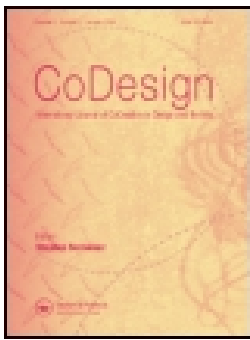


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# Creating tangible interactions with cultural heritage: lessons learned from a large scale, long term co-design project

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## ABSTRACT

We reflect on the process, outcomes and value generated by applying co-design to a large scale, long-term (4 years) collaboration involving designers, developers and cultural heritage professionals, with the goal of creating a platform for the realisation of tangible interactive installations. The project was pioneering in establishing and sustaining co-design for the introduction of sector-changing technology into the museum domain. We gathered extensive data about the co-design process itself, including interviews investigating the participants' experiences and the impact on their practices. The paper provides insights from such case study, particularly with respect to value co-creation.

## ARTICLE HISTORY

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## KEYWORDS

Co-design; cultural heritage; museums; value co-creation; qualitative study

## 1. Introduction

We report the lessons learned from a large scale, long-term project that was built on co-design in the heritage domain. It involved designers, technologists, social scientists and cultural heritage professionals, and had the goal of creating a platform to realise tangible interactive installations in exhibition settings. Co-design was inscribed into the project, meaning that a variety of activities, participants and goals characterising co-design practices shaped the decision-making, progress and impact of the project, thus interweaving many sensibilities, skills and requirements. Co-design was our way of working for a full 4 years. Thorough documentation and analysis helped us understand how such process unfolded, and the challenges, risks, advantages and outcomes of adopting such strategy in the domain of cultural technologies. Scale and duration gave us insights on how various participants and stakeholders perceived and felt impacted by their participation. Understanding the impact of co-design on the cultural heritage sector (particularly on museums) is important, for this domain entertains a complex relationship with both digital technology and participatory approaches. The former is increasingly present at heritage sites, but is often the product of design by external experts responding to a set of requirements established by an institution, and it can be perceived as being outside the realm of exhibition design and heritage interpretation despite being a very important part of it. The latter have been adopted, to various

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degrees, by many institutions to engage stakeholders in shaping or contributing to archives/exhibitions; participatory approaches also featured in digital technology projects leading to interactive installations. These have been, however, short-term exercises often driven by technologists.

Here we draw from the body of data we collected to document this process so to understand how co-design impacted our team and their practices, and how the value generated by the participatory approach was perceived and acknowledged.

With *value* we refer to the articulation of *value co-creation* proposed by Sanders and Simons (2009), resulting from the *collective creativity* of actors in co-design projects linking research, development and the creative and cultural sectors, as it occurred in our project. Sanders and Simons note that such endeavours should lead to *use or experience value* (i.e. the creation of effective and useful design outcomes), *social value* (i.e. the value generated for the team and for the greater set of stakeholders), *monetary value* (i.e. the economic benefit for a participating organisation, such as a museum). We will adopt this articulation of value co-creation to reflect on the results and impact of the co-design approach as practiced in our project.

We now examine related literature on co-design in technology design/Human-Computer Interaction for cultural heritage; we then present the case study and the methodology adopted; finally, we discuss relevant findings and key lessons learned.

## 2. Related work

Participatory Design frameworks and methodologies have been adopted and applied for long-term projects in Human-Computer Interaction (HCI) to develop interactive systems in many domains, from healthcare (Bowen et al. 2010) to local governance (Bødker and Zander 2015). However, such long-term efforts are rare when it comes to HCI work in cultural heritage: examples exist where heritage institutions, researchers and developers worked together to create large-scale digital resources, particularly regarding indigenous cultural heritage, where the participation of local institutions is essential (see Lyons et al. 2016; Rowley 2013). These examples, however, did not lead to novel interaction platforms. The vast majority of participatory and co-design initiatives for novel interactive experiences of heritage had limited duration (usually a few months). Important examples of co-design featuring novel heritage technologies development include interactive exhibition design (see Fuks et al. [2012] and Taxén [2004]) and participatory content creation (Dindler et al. 2010; Roussou, Kavalieratou, and Doulgeridis 2007). In each instance, different techniques have been used to encourage participation: from workshops to the joint development of creative ideas over time, supported by shared documentation and creativity-support tools (McDermott, Maye, and Avram 2014). These examples also demonstrate how stakeholders in the process of co-design around heritage varied as well, ranging from prospective visitors to specific subgroups – such as children (Bossen, Dindler, and Iversen 2012; Dindler et al. 2010), exhibition designers (Koleva et al. 2009), etc. Such varied practices of co-design demonstrate the heritage domain's complexity in terms of design goals, relevant stakeholders and challenges to overcome. Not only there is a wide variety of heritage institutions, each with unique holdings and mission, but the stakeholders involved can vary depending on the institution itself and on the goals of each project: different visitor

groups (in terms of age, nationality, interests, etc), students and teachers, local amateurs or enthusiasts, experts in the heritage in question can all be meaningful actors to engage.

