Do it together : the effect of curators, designers, and technologists sharing the making of new interactive visitors' experiences

PETRELLI, Daniela <http://orcid.org/0000-0003-4103-3565>, DULAKE, Nick <http://orcid.org/0000-0003-1841-5848>, MARSHALL, Mark <http://orcid.org/0000-0002-8875-4813>, KOCKELKORN, Hub and PISETTI, Anna

Do it together: The effect of curators, designers, and technologists sharing the making of new interactive visitors' experiences

Daniela Petrelli, Sheffield Hallam University, UK, nick dulake, Sheffield Hallam University , UK, Mark Marshall, Sheffield Hallam University, UK, Hub Kockelkorn, Museon, Netherlands, Anna Pisetti, Museo Storico Italiano della Guerra, Italy

Abstract

Tangible interaction offers new ways to engage users with digital systems through material means. We use ubiquitous computing to create reactive spaces and smart objects that seamlessly blend with the surroundings or the exhibition and bridge the gap between the physical and the digital. The technology is intentionally concealed to bring places and stories from the past into the present and create immersive experiences where technology complements heritage (as opposed to compete with it for visitors' attention). The full integration of technology with the exhibition or heritage requires approaching the design of the visitors' experience as a collaborative project that combines curatorial, technical and design aspects. As a multi-expertise team, we created, implemented, and evaluated thee concepts: an evocative experience in the trenches and camp of World War I in the Italian Alps; an interactive layer to tell the personal stories of those involved in the changes in The Hague during the Nazi occupation; and a set of multimedia installations to enrich a permanent collection of World War I artillery. The design effort was on both the creation of bespoke devices and the composition of content that was not didactic but open to personal interpretation: curators left traces for visitors to pick up, and when this occurred the experience was deeper and stronger. Our evaluations show that the powerful outcome cannot be ascribed to just one component, technology versus content. One empowers the other: an approach that simultaneously works on interaction and content is essential to make a design that exploits the place or the objects to a powerful final effect. Clearly, this challenges the traditional exhibition design process as curators become creative members of the team in charge of shaping, through the content, the final experience of the visitors. It is then a matter of rethinking not only the technology for heritage, but also the process, and for curators to become more daring with content.

Keywords: tangible embodied interaction, co-design, ubiquitous computing

1. Introduction

Pervasive computing, the type of digital technology that underpins the Internet of Things, offers ways to embed interactivity within the exhibition: microprocessors, sensors, and actuators can be concealed within reactive spaces and smart objects that seamlessly blend with their surroundings. As a matter of fact, digital technology is shapeless: as electricity, it needs a medium to become perceivable (Kuniavsky, 2010). This pliability, paired with the ever-expanding range of elementary

computational elements, allows us to think of interactives in museums in a radically different way: bespoke design can bring places and stories from the past into the present and create immersive experiences where technology complements heritage (as opposed to competing with it for the visitors' attention). Pervasive computing then becomes an addition to the exhibition designers' toolbox: it offers new ways to engage users with digital content through tangible interaction. There is much potential in making the technology disappear and the visiting experience more immersive, sensorial, and affective (Dudley, 2010). However, the full integration of technology and museums requires us to approach the creation of an interactive exhibition as a collaborative project that combines curatorial, technical, and design aspects.

As part of a large project (Petrelli et al., 2013), we used a co-design and co-creation approach to explore what pervasive computing has to offer to museums. While we make reference to some of the techniques we used, here we reflect on the process the multi-expertise team went through to create, implement, and evaluate three very different concepts: an outdoor narrative-based soundscape for the remains of a World War I camp in the Italian Alps; a multi-point indoor exhibition on the changes in The Hague during the Nazi occupation; and the introduction of four interactive multimedia stations in a bomb shelter that hosts a traditional display of WWI artillery. The bespoke interactions shared the same aims:

- Design a visitor experience that seamlessly integrates technology and heritage/ exhibition
- Offer visitors multiple and contrasting voices to foster personal meaning making (as opposed to offering a single interpretation of facts)
- Affect visitors at an emotional level by offering personal stories from the past

The design effort was equally on the creation of bespoke devices and the composition of content that was not didactic but open to personal interpretation: curators left the threads of multiple stories for the visitors to make personal connections for a deeper, stronger experience; interaction designers concealed the technology and used it to let the personal engagement emerge.

