An Exploration of Playful Participatory Design Practices with Museum Staff

A Case Study of the Gallo-Roman Museum of Biesheim, France

Master's Degree Project in Game Design, 30 credits
Department of Game Design
Uppsala University
Spring Semester of 2021

Date of Submission: 2021-05-26

Joseph Stich

Supervisor: Dr. Sabine Harrer
Examiner: Dr. Richard Bartle

Table of contents

Table of figures

Abstract

Museums are going through a digital transformation of their curation techniques to add interactive installations in their exhibition. However, museum staff are directly confronted with those devices without necessarily being able to assess their relevance to their work environment, nor having the skills to apprehend and maintain them. Previous research has introduced participatory design methodology as a tool to accompany this transformation, similarly to its origins in the 1970s where workers and unions had to face the introduction of computers in their workplace. These participatory projects in museums aimed at involving museum staff, stakeholders, and visitors in the collaborative development of interactive installations. Drawing inspiration from playful co-creation techniques and participatory projects in museums, this thesis explores games and play as a 'third-space' for experimentation to develop with the staff of the Gallo-Roman museum of Biesheim an interactive installation in adequation with their ideas, needs and skills. I created playful cultural probes as a means to gather inspiration from my participants regarding technology, play, and their work. I organised a future workshop as a game with playful activities to foster imagination and creativity, aiming at elaborating a concept of an interactive installation, which I then developed. By the end of this project, the prototype is yet to be evaluated before being placed in the museum space. However, the results suggest that facilitating collaborative playful behaviour in an unfamiliar work environment might encourage the staff to shape the digital transformation of their museums. As such, this study shows the value of participants embracing the process they are involved in through empathetic and joyful appropriation of the artefacts and techniques presented.

1 Introduction

Technologies are being introduced in the museum space in many ways, whether they are meant to be used in the museum or outside, and whether they are used before, during or after the visit (Sandri, 2020). They can be in the form of fixed devices with interactive tables, mobile devices with audio guides and apps, or online with websites and virtual museums (Hornecker & Ciolfi, 2019). Such devices are meant to enhance the visitor's experience by learning while having fun at the same time (Campos et al., 2011). Those new technologies are often regarded by journalists and politicians as beneficial to the museum space whereas museum professionals tend to contest this discourse; introducing new technologies in museums should not be motivated by innovation but rather by its relevance to the exhibition (Sandri, 2020). The demand for new technologies in the museum space also does not come explicitly from the public as "visitors tend to be in a relationship of trust and delegation of authority to the institution" (Sandri, 2020, p. 33). Adding a layer of technology and interactivity in an exhibition must then come from a desire of the staff, and must be designed with the staff, to produce a relevant installation.

The process of designing a museum exhibition is similar to information system design; the team targets an audience, develops the design, tests the concept and then evaluates the product (Taxén, 2004). Although participatory design applied to information system design is common practice—and in a way, as its origins—such processes are also applicable to museums. With the introduction of a new technological device to their workplace, it is sensible to consider the staff as the first users of the installation. In a small museum, the persons *in situ* can also endorse the role of guide and cultural mediator; they are at the forefront of the institution, meaning that their comfort with the exhibition plays an important role in the mediation of visits. Even though the installation has to fit in the overall curation, it is also important for the exhibition to allocate a spot of significance for the installation, and thus the need of enabling discussions between the staff and the designers. When introducing a new installation, designers should not solely see curators as their only experts, but should also include the staff and their point of view as core considerations of the design.

The purpose of this thesis is to critically explore the notion of playfulness in participatory design practices with museum staff. This research positions itself at the crossroads of co-creation in museums and playful co-creation techniques, using game design as a means of expression. By drawing inspiration from participatory studies in museum exhibition design

on how to collaborate as a designer within this field (Bossen et al., 2012; Taxén, 2004; Taxén et al., 2003; Watkins & Russo, 2007), the approach is shifted towards designing with and for the museum staff to enable their ideas for an interactive installation to be concretised. This thesis complements, rather than opposes, projects that emphasise collaboration with visitors. The usage of playful techniques as core elements of the participatory process acts as an accessible invitation for staff members to collaborate, even if they have little to no experience in museum exhibition design. These techniques also act as an open dialogue between the staff and the designer; the ambiguous nature of the field material "do not constrain analysis in a search of objectified knowledge on user activities" (Johansson & Linde, 2005, p. 8).

