In-situ Versus Reflective Elicitation and Envisionment
One of the major issues for future analysis of data (our recordings from workshops) will be the different methods and approaches used and what kind of engagement these engendered. Roughly speaking, this is comparing workshop sessions seated around a map and utilizing this as shared reference with sessions taking place on the grounds and walking around. There were a range of purposes or activities that were pursued using both methods

    a) discussion

    b) authoring

    c) imagination of use of the device

Our experience from the first workshop with Chawton House staff led us to realize that they were not comfortable with telling stories when seated inside the house. Instead one of them suggested going outside and being taken on a guided tour for collecting their stories. While we had hoped to get an overview of topics, discussion often tended to become very abstract and general. Walking around the grounds during the second workshop was highly successful and convinced us that telling stories is indeed triggered by being in location. Reviewing the tapes we could also tell the difference between stories told around the map and the more engaged and dramatic rhetorics when in-situ, in the well-known situation of taking people around the grounds.

Yet on reviewing the tapes we also found that discussions around the map were useful in other respects. For example, the practice of taking visitors around involves mainly interacting with visitors and prohibits reflecting about this with other docents at the same time. Walking the grounds with all docents at once would have created a very unusual situation. Sitting around the map allowed for more reflective conversation. Topics that came up and that we assume to be afforded by the birds-eye view of the map included that often visitors walking the grounds on their own would stop at the upper terrace and not continue towards the walled garden or not realize that they are allowed to go inside. There was also a lot of discussion about types of visitors and that docents would not categorize visitors, but respond to their body language and questions. Other discussions provided us with background on how the staff perceive the house to be different from a museum and what 'interpreting historic houses' means. So although the map-based activities did not function as we had intended, they did provide other kinds of insight that were very useful.

We furthermore found out that the different staff members had perceived these workshops very differently. This is related both to staff working experience and personalities.

The estate manager, a very hands-on and pragmatic character who could walk the grounds blind-folded, having supervised their restoration for some eight to ten years, found discussions around the map rather useless and was most in his element when outside and telling us about the estate. The assistant librarian on the other hand found this session very successful. Other than the estate manager, her work takes place mostly inside the house and she has been working for Chawton House for a much shorter time. Her perspective is furthermore somewhat more academic and reflective, being interested in 'interpreting' the house and relating to other historic houses.

Taking tours with docents had convinced us that authoring of new content would take place most naturally in-situ, as this would build upon docents established practices and would retain the authenticity and liveliness of personal tours that we had enjoyed. During the course of workshops with teachers we found another aspect of in-situ authoring. Designing an overall structure for the fieldtrip was eased by the map as a resource that provided an overview of the spatial relations and size of the estate. But teachers had difficulties imagining which kinds of activities and instructions would be appropriate at the different locations and told us that they would usually develop the worksheets on site, if they would do their first fieldtrip to a place.

As a consequence of these experiences we have concluded that authoring of content is likely to work best in situ, while walking about. This would require doing audio recordings or taking written notes – if possible on the device itself – and remembering where these had been created. Similar to our process of later-on editing and tagging of audio stories and selection and ordering of ideas for children's activities, the content authored in-situ would need to be accessible for further editing and orchestration afterwards.

Our experience during the early workshops had us taught early-on that in-situ experience is indispensable for imagining how visitors might use the devised device. Although we had presented Chawton House staff and teachers with a video from a previous project where children used a handheld device during a science fieldtrip they had not been able to imagine how this could work for Chawton House. A first attempt at providing a first hand experience for docents consisted simply of walking around the house and playing clips on a laptop. While this did not enable them to be active users, at least we could gain an impression of how the audio clips would sound when played outside of closed rooms. When playing the sound files inside, the sounds of birds or wind had seemed distracting. Interestingly when playing the clips outsides, these sounds seemed to fade into the natural environment and were noticed much less. As mentioned before, the ordering of clips and the path we had chosen also made docents realize that there are alternatives to their usual path for visitor tours.

Yet a clear understanding of what the system is and enables only emerged during the actual fieldtrip. Both teachers and docents commented later-on that up to the day they had had only a fuzzy understanding and that the experience of the day had enabled them to see its potential:

Docent: "*Not being technically minded, it didn't mean a great deal to me to begin with; but to actually see it working, and to see how the technology had been integrated - with the tour of the historic house and the grounds, that was very interesting.*" (…) "*I think when it first started I thought it was going to be along the lines of the ones that you often see people use at historic sites and museums where you have information programmed into it, and then you wander round and you often see a little card with a number on it, and then you press that number into the little keypad and it'll tell you something about the object at that point. So I thought perhaps it was going to be something like that. But I think this has probably got the potential to be a lot more flexible.*"

Teacher: "*I thought that (devising the fieldtrip) took a long time, only because we were not quite sure about the technologies. And now we've seen them, and we've got a much better understanding, I think.*"

During the interviews with docents directly following the fieldtrip they had partially observed, they started reflecting on other experiences with tour guides and comparing them with what they had seen as well as envisioning how the device could enable visitors to explore deeper levels of information and present them with different perspectives on a location from different docents (we had used three clips by different docents on the wilderness for the fieldtrip).