The paper describes how the design process evolved in the three case studies and reflects on how the curatorial component and the design component could enrich and complement each other.

2. The process: From getting to know each other to co-design and co-creation

The case studies in this paper capture different phases of a multidisciplinary and iterative design process carried out by the same interaction design team with two different museums. The museum professionals and the designers knew each other, as they are all part of the Material EncounterS with digital Cultural Heritage (meSch) consortium, and thus shared the same vision and aims. In particular, meSch seeks to design technology in museums in such a way that visitors are not diverted from the heritage onto the interaction; instead, technology is used to augment the visit and focus the attention on the heritage. We also acknowledge museum-going is a social activity, and therefore any technical interventions should, as much as possible, support a group visit as opposed to devices

designed for individual use. Finally we want to engage visitors at multiple levels (physical as well as cognitive) and with multiple senses (e.g., adding touch to sight and hearing).

As part of meSch, before starting the projects presented here, the team members had all taken part in some co-design activities (McDermott et al., 2015), albeit not necessarily the same ones. Key was the participation of the museum professionals to a "sketching in hardware" session where they experienced, in a short period of time, the whole design process from initial conception to early testing of tangible interactions in museums, such as a treasure hunt with smart objects and a smart bag (Petrelli et al., 2013). Sketching in hardware contributed to growing in the heritage professionals an understanding that pervasive computing in museums can be very flexible, that screens are not the only way to deliver digital media, and that the space and the objects can automatically react to people, places, and other objects. For designers and technologists, too, this was a **phase of discovery**, the progressive understanding of the needs, constraints, and desires of museums, professionals, and visitors alike.

A second important stage in establishing the collaboration was a **creative phase** when some key ideas were implemented and tested with visitors. Prototype testing in situ was a limited intervention aiming at evaluating early ideas and visitors' reactions (e.g., Marshall et al., 2015; Petrelli et al., 2016). This shifted the focus from "becoming acquainted with what is technically possible" to a more focussed intent of "what can I do with this in my museum." At this stage there is no commitment yet; it is the time to be innovative and experimental and observe how novel interactions affect visitors.

The creative phase was a turning point, as it gave the team a common language and the time to appreciate their complementary skills; it also gave them the confidence that radically different interactions were actually feasible and had great potential. At this point there was mutual trust, evidence of good teamwork, and knowledge that inspiring visitor experiences were in reach.

A **development phase** followed: not that of an experiment, but an exhibition or installation open to the public where new forms of interactions supported by pervasive technology would be handled by thousands of visitors for many months. This was a leap of faith, as it required us to step into the uncharted grounds of designing a unique visitors' experience that makes use of bespoke devices. While curators think "Will visitors like it?", designers think "Will visitors get it?" and technologists think "Will visitors break it?"

3. Case studies

To illustrate aspects of co-creation we describe and reflect on three processes: a creative phase when we experimented with an affective visitor experience set in the remains of a World War I camp in the Alps; and two examples of development of (1) an indoor exhibition on the Atlantikwall that makes use of smart replicas to activate personal narratives to complement more traditional displays; and (2) a permanent multimedia installation within a bomb shelter that adds more personal and emotional content to a display of WWI artillery.

3.1 Trenches and camp of World War I: The design of an evocative experience

At a meSch project meeting in late 2013, designers presented a concept for the free visit of an outdoor heritage. This was the outcome of a set of explorations carried out independently by the designers, although fed by the ongoing discussion in meSch (McDermott et al., 2015); for example, how to offer multiple layers of interpretation or how to address a target group of visitors.

Figure 1: the prototype of the book device used to explore the cemetery.