In this study, to emphasise both the special care addressed to the museum staff and the ludic aspect of a museum interactive installation, participatory methodologies are being adapted through the lens of playfulness. This lens calls for games, toys, and more generally playful artefacts to be used as means of expression for me as the designer but also for the museum staff as participants. The ways of interacting with playful materials lead to an open-ended design process (Johansson & Linde, 2005), which is of importance when tackling unknown territories while leaving space for each person involved to express their intentions. The goal is to create enjoyable experiences both for the visitors that will use the device and for the staff that are fumbling into a new field. Having fun and leaving space for experimentation in a field pressured by the digital transformation of their curation techniques and by communication challenges to attract new audiences, would hypothetically open up unfamiliar yet refreshing perspectives to approach them.

The Gallo-Roman museum of Biesheim, in France, is a small-scale museum, *i.e.*, a one-room museum, built in 1990 and founded by the association of Archeology and History of Biesheim. It exhibits archaeological collections of the Gallo-Roman civilisation and military presence of the extinct village of Oedenburg destroyed during the Thirty Years' War. The museum voiced its desire to introduce interactivity in its exhibition, notably to encourage locals to revisit the collection from a new interactive perspective, with the assumption of attracting younger audiences and actualising their curation techniques. Due to a lack of expertise, and arguably funds, the staff (consisting of a curator and a receptionist, associated with the president of the association—also founder of the museum, and archaeologist) was unsure on how to complement their curation through an interactive museum installation. My participants and I collaboratively explored the field of possibilities for an installation, with special attention addressed to their work practices and their work environment. The participatory process followed the three-stage framework defined by Watkins and Russo (2007), consisting of a

discovery stage, a prototyping stage and evaluation stage, although approached with playful materials, including cultural probes and a gamified future workshop. The resulting installation design took inspiration from their ideas and from the materials made either individually or collectively by the museum staff.

The design decisions made throughout the process and the feedback received from my participants will be critically explored in The design process section.

2 Background

2.1 The state of digital interactivity in museums

Since the "New Museology" of the late 1980s, museums have been encouraging communication and expression through their exhibition in opposition to the classic, collections-centred models (Desvallées & Mairesse, 2010). It has been accompanied with the introduction of technological devices aiming at enhancing the visit by giving access to more content, and to access it in multiple forms (Sandri, 2020). They can be classified in three main categories: Fixed devices (interactive tables, terminals), mobile devices (audio guides, apps) and online solutions (websites, virtual collections) (ibid.). Hornecker and Ciolfi (2019) identify a fourth category of *assemblies*, originally experimented by Fraser et al. (2003), consisting of multiple devices, either fixed or mobile, intertwined in an activity or a narrative for visitors to explore.

To decide which type of interactive installation suits a museum best, Hornecker and Ciolfi define factors to take into account: "the characteristics of the context of use, which influence its fit with the setting and with the institution, adoption and appropriation of the technology, and user reactions" (Hornecker & Ciolfi, 2019, p. 21).

2.1.1 The context of museums

The context of the museum matters in designing an interactive installation. Visitors tend to behave differently depending on the genre of museum and the way it presents itself; the variety of museum ecologies can be represented by a spectrum, with science and technology museums on the one side of the spectrum and art museums or galleries on the other (Bell, 2002). In science and technology museums, visitors, often families with children, expect to interact with machines, communicated by a visual design with bright colours and interactive systems (Hornecker & Ciolfi, 2019). In archaeology museums and galleries, visitors, mostly mature or school groups, expect to silently contemplate artworks without getting too close, prevented by ropes and indications (ibid.). Within this range, history and heritage museums are hard to categorise as they can invite visitors to engage with the collection by combining artefacts with text, video and image material or by re-enacting old craft practices. Another lens of differentiation can be the budget they are allocated as different investors "operate according to different economic rules and with different aims" (Hornecker & Ciolfi, 2019, p. 25). Economic considerations play an important role when discussing the deployment of an interactive

installation as it requires funds to purchase and maintain (ibid.). Combined with a rapid obsolescence of those technologies due to a constant evolution of hardware, software and operating systems, museums need to update their installations often to avoid being out-dated, which would impact the museum's perceived credibility (ibid.).