For docents the potential of the device and how visitors might experience using it became clearer still in the last feedback workshop, when we handed them the devices with a static version of the school fieldtrip (one had to select which location one was in instead of this being detected automatically). Docents enjoyed this and now started questioning us about the technical functionality, and what would happen if the device was connected, while we were explaining and proposing further opportunities.

Making sense of UbiComp
One of the hardest challenges for the co-design process was the difficulty for stakeholders and users to imagine what the technology would look like, how it would respond and what it could offer them. Showing videos of previous systems helped little, as these were not providing actual experience and were too far from users' contexts. On the other hand if they referred to prior experiences, e.g. the wands at other historic sites, there was always the risk of this limiting their envisionment. We were thus in the dilemma of providing

Figure 5. Chawton House staff exploring the device at the 'feedback workshop'

users with a too guiding vision provided by us and not enabling them to envision anything novel.

From all our previous project experience in combination with this new project we see that it is difficult to provide a vision of these novel technologies and their use without giving concrete examples that can be experienced first-hand. Yet with mobile systems whose use is difficult to imagine for us researchers as well (the school fieldtrip surprised us in many ways) it is almost impossible to provide an adequate conception with mock-ups. Our first attempt, walking around with a laptop to play clips in-situ, had been only partly successful. Even this required authoring of initial content and postproduction of clips. Playing clips on the actual device in the required order would have required large parts of the data definitions and the infrastructure to be in place. We thus need to invest a lot of effort before being able to experience the technology and from this to start envisioning further use options.

The fieldtrip event provided Chawton House staff more with a vision of what the new technology could provide them with than any of our prior attempts. They can see it as a template for other options that they might provide for other schools, for older groups of schoolchildren or for colleges, building upon the theme of literacy and creative writing. The event, while getting them away from their preconceptions of what they experienced elsewhere (walking around with a talking wand and punching numbers), now makes them focus very much on literacy experiences, although we feel that a similar approach, perhaps of a hunt for stories, could be taken for other visitor groups. An open question still remains whether more elderly visitors would also be a potential user group or if these would be too hesitant of the technology. On this issue curators repeatedly jumped between questioning whether senior visitors might prefer the personal experience and be challenged by the device or if they might be underestimating them and 'it might be worth a try'.

CONCLUSION
The research presented in this paper has generated a wealth of data as well as emerging issues for analysis that we are continuing to work with. The key initial lesson is that co-designing ubiquitous computing systems that are about envisioning and eventually creating novel user experiences

is not a simple or straightforward process, for many reasons. One is that, unlike many instances of CSCW pre-UbiComp, the problem space is not as defined or constrained: rather than a problem space, Chawton House, both for its curators and the teachers that designed the fieldtrip, represents a space of possibilities: an opportunity space. This means that we are asking the people we co-design with, to re-envision and extend their existing practices. This involves careful engagement grounded in good understandings of current practices and the latitude or 'give' in this practice that might allow new practices to emerge. At the same time, a key issue with this type of technology is that it is hard to see what it can do and how it can be used until it is built: there is a basic issue of what form the lo- and mid-fidelity prototypes that user centred design depend on might take: what often gets demonstrated is the system at at least hi-fidelity prototype level, because only at this level does its functionality become clear. This issue is compounded by lack of cultural familiarity. UbiComp systems are at the cutting edge of computing research and development, and are far less familiar to users than, for example, websites and desktop applications, and this means there is less current knowledge to draw on when working with users to develop UbiComp systems with us, i.e. do co-design. All of these issues strongly suggest that creating persistent UbiComp infrastructures in opportunity spaces like Chawton House depends on a long-term iterative process of mutual exposure and communication to build relationships, including the regular rolling out of experiences as demonstrators; and particularly finding effective and meaningful ways to do prototyping. This process might lead to a progressive decoupling of owners from developers as owners increasingly understand and take charge of the system. Thus we aim to move to other forms of engagement particularly working with how our existing demonstrator could be repurposed a an in-situ authoring tool along the lines we have indicated.

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