The concept is that of an interactive soundscape: the space reacts to the visitors' presence and movements to tell stories related to that specific place. A bespoke device shaped like a book (figure 1) was developed for a local heritage, an historical cemetery: the book holds four themes, one per page. Visitors select the theme they want to listen to by placing the bookmark on the corresponding page. Sound was chosen as the medium to deliver content: screens were intentionally disregarded so as to encourage visitors to stay present to their bodily experience, and to leave their sight free to explore their surroundings.

Loudspeakers in place automatically played audio in response to the visitor's movement (i.e., in response to where the book is). The visitor holding the book walks the cemetery grounds. When the visitor is in proximity of a point of interest (about a 20-meter radius), the system triggers the playback of a loud sound in order to invite the visitor to get closer (attraction sound). When the visitor is about 5 meters from the loudspeaker, a story relevant to the point and corresponding to the theme selected via the bookmark is played (the narrative). The visitor can then move the bookmark and listen to another story from another theme, but still relevant to the point of interest, or move on.

When the concept was presented at a project meeting, the curators of the Museo Storico Italiano della Guerra suggested to trial it in the remains of the fortifications built across part of the Italian Alps at the outbreak of World War I in what was in 1914 the Austro-Hungarian Empire. Porting the prototype to site other than the cemetery only required us to change the sound files and the printed pages. However, the designers thought the device should be sympathetic to the place and explored different forms that resonated more with the trenches. The new design converged toward an interactive belt inspired by WWI soldiers' uniforms and a set of augmented cards to select the theme (figure 2).

Figure 2: the inspiration (left) for the interactive belt (centre) and the cards (right)

While the designers and technologists were implementing and testing the equipment, curators at the museum selected and prepared the content using material from their historical archives. The book and the belt offered the possibility of telling multiple stories at the same time (as opposed to developing a single trail). The curators chose four voices: that of the commander, formal with orders and war journals; the soldier, based on diaries; the story of women at war involved in the building of the trenches or evacuated from their homes; and the emotional voice of the poets. The content was carefully selected from historical sources and curated by the museum: references to the landscape (e.g., peaks or villages visible from the camp) gave a sense of immersion; the recording by professional actors was intended to provoke empathy.

We aimed at creating an evocative and immersive experience (Petrelli et al., 2016). By using only sound we wanted to leave the visitors free to look around and explore the place—the ruins close by and the landscape in the distance. The narratives were not explanations of what the place was, but invited the visitors to an active meaning-making. Finally, the stories chosen were intentionally contrasting (e.g., at the water cistern the voice of the commander declaimed the regulation on how much water was needed for every man in the camp, but the soldier would tell of his unbearable thirst).

The trial took place in the July 2014, and both devices, the book and the belt, were tested by a group of volunteers: they were given a map of the camp and let free to visit in whichever order they wanted and to listen to as many stories as they liked. All participants listened to more than one story at every point of interest and commented on the value of the sound coming from the place itself as opposed to individual headsets: "*sound in the headphone isolates, it becomes your own thoughts. Sound in*

place—like here—it is a narrative that comes directly from this place, that past." This participant's comment highlights the combined effect of the sound, environment, and content of the narratives. Other participants offered similar thoughts on how the sound in place, triggered by simply being there, was very effective: "*[the attraction sound] is like the place is welcoming you*"; "*[the narrative] is like someone is imprisoned in the place"; "[in the caverns] it resounds all around you*"; "*I liked the caverns best because you enter but cannot see—then the music starts, it is of great effect.*"

Figure 3: map of the WWI camp and the different points of interest.

Observing the visits and listening to the participants' comments, it became clear how the technology was completely transparent to them and the place became meaningful because of the stories. The narratives, prepared for this specific place and its locale, linked the present time, as experienced by the visitors, to the same place as experienced in the past by others: "*it is a clash between this place where the war was fought and [that] is now so beautiful.*" The curators left the traces of many lives for the visitors to pick up and to interpret and feel the place individually filtered by their own sensibility. The designers made the technology invisible and the interaction so obvious that what was left were the stories, the sense of immersion, and the personal connection. For us, it was a first example of how the design of the devices and the interaction, the concealed technology, and the crafted content work in synergy to create a unique experience of the place.