Knowing the demographics of the museum plays a role in targeting specific groups for an installation. If, for example, "adults visit the museum largely by themselves, as couples, or in larger groups" or if children visit "mostly as part of a large (school) group or with family", the design might differ (Hornecker & Ciolfi, 2019, p. 26). Some groups would want to interact together, or some parents would play the role of a planner or overseer of the child's progress. The context in which a visitor approaches an installation also defines "what learning experience they might seek, how they want to learn, what they are interested in" (Hornecker & Ciolfi, 2019, pp. 26–27), thus implying that an installation cannot interfere with a visitor's own motivations and "free-choice learning" (Falk & Dierking, 2016). Falk (2016) categorises visitors in five not mutually exclusive "experience types": explorer, facilitator, experience seeker, professional or hobbyist, and recharger—who are looking to relax in the museum. Hornecker and Ciolfi (2019) argue that even if those categories establish typologies of visitors, they should not guide the design by themselves due to the volatility of visitors' motivations based on the overall context of the museum environment. However, there are still characteristics to aim for to design a successful interactive installation: "immediate apprehendability" of the installation, referring to the need for visitors to quickly grasp how to interact (Allen, 2004), and the "attention-value model" defining how visitors should be able to quickly evaluate the benefit of the installation, based on the cost of paying attention (e.g., the length of informational text), and the added value of accessing the information (Bitgood, 2013).

2.1.2 The digital transformation of museums

Regarding the reasons to introduce interactive installations in the museum, two discourses can be observed, and sometimes be opposed; discourses from inside cultural institutions, and from outside, such as journalists and politics (Sandri, 2020). Museum professionals aim at attracting new audiences to the museum with the help of digital devices, most notably younger audiences and the public removed from cultural institutions, either due to social context or due to a lack of accessibility (ibid.). They also want to experiment with new forms of mediation using ludic elements as a way to vivify the museum space, valorising pleasure and conviviality (ibid.). However, all new technologies must be "relevant, discreet

and reasoned" (ibid., p. 86) as "curators are frequently concerned about loss of authority and control and their significance" if the visitor experience becomes central (Hornecker & Ciolfi, 2019, p. 34). Sandri (2020) observes a major apprehension in cultural institutions: the apprehension of a cognitive competition for visitors between digital devices and items of the collection.

The discourse outside of cultural institutions, analysed by Sandri using a corpus of French written press and French political and governmental texts, gravitates around a technocratic view of the museums, where "digitalisation is only justified by itself, novelty of the device has a value of virtue" (Sandri, 2020, p. 67). The discourse is inscribed in the trend of digitalisation of culture, aiming at cultural democratisation, reducing the digital divide, developing the desire of learning and expanding access to knowledge (ibid.). Echoing this discourse, some written press articles describe museums as being revitalised and dusted by interactivity, in an injunction to movement and dynamism (ibid.). This injunction is communicated using concepts such as "augmented visit", "enhanced visit" or "visit +", showing interest in adding content to museums, thus in upgrading them with the help of technology (ibid., p. 28).

Museums are now conflicted by their liberalisation as they have to focus on profitability, cultural communication and marketing for targeted audiences (Sandri, 2020). This shift also tends towards a standardisation of museums: museums want to stand out with unique digital devices; therefore, they homogenise their cultural mediation with technological solutions (ibid.). Museums without technology now arguably look outdated; they have to follow the digitalisation of the museum space by striving for an "impossible desire for singularity, which comes up against the development of an endlessly obsolete digital trend" (Sandri, 2020, p. 55).

The digital transformation of museums, even if it has made "tasks such as collecting, tracking and preserving artifacts more effective and efficient" (Tim et al., 2020, p. 1), is demanding "significant commitment from organizations, including the development of new capabilities, organisational restructuring, changing organisational culture and overcoming employee inertia and resistance" (Tim et al., 2020, p. 2). Museum staff are directly confronted with interactive installations while not being familiar with the required technical skills, thus being dependent on external contractors if a problem occurs during a visit (Sandri, 2020). This transformation is challenging for the staff as they have to become polyvalent in all technical skills to keep a certain control over their work environment, which can result in techno-stress and tensions (Tim et al., 2020). Sandri observes that the digitalisation of museums is both a

factor of emancipation and frustration "depending on the place in the hierarchy and the possibility of being trained" (Sandri, 2020, p. 100). The introduction of digital devices in museums must therefore be accompanied with greater support for on-site maintenance and supervision (Hornecker & Ciolfi, 2019).