Overall, there is a trend in facilitating greater engagement by various actors in designing interactive systems for cultural heritage, also including end-user programming toolkits aimed at heritage professionals (Ardito et al. 2010), leading to intended end-users gaining new roles (Kanstrup 2012). All this is important when devising long-term participatory strategies that engage cultural institutions and professionals, aiming to deliver a series of projects (rather than just one-off prototypes), and to significantly impact on the practices of participants. While such examples in the heritage domain are – as we said – few, issues arising from long-lived co-design have been examined by several researchers. To the examples listed earlier, we must also add the investigations of how the balance of power and the mechanisms of decision making operate in co-design teams (Bratteteig and Wagner 2014); the establishment and configuration of various roles and related responsibilities (McCarthy and Wright 2015); the relationships among them (Vines et al. 2013); the role that technological prototypes play in developing design concepts (Ciolfi et al. 2016).

In parallel to HCI and PD research, participatory methods have been adopted and discussed by heritage practitioners (Simon 2010), who reconsidered the set of skills and techniques to deploy in light of increased participation (Marty 2006), and reflected upon the benefits of participatory initiatives for cultural institutions and their audiences (Bienkowski 2016; Silvia, Jaebker, and Leason 2014). However, almost always these initiatives had visitors and local communities (or linked institutions) take part in projects designed by the institution itself, rather than co-design them. These examples are, in other words, instances of one type of participatory strategy (e.g. audiences invited to contribute in part to projects designed by institutions), rather than pervasive co-design exercises.

From such state-of-the-art, several issues emerge. The relationship with technology in a sector often struggling to find resources and bring in new skills is evolving from something that is usually outsourced and/or commissioned to external experts, to something that is more pervasively built into the skillset of heritage professionals. The Do-It-Yourself trend also enables heritage professionals to play a greater role, by providing them with tools and peer support for developing projects, while at the same time creating new demands and expectations.

Furthermore, the variety of staff profiles and of mission ‘ethos’ of heritage institutions means that participatory approaches are likely going to be unique to each project and to each co-design team, and that whoever coordinates participation might do so in different ways. Furthermore, issues of power and authority in cultural heritage can affect co-design strategies, particularly if institutions are wary of engaging with non-experts in shaping exhibitions or companion activities. What is the actual impact that co-design can have? What legacy does it leave? Who benefits from it beyond project-specific endeavours? In other words, what value does technology co-design with and for the heritage domain generate? These issues must be examined in the longer term rather than on the basis of one-off, short-lived projects. Furthermore, there is the need to be reflective about the co-design process in the heritage domain, rather than just examine its outcomes, by paying attention

to how co-design unfolds and what kinds of impact it has in terms of skills, concerns and understandings. We shed light on these issues through our case study as part of the European research project called meSch.

### 3. The case study: co-design in meSch

Our case study is the European Project Material EncounterS with Digital Cultural Heritage-meSch (2013–2017). meSch had the goal of co-designing a toolkit enabling cultural heritage professionals (CHPs) to create tangible interactive installations (Petrelli et al. 2013). The team included twelve partners across six countries (Table 1). The heritage sector was well represented: three partners were museums and one was a digital heritage foundation. Other partners were six universities/research institutes, a design foundation, and a small-medium enterprise (SME) specialising in services for tourism and the cultural sector. The academic members represented many skills and disciplines: computer science, engineering, social science, heritage studies, interaction and product design. All academic teams were multi-disciplinary and had previous experience of working with heritage institutions, including on the design of interactive technologies. On the other hand, the heritage partners' previous experiences were more varied: only some of them had worked with academics and embarked on significant technology development projects. The practitioners from industry and from the design foundation similarly had a breadth of expertise regarding heritage projects, and both had previously worked with academics and museums.

Additionally, several heritage institutions that were not formally members of meSch participated as external collaborators in dedicated co-design events, enabling the team to involve a wider range of heritage bodies.

As we mentioned, meSch worked through co-design for its entire duration, with the heritage partners and collaborators fully contributing to developing the technology and toolkit. Co-located 'intensive' events alternated with sustained asynchronous collaborations between subgroups of partners (also maintained through shared blogs and documentation, and regular online meetings, given the team's geographical distribution). We term 'intensive' those events that were fully dedicated to co-design activities (such as workshops for generating design concepts, and hands-on exploratory labs devoted to rapid prototyping), lasting for 2–3 days, and which had an important role in the progression of the co-design.

The heritage full partners in the consortium were: an archaeological museum- Allard Pierson Museum, an educational museum oriented toward families and schools – Museon

**Table 1.** Organisations and teams involved in co-design.

Partners involved in co-design	Team size	Designers	CHPs	Previous collaboration experience	Interviewed
Uni1	5	3		2	4
Uni2	3	3		1	1
Uni3	4	2	1	3	1
Uni4	2			1	1
Design Agency	3	2		2	1
SME	2			1	
Museum1	2		2	2	1
Museum2	2		2	1	2
Museum3	2		2		1
Digital Heritage Foundation	3		3	2	

(both in The Netherlands), and a historical museum- Museo Storico Italiano della Guerra (in Italy). These partners received project funding and had responsibilities for delivering various aspects of the project. The group of external collaborating institutions included two historic cemeteries (UK and Germany), local city-based museums of arts and antiquities (Ireland, The Netherlands, Spain), one historic house museum (The Netherlands), and a second educational museum (UK).