This initial shared small project was instrumental for each partner to progress their individual line of enquiry and, at the same time, find the terms of a collaboration. The museum wanted to assess if multiple and contrasting personal accounts appeal to visitors; the designers wanted to see the extent by which the different forms had any effect on the experience; the technologists wanted to test how reliable the system was and how much it could be pushed in an hostile environment (outdoor, no electricity, and no mobile phone signal). The enthusiastic response of the volunteering visitors fully justified the museum's extra effort in finding content to compose multiple stories around the same theme; the book and the belt showed that a tangible interaction with digital content is much appreciated. But glitches with Bluetooth technology and limited power provision push us toward a more reliable technical solution despite the emotional effect of an installation that automatically reacts to the visitors' presence.

3.2 *The Hague and the Atlantic Wall*: Complementing an objective trail with personal views

The collaboration behind the *The Hague and the Atlantic Wall* exhibition was based on a shared experiment set up during a museum professional conference hosted by Museon: fifteen objects competed for four interactive cases that monitored how much interest visitors showed in each object on display; every two hours the lowest scorer would be substituted with another (Marshall et al., 2015). A curator who was not involved in the design of the experiment was inspired by the interactive cases and approached the design team in order to collaborate on the exhibition he was preparing next: *The Hague and the Atlantic Wall* centred on the deep changes in The Hague when the Nazis demolished part of the city to make space for an impressive defence system against the Allies. The core content of the exhibition had to be available for everyone, irrespective of their willingness to

interact with technology. In other words, the purpose of the technology was to add a further layer of interpretation, possibly a "subjective" perspective to complement a more traditional "objective" physical trail (Marshall et al., 2016). This was the starting point of the six-month collaboration that preceded the opening of the exhibition and lasted after the opening. Here are the main stages:

1. A two-day ideation workshop kicked off the collaboration. The initial idea was to have a single booth for the interaction. As the discussion progressed and several possible scenarios were considered, the value of offering a subjective perspective throughout the whole exhibition became clear. We agreed on interactivity to be available for every display case and started discussing the relationship of the exhibition and the city and the possibility for visitors to contribute their personal and family memories (visitors' contributions then became an online interactive map for content browsing and uploading). The value of offering contrasting voices (the Dutch civilian, German invader, and civil servant) was clear to the curator and brought the team to the decision of creating smart replicas, one per voice (figure 4): visitors would pick a replica at the entrance, then would place the replica on a case, thus triggering the content for that specific perspective. Issues such as the number of visitors expected and the likeliness of many replicas to be lost were factored in.

   Figure 4: the six replicas created for the Atlantikwall exhibition, one for each of the three perspectives (the Dutch, German, and civil servant) in two languages (English and Dutch).

2. The co-design session resulted in an agreed solution and a plan of action that split the work based on partners' expertise: the curator to prepare the content, the designer to focus on the replicas and installation, and the technologist to implement the hardware and software infrastructure. This remote co-creation phase was supported by frequent communication: partners were continuously informed of what the other members of the remote team were doing and exchanged material (e.g., the preliminary content or video clips of an early working prototype). The final agreement was for multimedia to be integrated within the case: projection of visual content on the case glass and an earpiece for the narrative close by (figures 5 and 6).

   Figure 5: the interactive cases at the Atlantic Wall exhibition.

3. The distributed team met again in person at Museon to try the first implementation, discuss technical details, and take pictures of the objects the curator selected to be rendered as replicas. Discussions were held on the need for the museum to be able to reproduce the replicas independently from the design team. The design then took into account both the objects and their production and provided the museum with DIY kits for replica making (figure 6) (apart from the 3D-printed and decorated mug). This was instrumental to the selection of the final objects, as paper-based replicas were easier and cheaper to produce.

   Figure 6: materials and tools to make the replica of the sugar surrogate box. From left: a small box and a block of cork to to give it weight; the NFC tag; the printed wrapper; glue gun and sellotape.