2.2 Addressing the digital transformation in museums

2.2.1 Participatory design

The context of the digital transformation that museums go through is similar to the early 1970s where technology and education regarding technology emerged in the workplace. Participatory design "was developed as a tool to help workers and their unions influence the changes brought about when management introduced computers on the shop floor" in Scandinavia at that time, aiming at being empowering to shape future alternatives and addressing specific problems (Bødker & Kyng, 2018, p. 2). Most museums are now "subject to a strong extrinsic pressure for change" by being in competition with other entertainment industries, leading to the introduction of participatory design methodologies in the museum space (Taxén, 2004, p. 3). However, participatory design in museums can be used to either approach installation design by including visitors in the process, mostly due to the rise of visitors studies (Taxén, 2004), thus placing visitors as users of the installation, or by instead considering the museum staff as main users (Bossen et al., 2012), as it is their work environment that is directly transformed by technology.

Participatory design is meant to facilitate direct collaboration between the users and the designers by engaging in co-design processes to create initiatives in areas that are important to them; it is a process of mutual learning. Muller and Druin (2010) define the core characteristic of participatory design as the attention and care for users in order to both develop products and services by optimising usability and to improve users' quality of life at work. This process can be one-way: "requirements are elicited from, usability tested upon, and systems are delivered to users" (Bossen et al., 2012, p. 1). It can also be two-way if the designers engage more with users and leave the opportunity open "to learn something that we didn't know we needed to know" (Muller & Druin, 2010, p. 15). Enabling unexpected outcomes to occur in participatory design methodologies is referred to as the 'third space', by Muller and Druin (2010), which neither belongs to the designers nor to the users, and "in which new insights, skills and identities can emerge" (Bossen et al., 2012, p. 1).

The users—or the workers—involved can however experience frustrations in a participatory design process. Bossen et al. (2012) observe seven themes of potential frustration from their critical analysis of participatory design projects in museums: differing aims between all users and designers involved; lack of clarity in decision-making; unclear project organisation; lack of resources; usage of technology and research prototypes; and the role of technology in the content of the museum. Those themes highlight that even if "long-term engagement and maximal effort on behalf of both researchers and users are important for a process of mutual gain, it is not necessarily sufficient" as it can be seen as "a tiresome addition to the tasks already to be carried out" (Bødker & Kyng, 2018, pp. 2–3). Participatory design processes therefore need to be carefully controlled by balancing "clarity and ambiguity, formality and informality, and the new judicious use of different disciplinary languages" coming from hybrid 'third-spaces' that "encourage innovation and support creativity" (Muller & Druin, 2010, p. 16).

2.2.2 Playfulness as a 'third-space'

The region, or border, between two domains, or two spaces, can be a region of overlap and hybridity, which Muller and Druin define as "a 'third-space' that contains an unpredictable and changing combination of attributes of each of the two bordering spaces" (Muller & Druin, 2010, p. 11). They describe participatory design as the 'third-space' between the domain of expertise from the designers that the users have to enter in order to participate, and *vice-versa*, in which hybrid methods are explored. They also compiled multiple participatory design tools or activities that provide such a space to be explored both for designers and for users, while assessing their potential benefits: sittings, workshops, narrative structures, games and constructions (Muller & Druin, 2010). Games, specifically, allow for users to be on equal footing as games are "generally outside of most workers' jobs and tasks" and "likely to be novel to most or all of the participants", meaning that users will discover and learn the activities from the same base, potentially reducing differences from rank, authority or background (Muller & Druin, 2010, p. 34). Games can encourage collaboration and communication between participants through enjoyment of self and others, suspense and personal outcomes (ibid.).

The 'third-space' created by games, and more generally play, are also facilitating "imaginary situations that complement reflective understanding of practice" (Johansson & Linde, 2005, p. 8), thus allowing subjective responses and experiences to be embraced. From this subjectiveness, the creativity of users can enter in discussion with the creativity of

designers, hence affecting each other simultaneously, fostering inspiration and empathy (Lange-Nielsen et al., 2012). The empathetic stance seems critical for designers to approach a participatory design process with users dealing with a radical change of their work environment.