Some of the intensive co-design workshops included only the consortium partners (particularly earlier in the project so to set up the team, shared goals and strategy in the best possible way), whereas others were open to external collaborators. Furthermore, meSch featured three major case studies, where full-scale interactive exhibitions were designed, developed and opened to the public. Each case study was led by the corresponding museum partner, which had final say on every aspect of the case study delivery, as they were part of their official programme and targeted at their intended audiences. Both co-located intensive co-design events and longer-term activities through shared collaboration tools took place to realise the case studies.

Roles and power relationships within the team were first and foremost shaped by the project work plan, with clear assignment of leadership for tasks and deliverables shared by all partners, according to their expertise. Given its prominence, conducting, monitoring and analysing, the co-design process corresponded to a separate unit of work with allocated resources. It was led by one of the academic partners, specialising in interaction design and co-design, and partners with previous experience of managing co-design (four universities, two museums and the design foundation) were assigned roles in organising, facilitating and documenting activities. For all participants, meSch was the first experience of working on such an extensive co-design effort and with such a configuration of collaborators/expertise.

Goal setting and skills mapping activities within the team started since the preparation of the project funding proposal, and involved representatives from all partners. These exercises continued as the project started in earnest with a full team.

The co-design process was carefully monitored and extensively documented throughout. The intensive co-design workshops were documented through observations, analysis of the materials produced, post-event questionnaires and interviews with participants (see Table 2). The longer-term collaborations within the team were documented through shared blogs (each relating to a case study being co-designed by

**Table 2.** Interview Participants.

Name	Profile	2014	2016
Bessie	CHP	x	x
Nancy	CHP	x	x
Ian	CHP	x	x
Zack	CHP	x	
Eric	Designer	x	x
Bea	CHP/Academic	x	
Fran	Designer/Technologist		x
Ellen	Designer/Technologist		x
Noel	Technologist		x
Oliver	Designer/Technologist	x	x
Hazel	Designer		x
Maureen	Designer/Technologist		x

partners), self-documentation by the key project personnel, and through interviews with project participants.

Data sets collected are:

- Documentation of co-design activities: notes, photographs, video recordings of all co-design activities; follow-up notes written as a thorough descriptions of the activity within one week of each event;
- Case studies: each team involved in the exhibitions at the three partner museums used a closed access blog to keep notes (in Italian, Dutch and English). Self-documentation involved photo-taking, videoing, audio recording.
- Interviews in the Spring of 2014 (midway through the project) with seven cultural heritage professionals and designers involved in co-design (Table 2); focus group on co-design held in Germany in the summer of 2014.
- Semi-structured follow-up interviews with ten key participants (i.e. people involved in most co-design activities, particularly regarding the case studies) conducted close to the end of the project (late 2016) (Table 2).

The data were analysed thematically during the life of the project in correspondence to milestones, and used for reporting on progress in meSch. We now reflect on the process and discuss the insights drawn from the thematic analysis of the co-design data. We particularly make use of excerpts from the reflective interviews as they shed light on the participants' views, reflections and comments on the entire process.

#### 4. Co-design as the medium for mesch

The meSch perspective was built on the principles of Participatory Design (Ehn 2008; Greenbaum and Kyng 1991; Bratteteig and Wagner 2014), with the participation of stakeholders in all phases of the design process (and particularly in creating, selecting and concretising choices), as a sine-qua-non condition for addressing actual cultural heritage institutions' concerns, and with the designer's role as a facilitator and provider of platforms and situations for participants to contribute fully and fruitfully to the process. Co-design thus shaped the working relationships among team members in complex ways. Furthermore, it led to mutual understanding and learning, which is one of the extensively documented impacts of co-design on the practices of participants (Bratteteig and Wagner 2014). During the first two years, activities such as goal-setting workshops and subsequent creative workshops formed and strengthened the basis for common understanding and for a common language. This took time, but was crucial: the team had to bridge the gap between proposing an ambitious vision for meSch and realising it against very real constraints. Learning and building mutual understanding went both ways: while designers and technologists learnt about the CHPs' interests and challenges, these also offered opportunities for CHPs to explore new technologies and interaction concepts that they were not familiar with (e.g. sensors and actuators embedded into physical objects, replica museum artefacts augmented with NFCs tags that conferred them the power of unlocking personalised digital content when placed at key points throughout an exhibition).

After the initial co-design activities, when the time came to move towards the three case studies, Zack (an experienced curator leading a case study) expressed the need for more than reaching common understanding. He spoke about ‘bridge figures’, who could bring one world into the other:

The short [co-design] sessions are good as a start, but in the end we really need to bridge these domains and that means really working side-by-side. And that may be one of the lessons we are already learning, because I really appreciate it now that they’re bringing D. [a postgraduate research student from a technical partner] in for a long-term project. I think that’s something that later on will really be helpful, because he can now be some sort of ambassador for the museums in his team. And that’s what we need(. . .) I think we need to look for these kind of key figures in the project: the people who are really bridging the different domains. (Zack, CHP, 2014)

We now examine some key aspects emerged from our data that shed light onto less-researched aspects of the impact of co-design. We refer to participants through pseudonyms.