4. The final stage of independent production followed. The hardware was shipped in advance of the opening for Museon to test and integrate into the exhibition. The software was designed in such a way that remote access was available should the need for amendments arise. The whole team was present for the final setup and the opening.

Figure 7: the exhibition (top); the replicas as available to the visitors (bottom right); visitors discussing their choice of replica (bottom centre); and a replica next to the original (bottom left).

5. From the opening, it was clear the projection and the earpiece made the subjective route clearly visible and pushed visitors to question what it was for and thus to try the replicas. Museon then improved the signage on where to collect the replicas and how to use them. The content was also amended a few times to respond to observation of visitors' behaviour; this did not need an intervention from the technologists, as the system design clearly separated infrastructure and content, this last completely controlled by the museum.

The exhibition was open from April to October 2015, and over fourteen thousand visitors actively used the replicas (data derived from system logs of visitor interactions). A number of evaluations were run by the different members of the team and Museon. All consistently reported enthusiasm for this novel way of interacting and the personal perspectives that were so different from the traditional factual exhibition. The data log also showed that the perspective of the German soldiers was the most listened to, marginally more so than the Dutch civilians, showing how the possibility of holding more than one narrative thread across the exhibition is a winning choice.

Figure 8: the WWI artillery gallery: a traditional display of objects and panels in the unusual setting of a bomb shelter.

3.3 Voices from the war: Introducing the human factor in the artillery gallery

A new project on World War I followed on from the the trenches project described in section 3.1, with the same team involved. This time the Museo aimed at enriching its permanent artillery exhibition with an interactive multimedia installation. The artillery gallery is hosted in a World War II bomb shelter, a set of chambers and tunnels dug into the rock beneath the Museo (figure 8). The process followed:

1. At the first ideation session, each team member arrived with her or his own ideas to feed the common brainstorming—props and sketches were used to discuss concepts and formulate scenarios (McDermott et al., 2015). Over two days, different objects for the visitors to hold were considered (e.g., a staff, a lantern, a helmet) and repeatedly challenged by the constraints and desiderata from the Museo (e.g., to be very cheap and easily replaceable, extremely simple to use). The shared solution emerged on the second day, triggered by the museum reconsidering the organisation of the content. At the entrance, visitors receive a "pebble" that they can use to activate content in four multimedia stations in the gallery; each station has multiple personal stories on the same theme; when leaving, the visitors hand in the "pebble" and receive a personalised postcard that summarises their visit (based on a log recorded in the pebble).
2. As with the Atlantic Wall exhibition, the co-design session was followed by independent work split by expertise and supported by frequent communication (e.g., exchanging preliminary content or video clips of an early working prototype).
3. A further face-to-face meeting took place at the Museo to allow technical tests and to discuss and agree on the final details. A further period of independent work followed until all was ready for the installation and the opening.

Figure 9: two of the multimedia installations: white-on-black drawing animation of the contended fort (left); talking portraits of the soldiers telling their stories (right).

The singularity of this example is that, as the collaboration progressed, the discussion shifted to the details and how to reach a specific effect. At one station, the curators wanted to use diaries of soldiers from opposing armies talking about the same battle. The theme was very strong, and the design team worked simultaneously on the narrative, projection, and settings to emphasise the sense of intimacy, the feeling that one is listening to deeply personal thoughts, to a confession (figure 9, right): actors recite the diaries, their faces projected on a large white canvas positioned in a niche out of the main visiting path. Team discussions in situ are also essential. When testing the projection in place, we considered which visual material would better support the stories; a number of different options were tried out, including a slide show of archival materials (floor plans, maps, and photos) and a coloured animation. White-on-black animated drawing was by far the most visually effective medium, as the lines seem to appear from nowhere (figure 9, left).

4. Toward collaborative exhibition design and creation

This section collects our reflections. It is the outcome of a dialogue on our individual experiences of the different projects and aims to tease out the critical points in the collaborative process that made the outcomes particularly successful.