Play emerging from the 'third-space' directs this thesis. Game design was the domain of expertise I brought into the museum environment, and the museum staff brought their expertise on curation techniques, field knowledge, and museology. The goal of the staff was to add a layer of interactivity in their museum while keeping control over it. Mine was to facilitate this daunting step using tools I was familiar with: games and play. As our knowledge concern different facets of museum interactive installations (how to nudge visitors into using the device, how to make this interaction playful, who is the target audience of the device, what the device should show from the exhibition, *etc.*), creating a space for those views to converge was crucial. Drawing inspiration from the history of participatory design and its application in museums, this thesis presents playful techniques used in the 'third-space' to facilitate the development of an interactive installation suited for the museum and its staff. This thesis aims to show that playfulness could enable participants and designers to express themselves about an unexplored territory–here museum interactive installation–in an unfamiliar yet engaging way.

3 Methodology

The Gallo-Roman museum of Biesheim, in France, volunteered for this project. It is a one-room local museum built in 1990 and founded by the association of Archaeology and History of Biesheim. It exhibits archaeological collections of the Gallo-Roman civilisation and military presence of the extinct village of Oedenburg destroyed during the Thirty Years' War (see Figure 1). The three participants selected are the two staff members of the museum—the curator and the receptionist, and the president of the association, who is also the founder of the museum and archaeologist.

Figure 1: Picture of the museum (copyright of the Gallo-Roman museum of Biesheim)

I approached the Gallo-Roman museum of Biesheim for this research project as I had been made aware that the museum wanted to add interactivity in the exhibition by discussing with the president of the association, prior to this study. The proximity and familiarity with the president for sure contributed for the museum and the city council to volunteer, even though it came with the potential drawback of the other participants being more reluctant to criticise my study. I made the choice of having participants coming from the museum only, that is the curator, the receptionist and the president of the association, and not potential visitors or from the city council. Not including the latter meant focusing on the expert and field knowledge of my participants, leaving aside communication and city politics considerations, which are taking

more and more space in installation design in part due to the liberalisation of museums (Sandri, 2020).

For an installation that is respectful of museum staff and their workplace, designers can seek to include them throughout the multiple processes implied in its design; targeting an audience, defining a relevant angle to supplement the exhibition, innovating in the scope of the museum, and most importantly, being aligned with their expectation. Participatory design aims at being considerate of this issue, and at the same time aims at "[empowering] workers to shape and influence the introduction of new technology in their work environment" (Taxén, 2004, p. 1). With the introduction of technology being a sensitive aspect of museum installation design, I chose participatory design as the central methodology to guide the project. Additionally, to emphasise the engagement and the empowerment of the participants, I adapted participatory design through the lens of playfulness.

Watkins and Russo (2007) define a framework for participatory design in museum exhibition design consisting of three consecutives stages: discovery, prototyping and evaluation. They applied the framework in a collaborative project to embed community content creation in the museum exhibition, by conducting narrative-based co-creative production, workshops, surveys and focus groups. For this study with the Gallo-Roman museum of Biesheim, the process is structured following the framework established by Watkins and Russo (ibid.).

The discovery stage from the framework consists of gaining the trust of participants by exploring their working practices, goals and values (Watkins & Russo, 2007, p. 5). To do so, I made cultural probes to engage my participants in a playful discussion, similarly to how Gaver et al. (1999) use cultural probes as a way for them to get to know their participants better, and *vice versa*. Cultural probes can be defined as activity packs containing artefacts for the participants to explore when, where, and how they want, with the purpose of eliciting inspirational responses (ibid.). Those probes were used both as ice-breakers and as a way to gather inspirational clues about the following steps of the project, both for the design of the workshop and for the actual making of the museum installation. The probes were designed to elicit thinking and discussions.

The cultural probes handed to my participants consisted of one diary to document when technology failed them, a slate to draw what they valued in the museum exhibition, and an artefact made of cardboard called the *Pictoscope* to explore their definition of what play meant for them. The bag containing the items, and the items themselves, were customised with a unique colour for each participant. The material and artefacts made were carefully crafted but

not professionally finished, thus having a more personal and informal style. In a similar fashion of the probes made by Graver et al., "the aesthetics of the package were thus another attempt to reduce the distance between us and the groups" (Gaver et al., 1999, p. 6). I handed the probes in person to the participants to explain their content while not accurately describing the items inside, thus leaving space for surprise when the participants opened the package alone. This moment was also used as a way to introduce a bit more about myself and to determine a date to pick up the probes after completion.