#### 4.1. The role of technology in co-design

Digital technology was not just the intended ‘product’ of the co-design process, but it impacted and shaped the process in several other ways. In the first 20 months, inspired by the earlier activities and the well-known settings of the participating museums, several interactive prototypes were developed: these included, for example, a magnifying glass-shaped device (‘The Loupe’, shown in Figure 1 (a)) that visitors could use to explore paths in the museum; an interactive book (Figure 1 (b)) where visitors could choose the theme of the audio content accompanying their visit (e.g. history, architecture, local legends, etc.) by placing a bookmark on a particular page; an interactive plinth (Figure 1 (c)) that could sense approaching visitors and display information about the object it held.

These early prototypes were meant not as final products, but as prompts to stimulate discussion and to inspire future developments such as the case studies. These prototypes and related interaction concepts were also seen as *blueprints*, and a way to build the toolkit from the ground-up: i.e. what would CHPs need to know in order to create a similar prototype in their own museum?

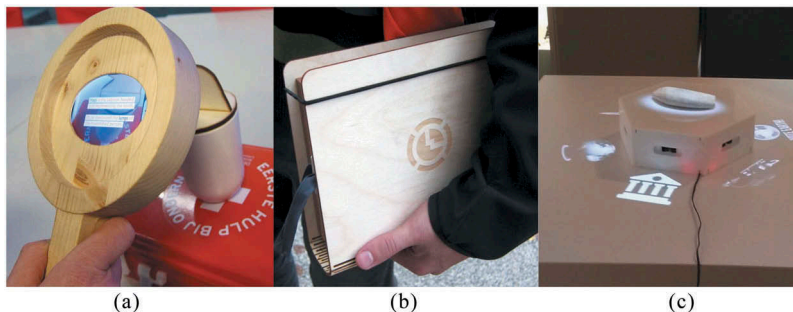


Figure 1. (a) The Loupe (b) The Interactive Book (c) The Interactive Plinth.

The prototypes were therefore used as examples/templates in further co-design activities (including those with local collaborating institutions) and in hands-on building and prototyping events called *exploratory labs*. As examples, one local collaborating museum developed its own version of the Loupe prototype; the interaction template of the book prototype was adapted to create a version suitable for an outdoor heritage site. Only some of the co-design activities (particularly the exploratory labs) included experimentation with technology at this level, but due to the aim of meSch, technology was a constant presence in everybody's mind:

For me, co-design is a way to get a hold of a project for seeing the possibilities of technology. (...) it helps to make it more concrete; to explore the possibilities, and to have ideas of the possibilities that the project offers. And I think that should be the aim of these co-creation sessions. (Ian, CHP, 2014)

Designers and technologists saw the prototypes as means for supporting dialogue and understanding the CHPs needs in building narratives for their own museums, as with the examples we mentioned. Prototypes made things more concrete and provided an 'entry point' to what could actually be done in the settings that they work in:

For me the prototypes are a means of creating a dialogue because if you proposed something to a museum then they can say 'I like this', or 'I would have liked it if it had done this'. So then it becomes less open, but it triggers other questions because it is something you can use, rather than it being just a discussion in words where everything is possible (...). (Eric, designer, 2014)

Technology was used as a demonstrator and -importantly- as a way of bridging frames of mind:

We had a sort of empty shell of a piece of technology or an idea, and the curators didn't know what that was until we sort of sold it to them – we explained what it was, and then they could make their own mind up about how to implement it. And what was good about that session was that we had two sets of very-very focused use for that technology or product. So they immediately bonded with that technology, they thought "I could do this!" and "this is my concept". (Oliver, designer and technologist, 2014)

The two rounds of exploratory labs saw designers, technologists and CHPs (from both inside and outside the consortium) using the concepts and prototypes developed thus far, and repurposing them to be used in their own heritage institutions. Physical shape, media content and behaviours were altered on the spot under the eyes of CHPs. For example, a prototype called 'The Way Detector' (a hand-held egg-shaped object that would vibrate with different intensity depending on its proximity to relevant exhibits) was adapted into a variation suited to a historic house museum: a pie dish designed to guide the visitor from the ground floor kitchen, where the visit started, through all the rooms of the house. This *prototyping together* (for the benefit of the process and for demonstrating that indeed such activities could be performed by CHPs with confidence) showed how co-design activities using technological artefacts could impact the practices of CHPs. The actual impact is emphasised in the quote below:

(...) the exploratory lab was quite good because it's intervening into the curatorial practice, in a way. It's really about what's there in the museum and how you can use

technology, those kinds of tools, to enhance the visitor experience... From my perspective, that was the most productive... The second exploratory lab was also with curators [external to meSch]. I heard that they really liked it, and that it was really good to have a dialogue with designers, and that's really crucial part of the success. Because design, technology, and curators are parallel worlds and we really need to bridge that... you can only do that if you are in a dialogue and looking at the same solution in a way. (Zack, CHP, 2014)

At the same time, some designers were concerned that technology might have been introduced too early and might have hampered creativity, allowing technological feasibility to play a major role in dictating the outcomes:

At the time of the co-design workshop we had in Amsterdam in the summer of 2013, due to what happened in my own group, I had the feeling that we had betrayed the museums. Tech took over the show. As a designer, I felt we lost control. (...) But looking back, nothing was lost, we learnt from experience and this episode proved useful. (Hazel, designer, 2016)

While the rationale for focusing on the prototypes was that of enabling the CHPs to become as familiar as possible with the technology, this could have had some ill effects in terms of creativity. However, as we discussed in (Ciolfi et al. 2016), open brainstorming (as it happened in some of the very early workshops) also required a significant amount of bridging and supporting by both designers and co-design facilitators.