First and most important is the people involved. Co-design and co-creation is not to everyone's taste. Neither is it something that everyone should do, although everyone could do it. It needs a certain attitude: one should feel at ease with discussing openly with no judgement even the most absurd of ideas as if feasible (reality checks always come, but at a later stage); one should not feel precious about one's own ideas, as they will be criticised and discarded or built upon and changed. Open-mindedness is the key personal factor: "*openness to the risk of making mistakes, willingness to think in different directions or to change direction*" (Hub). Designers knowledge and understanding evolves by making, prototyping and testing ideas, backtracking, and finding another way if they hit a dead end. However, this is not the way museums normally proceed in the exhibition creation: "*I was fascinated by the work of adapting the intuition to the "reality," the moving from the spark of an idea to a solid concept*" (Anna). Museums are more used to a traditional progression centred on decision making instead of prototyping and experimenting. In our experience, it is important to experience a practice-based creative process, possibly in the safe environment of a prototype trial. This builds up confidence in the team and trust.

The design process is messy; to those involved for the first time it feels slow, as if no decision is taken. But it slows down at the beginning to speed up later. Many ideas are explored earlier and tested via sketches, props, or rapid prototyping; failing often and failing quickly is important to reduce the number of options and to avoid committing to a solution that can later reveal itself as unfeasible or impractical (Brown, 2009). This core design principle can be extended to content preparation, too (e.g., the testing of different types of visual media for a given content and to achieve a specific effect).

Figure 10: how the different disciplines intertwine during the development of the creative process. Brainstorming is followed by parallel individual work supported by continuous communication; face-to-face meetings are important to progressively converge toward an integrated product.

Co-design and co-creation require commitment in the long run (figure 10). The initial brainstorming is always stimulating and exciting. It is the time to break rules and boundaries by being imaginative in a creative shared space: "*by visualising the concepts [via sketches, props or prototypes] the team can discuss, build upon and critique the developments in real time … this evokes empowerment, everyone feels they have ownership of the ideas and feel invested in the long-term development*" (Nick). Our brainstorming sessions were undoubtedly long: one day for an ideation session followed the next day by a reflective session where core points and assumptions were checked and agreed (half a day). The physical settings (enough space to act out situations), activities (discussing, listing, sketching) and materials used (pen and paper or props) are important to share thoughts and see those of others. It was also important for the same team to be present at both sessions and to have time to reflect in between. In the case of the Atlantic Wall, the second day was a consolidation and a refinement, while for the Voices from the War it was a turning point, as the curators proposed on the second day a different organisation of the content that drove the thinking in another direction.

The creative process initiated with the brainstorming needs to be sustained and renewed over time. Indeed, the initial collaborative creation is followed by a breakout where every member of the team develop their own component/contribution. It is essential in this phase to maintain good communication. Its nature, however, is very different from the one occurring in commissioned work, where multiple options are polished before they are offered for selection. Here it is more a case of showing the progression to maintain the feeling of a shared ownership and to enable constructive criticisms (figure 11); indeed, the less refined the prototype, the more likely it will elicit an honest comment by the different stakeholders. To show progression, the exchange of artifacts is vital; this includes duties for the museum, too (e.g., to send to partners examples of content or photos of objects), as every element contributes to create a mental picture of what the final piece will be and move the whole project closer to its final form.

Figure 11: examples of honest communication sent by the designers to the museums: top row the making of the interactive cases for the Atlantikwall; bottom row the making of the Voices from the War.

Periodic face-to-face meetings are important. We found early testing of an assembly of the technology (with potential content) in place particularly insightful, as we could focus the interaction and gain an early impression of what the final setting would be like. "*It's only when you see it in situ that you realise how it will work, the effect it can have. It all starts to come together and you see the importance of all the pieces: the setting, the content, the technology, the design*" (Mark). In a sense, it is a renewal of the brainstorming session, just more focussed as it builds upon decisions already taken.

The process progresses iteratively by alternating breakout developments with points of synchronization of the thinking and the collaboration. The outcome is not the artifact on its own, but "*the possibility for each of the parties—technical, design, curator—to see and evaluate their own*

values as embodied by the artifact" (Daniela). In other words, it is a shared object that materialises the vision each member of the team had and how it evolved through the iterative process.
We return to the importance of the team in a co-creation process: "*It means sharing responsibility, sharing success, sharing the credits, sharing ownership. It only works if the person responsible for the project is really convinced of this way of working*" (Hub). It needs long-term commitment, but it is rewarding: "*the experience of co-design was really important for me, but our everyday job does not offer many opportunity to work in teams of people with different backgrounds, so not to adopt co-design is often a matter of habit*" (Anna).

5. Conclusions

All evaluations consistently show much appreciation for our novel interactions: holding an object to select content empowers and engages visitors more than pressing a button would do. From a technical point of view, there is no difference, but the human factor here is strong. By completely concealing the technology, we achieved the immersion of the visitors into the storytelling. It also assured robustness, as there is no chance the visitor could tamper with it.
While the design is key to engage visitors at a physical level, the stories engage them at a cognitive level. In our experiments, the content was most of the time narrated in the first person, and it was designed to provoke empathy and an affective reaction.

The high impact our design had on visitors cannot be ascribed to just one component, technology versus content. One empowers the other: by simultaneously designing interaction and content, it is possible to create a bespoke experience that exploits the place or the objects to a powerful final effect. Clearly, this challenges the traditional exhibition design process as curators become creative members of the team in charge of shaping, through the content, the final experience of the visitors. It is then a matter of rethinking not only the technology for heritage, but also the process, and for curators to become more daring with content.

Acknowledgements

meSch (2013 to 2017) receives funding from the European Community's Seventh Framework Programme "ICT for access to cultural resources" (ICT Call 9: FP7-ICT-2011-9) under the Grant Agreement 600851.

Links

More information on the meSch project can be found at http://www.mesch-project.eu
WWI Trenches: video clip
The Hague Atlantikwall: video clip
WWI Artillery gallery: video clip

References

Brown, T. (2009). *Change by Design*. Harper Business.

Dudley, S. (2010). "Museum materialities: Objects, sense and feeling." In S. Dudley (ed.). *Museum Materialities: Objects, Engagements, Interpretations*. Routledge.

Kuniavsky, M. (2010). *Smart Things: Ubiquitous Computing User Experience Design*, Morgan Kaufmann.

Marshall, M., N. Dulake, D. Petrelli, & H. Kockelkorn. (2015). "From the Deposit to the Exhibit Floor: An Exploration on Giving Museum Objects Personality and Social Life." *Proc. of. ACM CHI Human Factors in Computing Systems – Extended Abstract*, 1917–1922.

Marshall, M., N,. Dulake, L. Ciolfi, D. Duranti, H. Kockelkorn, & D. Petrelli. (2016). "Using Tangible Smart Replicas as Control for an Interactive Museum Exhibition." *Proc of Tangible, Embedded and Embodied Interaction TEI 2016.* February 14–17.

McDermott, F., G. Avram, & L. Maye. (2015). "Co-Designing Encounters with Digital Cultural Heritage." Consulted January 2016. Available http://www.mesch-project.eu/co-design/

Petrelli, D., L. Ciolfi, D. van Djik, E. Hornecker, E. Not, & A. Schmidt. (2013). "Integrating Material and Digital: A New Way for Cultural Heritage." *ACM Interactions* 20(4), July + August: 58–63.

Petrelli, D., N. Dulake, N. Marshall, A. Pisetti, & E. Not. (2016). "Voices from the War: Design as a Means of Understanding the Experience of Visiting Heritage." *Proc. of. ACM CHI Human Factors in Computing Systems*. May 7–12.

Cite as:
Petrelli, Daniela, nick dulake, Mark Marshall, Hub Kockelkorn and Anna Pisetti. "Do it together: The effect of curators, designers, and technologists sharing the making of new interactive visitors' experiences." *MW2016: Museums and the Web 2016*. Published February 5, 2016. Consulted June 2, 2016.
http://mw2016.museumsandtheweb.com/paper/do-it-together-the-effect-of-curators-designers-and-technologists-sharing-the-making-of-new-interactive-visitors-experiences/