#### **4.2. Embedding co-design into heritage practice**

Designers and technologists became acutely aware that the design of new exhibitions, tours, or learning experiences does not revolve around technologies, and that the CHPs' narratives must come first. While all designers and technologists adopted a user-centred view before meSch, and most of them had had experience of prior (albeit smaller) co-design exercises, facing the complexities of integrating interactive components into a wider exhibition narrative was a steep learning curve, particularly due to the role of cultural institutions as co-designers and to the novelty of the interaction modalities and relationship to exhibition settings (e.g. tangible interaction, avoiding screens as input or output displays, etc.). This was particularly affected by the diversity of the heritage partners, meaning diverse physical set-ups, audiences, narratives and priorities. Earlier in the co-design process (2013–2014), interaction concepts (including those in earlier examples) were developed, and then reshaped, changed, or abandoned altogether. Needs and preferences took a while to emerge and become clear, and some of the participants' individual perspectives diverged as the scope and aims of meSch were shaped by working together and finding agreement:

In a workshop with Allard Pierson Museum, there was a Greek helmet proposed. It was a paper prototype [a tangible replica of a Greek helmet housed at the Allard Pierson Museum] – if you looked at the helmet it would tell a general war story and if you put it on, you would hear the individual soldier's story (...). But because a smart replica is never the real thing, Allard Pierson Museum was opposed to the idea (...). So the strange thing is that the term 'smart replica' keeps popping up and when we talk about giving the object

a more important place (...) but it drove us to create stuff that you put between the object and the visitor rather than letting the object talk (...) So in that sense I feel that the museums could've been more vocal about what they need. In retrospect it doesn't feel like they got something out of it. (Eric, designer, 2014)

Furthermore, as some initial concepts changed shape and functionality to become technically feasible prototypes, some of the initial CHPs' contributions were superseded. Technical explanations were provided for these changes, but frustration persisted and required tending to by means of reviewing the decision making process and ensuring that the heritage partners shared the motivations:

From speaking with some of the museum professionals (...) I get the impression that they are delighted to have all of these co-design activities, but the same time I have the feeling that they are somehow frustrated at how the actual prototypes are finally being implemented, somehow they are cut out off [from] the equation. (Bea, researcher and CHP, 2014)

Additionally, consolidating concepts into functional prototypes required further facilitation to ensure everyone's contributions were acknowledged, for example regarding the type of digital content to support and the materials used to realise the physical components. Understanding the language and the actual challenges of CHPs in their institutions at an even deeper level, and more pervasive ways of working together and sharing insights long-term became vital in the second part of meSch, in order to design actual exhibitions.

### **4.3. Maintaining working relationships**

Multidisciplinary collaboration on this scale was a novel experience for everyone involved. Clear value was perceived by all participants, not only in being able to voice their concerns, skills and goals, but in understanding others' way of thinking and in mutual learning.

Although the idea of co-design could suggest that all the participants are on equal footing, previous research showed how various roles are articulated in terms of decision-making power. In our case, designers and technologists stated that the ideas and existing practices of cultural heritage professionals guided and inspired the process, and the CHPs served as ultimate arbiter for interactions underpinning the leading narratives. Designer and technologist Ellen recalled strongly supporting the idea of an interactive walking stick for guiding visitors while the curators didn't regard it with the same enthusiasm, and thus it was not realised. At the same time, Oliver felt like he acted as 'creative tool' during the second exploratory workshop, where a number of concepts and prototypes were transformed to suit the ideas of participating museums. This gave him – and the whole consortium – a better sense of the functionalities of the meSch toolkit to be developed:

(...) we [designers] were a sort of creative tool for them to use and guide, and that worked very well because they understood (...) what the limitations were and what they could do with it, and it was for us to implement in a very short period of time. (...) for those four hours, I was the curator's tool (Oliver, designer and technologist, 2014)

For Oliver, in that particular instance, co-design felt like mainly supporting others, while still significantly contributing to the process.

Another interesting aspect was the feeling that by virtue of the work even non-CHPs ‘fitted’ in the museum:

When we were installing in Museon, the ladies who looked after coats came to us and asked us ‘what museum are you from?’ And you know, you got me and [colleagues] putting the objects in the cases, and I just thought that it was nice that they thought we had the same approach, we fitted in a museum setting. And I think that’s only coming about from the work that we’ve done over the last year and understanding the sensitivity of what we are handling, understanding the environment, understanding the people, how they work how, we have concessions with each other; it is a very interesting question who benefits more, who’s learning more, who’s going to get more out of this? (Oliver, designer and technologist, 2014)

However, not all the participants felt comfortable with this way of collaborating. Bea, researcher and CHP, who, however, only took part in one consortium-wide co-design workshop, felt that the lack of a common background was possibly making the conversation counterproductive:

Another thing about this exercise was that, the point was to put together people of different specialisations, and in my group this became difficult because, for example, the way that the technical person would approach a situation is completely different to how a museum professional would approach the situation (...) It feels that sometimes teams of mixed expertise (...) lead to confused outcomes... (Bea, 2014)

This perception raises the question of how to ensure that the team shares enough experiences to feel like they are part of the dialogue, rather than outsiders. Overall, the long-term engagement through co-design was seen as a win-win situation for all those involved in a sustained way:

(...) The CHPs also admitted to building new skills and knowledge. While they admitted toward the end they still had a lot to learn, they also acknowledged that they had learned a lot about creating an interactive tour for the museum... Overall, I believe we learned something of value that went beyond this project. For me as a designer, I feel I have learned what can be done to build an effective design collaboration with a museum, and the museum learned a bit more about their visitor base. (Maureen, designer and technologist, 2016)

#### **4.4. The value of long term engagement**

Being part of such a project was perceived by many as ‘a luxury’: compared to other smaller initiatives, meSch had resources and time to go from ideation to technical implementation without sacrificing quality. The scale also meant that different collaborations formed dynamically, based on affinities, an emerging common language, and common interests. How the co-design process was organised, led, and reflected upon (i.e. recognising its importance) was key for getting everybody to commit to it on such scale. The earlier activities gave CHPs the impression that everything came a bit too easily in comparison with their existing practices. It took a while for them to be convinced that results can be produced this way and ‘to trust the process, and to

believe what comes out will have value' (Maureen, designer and technologist, 2016). Initially, making a connection between experimenting with interaction concepts and actual future exhibitions that would incorporate them was not straightforward: for example imagining the concept of a 'smart' replica museum object that can unlock digital content (as it was proposed for the Allard Pierson Museum case study) becoming implemented and playing a part in an exhibition, rather than just being part of brainstorming. Additionally, it appeared that things were moving too slowly: Ian (CHP) in his 2014 interview stated that there had been enough work done in workshops and it was time to 'focus on real cases and on real stuff that we're going to implement'. The replicas were indeed fully realised for the Allard Pierson Museum case study.

A way to sustain the process is to make other forms of value generation visible; while the end goal is not immediately achieved, however this depends on establishing a strong relationship:

(...)it's not just about putting a designer and a curator into one space to come up with a solution, it's a relationship. It's about recognising opportunities, it's about appreciating creativity, maybe thinking out-of-the-box? (...) You need to invest in it. (Zack, CHP, 2014)

Ellen recalled this challenge in relation to the co-design of an exhibition for Museo della Guerra on the theme of World War 1, where those involved worked together before:

We spent the first day discussing all kinds of ideas; nothing seemed to work; none of the scenarios worked; we were all disappointed and someone even mentioned they felt we wasted the day. However, the next day, as a result of these alternatives explored, Bessie [the curator] and her colleague arrived at a completely new approach, and we all knew in a matter of minutes that this was the solution we needed. (Ellen, designer and technologist, 2016)

When asked, all the participants said they would use co-design again if the situation allowed, and would recommend it to others. Almost everybody agreed in the interviews that co-design takes more time, but can produce better results, especially in long-term collaborations. Participants valued co-creation more when examining the phases of the project retrospectively, therefore building these into the process may be beneficial. During the mid-project interviews in 2014, the perceived meanderings of the process made some participants anxious; in 2016, closer to the end of the project, they valued the whole co-creation process as an important enabler of mutual learning and the concrete outcomes of the project. Unfortunately, Bea, who had been so negative in her 2014 interview, could not be interviewed again to see whether her perception changed.

Consortium workshops, local activities, exploratory labs and research on co-design all fed into the process, even if how each pushed it forward was never explicitly discussed:

(...) I thought that the co-design workshops were not only a means of getting the scenarios fixed or drawn, but also a means to have a conversation about all of the things that we have learnt and that you could bring to the table. Which is kind of implicit in the whole process. I'm not sure how many people felt it was goal oriented or knowledge sharing orientated. Maybe in that sense, it would've been clearer if we had discussed those things and make them explicit beforehand. (Eric, designer, 2014)

The resulting documentation was used to develop a booklet of co-design techniques and templates, made freely available online. This was not a planned outcome of the co-design, but rather another form of value-creation that emerged as the work was conducted and was recognised as a major outcome of the process.

## 5. Conclusions and lessons learned

After discussing four dimensions of the meSch co-design process, we focus on how the impact and value generated were perceived, recognised and acknowledged. To conclude, we reflect upon the Sanders and Simons (2009) ‘value co-creation’ dimensions: use or experience value, social value, and monetary value (skills, expertise).

Regarding the *use or experience value*, what was created was a very positive user experience for the CHPs using the toolkit, and – consequently – for the visitors of the museums featuring the installations. It took time and dedicated efforts to bridge between understandings, languages and concerns, but the results from co-creation were perceived to have added value to the institutions. Also, the non-heritage partners felt that this process truly took into account the experience value of the intended users, on a scale that is unusual even in research. The experience value therefore refers not only to the experience of the technology that was developed, but to that of co-design itself.

Regarding *social value*, mutual learning and understanding were two of the most acknowledged forms of value co-creation. We illustrated how team building and the forging of relationships that helped deal with occasional tensions and conflicts were highly appreciated. Importantly, while many views expressed in the 2014 interviews were quite critical and even sceptical, the 2016 interviews (in light of the successful case studies) offer a significantly more positive perception of roles and contributions. This illustrates the key importance of the co-design extended time frame and of highlighting intermediate achievements to sustain a challenging process. A number of smaller, unplanned collaborations among certain participants also emerged, demonstrating the benefits of social value building within the team.

Finally, regarding the *monetary value* of co-creation, obviously all the partners aimed at generating economic value out of meSch, particularly the museums that embarked on a project quite unlike the ones they normally conduct. The participants emphasised that they gained new skills in the process, akin to professional training. Furthermore, when discussing the sustainability of using co-design after meSch, CHPs were positive and confident that the experience acquired will allow them to involve other colleagues and/or external collaborators in future. In the case of small museums with limited resources, the involvement of volunteers (such as interns) in co-design was seen as a viable alternative.

This articulation of value co-creation provides insights on other issues that are well known in co-design scholarship, such as the negotiation/balancing of power relationships and the actual extent of co-design’s impact. Regarding power relationships, the group dynamics earlier in the project reflect broadly what previous research established, particularly on the negotiation of roles and responsibilities. For example in earlier consortium co-design activities, CHPs were for the first time directly involved in decision making regarding design and technology development (which designers and

developers led), while driving the definition of goals and requirements for their heritage institution. During that phase we saw leadership negotiations in terms of what could be technically realised as well as what could fit in a museum. As the process evolved, however, and particularly as the case studies approached, the CHPs shouldered more responsibility and leadership. While this was in part due to the project formal workload allocation, the fact that CHPs could confidently lead the process was also by virtue of how much they felt they had learned. Mutual trust had also increased, and this was echoed in the second round of interviews (after the case studies). Beyond trust, value was also generated in terms of knowledge and understanding: participants expressed their appreciation for being able to ‘fit in’, by recognising and communicating issues in a domain that was not their own at the beginning of meSch.

While we showed how such extensive process presented challenges in terms of establishing, maintaining and rewarding these relationships, we also saw the extent of what was gained, in terms of co-design outcomes (prototypes, exhibitions), and experience, knowledge and skill. This demonstrates that the participants attribute co-creation a higher value as time goes by – after mutual understandings emerge, shared goals are negotiated and results begin to materialise, compared to the initial phases, when the level of required effort is high and results uncertain. There is a real tension between choosing co-creation as the core approach for a new collaboration project, and the requirements to demonstrate early in the process that the project is on track. However, co-design should not be seen as a universal solution for any project, and the decision of adopting must be made with proper consideration.

What we presented is of course the result of a particular study setting, which might be difficult to replicate. Another limitation is that the researchers monitoring and reflecting on co-design were also involved in other meSch activities, meaning an insider’s perspective throughout. However, despite these limitations, the study presents, in our view, a significant instance of long-term co-design for cultural heritage technologies, populating a space of case studies where examples of this scale are few, and contributes useful knowledge about the broader challenges of long-term and large-scale participatory initiatives.

Our empirical study shows how in such a co-design approach it is more difficult to perceive intermediate achievements, while it is instrumental to establish stronger, and indeed life-changing partnerships.

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## References

- Ardito, C., M. F. Costabile, R. Lanzilotti, and A. L. Simeone. 2010. "Combining Multimedia Resources for an Engaging Experience of Cultural Heritage". In *Proceedings of the 2010 ACM Workshop on Social, Adaptive and Personalized Multimedia Interaction and Access (SAPMIA '10)*. New York, NY: ACM. doi:10.1145/1878061.1878077.
- Bienkowski, P., Ed. 2016. *No Longer Us and Them: How to change into a participatory museum and gallery*. London: Paul Hamlyn Foundation. [https://www.phf.org.uk/wp-content/uploads/2016/07/Our-Museum-Report\\_April-2016-double-page.pdf](https://www.phf.org.uk/wp-content/uploads/2016/07/Our-Museum-Report_April-2016-double-page.pdf).
- Bødker, S., and P.-O. Zander. 2015. "Participation in Design between Public Sector and Local Communities." In *C&T '15 - Proceedings of the 7th International Conference on Communities & Technologies*, 49–58. New York, NY: ACM.
- Bossen, C., C. Dindler, and O. S. Iversen. 2012. "Impediments to user gains: Experiences from a critical participatory design project." In *Proceedings of the 12th Participatory Design Conference: Research Papers - Volume 1 (PDC '12)*, edited by K. Halskov, H. Winschiers-Theophilus, Y. Lee, J. Simonsen, and K. Bødker, Vol. 1. 31–40. New York, NY: ACM.
- Bowen, S., A. Dearden, P. Wright, D. Wolstenholme, and M. Cobb. 2010. "Participatory Healthcare Service Design and Innovation." In *Proceedings of the 11th biennial Participatory Design Conference*, 155–158. New York, NY: ACM.
- Bratteteig, T., and I. Wagner. 2014. *Disentangling Participation: Power and Decision-Making in Participatory Design*. London: Springer.
- Ciolfi, L., G. Avram, L. Maye, N. Dulake, M. Marshall, D. VanDijk, and F. McDermott. 2016. "Articulating Co-Design in Museums: Reflections on Two Participatory Processes." In *Proceedings of the 19th ACM Conference on Computer Supported Cooperative Work & Social Computing (CSCW '16)*, 13–25. New York, NY: ACM.
- Dindler, C., O. S. Iversen, R. Smith, and R. Veerasawmy. 2010. "Participatory Design at the Museum: Inquiring into Children's Everyday Engagement in Cultural Heritage." In *Proceedings of the 22Nd Conference of the Computer-Human Interaction Special Interest Group of Australia on Computer-Human Interaction, (OZCHI '10)*. 72–79. New York, NY: ACM. doi:10.1145/1952222.1952239.
- Ehn, P. 2008. "Participation in Design Things." In *Proceedings of the Tenth Anniversary Conference on Participatory Design 2008*, edited by D. Hakken, 92–101. Bloomington, IN: ACM.
- Fuks, H., H. Moura, D. Cardador, K. Vega, W. Ugulino, and M. Barbato. 2012. "Collaborative museums: An approach to co-design." In *Proceedings of the ACM 2012 conference on Computer Supported Cooperative Work (CSCW '12)*, 681–684. New York, NY: ACM. doi:10.1097/PHM.0b013e31825a0a1b
- Greenbaum, J., and M. Kyng, editors. 1991. *Design at Work: Cooperative Design of Computer Systems*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Kanstrup, A. M. 2012. "A Small Matter of Design: An Analysis of End Users as Designers." In *Proceedings of the 12th Participatory Design Conference: Research Papers (PDC)*, edited by K. Halskov, H. Winschiers-Theophilus, Y. Lee, J. Simonsen, and K. Bødker, 109–118. Roskilde, Denmark: ACM. doi:10.1177/1753193411419439
- Koleva, B., S. R. Egglestone, H. Schnädelbach, K. Glover, C. Greenhalgh, T. Rodden, and M. Dade-Robertson. 2009. "Supporting the Creation of Hybrid Museum Experiences." In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, (CHI '09)*, 1973–1982. New York, NY: ACM. doi:10.1145/1518701.1519001.

- Lyons, N., D. M. Schaepe, K. Hennessy, M. Blake, C. Pennier, J. R. Welch, K. McIntosh, et al. 2016. "Sharing deep history as digital knowledge: An ontology of the Sq'ewlets website project." *Journal of Social Archaeology* 16 (3): 359–384. doi:10.1177/1469605316668451.
- Marty, P. F. 2006. "Finding the skills for tomorrow: Information literacy and museum information professionals." *Museum Management and Curatorship* 21 (4): 317–335. doi:10.1080/09647770600702104.
- McCarthy, J., and P. Wright. 2015. *Taking [A]part: The politics and aesthetics of participation in experience-centred design*. Cambridge, Mass: MIT.
- McDermott, F., L. Maye, and G. Avram. 2014. "Co-designing a Collaborative Platform with Cultural Heritage Professionals." In *Proceedings of the 8th Irish Human-Computer Interaction Conference*, 18–24. Dublin.
- Petrelli, D., L. Cioffi, D. Van Dijk, E. Hornecker, E. Not, and A. Schmidt. 2013. "Integrating material and digital: A new way for cultural heritage." *Interactions: New Visions of Human-computer Interaction* 20 (4): 58–63. doi:10.1145/2486227.
- Roussou, M., E. Kavalieratou, and M. Doulgeridis. 2007. "Children Designers in the Museum: Applying Participatory Design for the Development of an Art Education Program." in *Proceedings of the 6th International Conference on Interaction Design and Children (IDC '07)*, 77–80, New York, NY: ACM. doi:10.1145/1297277.1297292.
- Rowley, S. 2013. "The Reciprocal Research Network: The Development Process." *Museum Anthropology Review* 7 (1–2): 22–43.
- Sanders, L., and G. Simons. 2009. "A Social Vision for Value Co-creation in Design", *Technology Innovation Management Review*. Accessed 16 November 2017. <http://timreview.ca/article/310>
- Silvia, F. F., K. Jaebker, and T. Leason. 2014. "Participatory Experiences in Art Museums: Lessons from Two Years of Practice." *MW2014: Museums and the Web 2014*. <http://mw2014.museum sandtheweb.com/paper/participatory-experiences-in-art-museums-lessons-from-two-years-of-practice/>
- Simon, N. (2010) "The Participatory Museum". Museum 2.0
- Taxén, G. 2004. "Introducing Participatory Design in Museums." In *Proceedings of the Eighth Conference on Participatory Design: Artful Integration: Interweaving Media, Materials and Practices - Volume 1, (PDC 04)* 204–213. New York, NY: ACM. doi:10.1145/1011870.1011894.
- Vines, J., R. Clarke, P. Wright, J. McCarthy, and P. Olivier. 2013. "Configuring Participation: On How We Involve People In Design." In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 429–438. New York, NY: ACM.