The prototyping stage from the framework consists of a co-creative process to produce ideas and concepts for participants to use within their institutions (Watkins & Russo, 2007, p. 5). To do so, I created a workshop in the form of a board game for all participants and myself as both a facilitator and a participant, to collaboratively explore the possibilities of the upcoming museum installation. The workshop was based on future workshop methodology, as this technique aims at first "criticize the actual situation, then to dream about a preferable future situation, and finally to find ways to move from the actual situation to a preferable one" (Vidal, 2005, p. 2). With the emphasis on creativity and fantasy in the future workshop methodology, it enabled enough space to adapt it through the lens of playfulness. The different profiles and personalities of my participants, informed by the cultural probes, were taken into account when defining the workshop's activities. As I mediated the session, I also made sure to understand the hierarchy and power dynamics between each of them, because, as Hornecker and Ciolfi argue, the planning and management of a participatory design process is crucial as it can lead to both "fruitful relationships and effective design outcomes" and "diverging, or even conflicting interests in the team, which need facilitation and mediation" (Hornecker & Ciolfi, 2019, p. 91). The curator was in charge of the museum (curation, museography, communication, accounting, *etc.*), the receptionist was involved in interacting with visitors and gave a helping hand to the curator when needed, and the president of association contributed archaeological data to the museum collection as well as being the founder of the museum. Even if not explicitly said, the curator could be seen as superior to the receptionist, and the president could be seen as a collaborator of the museum, thus not as much involved in its curation as the two others. The workshop took place in a familiar room for my participants; the main room of the association of Archaeology and History of Biesheim.

The first part of the workshop referred to the *critique phase* of the future workshop methodology (Vidal, 2005), where participants shared and discussed their views on what to promote in the exhibition and for whom, as museum experts, using sticky notes and cubes of colour, and personas. The second part of the workshop, referring to the *fantasy phase* (ibid.),

was to initiate a prototyping process with low-tech material (paper, cardboard, *Lego* bricks, strings, tools, …) to develop a museum installation concept that would incorporate the discussions and personas made in the first part. The third part was for discussing and evaluating collectively the artefacts made during the session, referring to the *implementation phase* of the workshop (ibid.). The discussions were centred on the prototype feasibility, such as the degree of technology it would involve, or the difficulty to maintain it, but also its relevance regarding each participant's own contribution to the museum. This last part of discussion is crucial for avoiding potential tension of differing aims amongst the group that could lead to a failed participatory project (Bossen et al., 2012).

The workshop was then followed by the development of a prototype, by myself, using the resulting materials and discussions from the session. To validate the design, a concept document (see Appendix 2: Concept document of the prototype (in French)) was distributed to each participant, summarising the ideas of the workshop while proposing possible solutions to the challenges brought up. It was written in a succinct yet understandable way, aiming at being quickly comprehensible.

The evaluation stage from the framework consists of discussing and assessing the artefacts made throughout the study (Watkins & Russo, 2007, p. 5). To do so, I prepared an evaluation method for the methodology, for the prototype, and for the final installation, which will be conducted in future work. Evaluating the methodology with my participants will imply probing for their thoughts on playful participatory design and on the added value they observed regarding their work practices. To emphasise the artefacts made before, the interviews will be using stimulated recall methodology, highlighting the work they did in the study. Regarding the prototype, playtesting sessions with my participants will be handled, experimenting both as visitors and as museum staff to gather exhaustive feedback on the museum interactive installation. Finally, before installing the final device in the museum, an official review with the city hall will be conducted to assess the project and potential integration in a communication plan.

Before any work with my participants, an ethical contract had been established with the city council; for me to be able to work with the museum, the museum installation would have to be technologically interesting, functioning and sustainable at the end of the study. Ultimately, it means that the scope of this study is different from the scope of the project, as the city council expected a result, whereas this study is focused on the participatory design process made with the museum staff. This dissonance of objectives resonates with the observations made by Sandri (2020), that the political and journalistic discourse differs from

the museum staff discourse; one is technocratic and result-oriented, and the other is more reserved and critical of the technology that is introduced in their workplace.

Participants were informed and consented to the usage and analysis of their pictures, audio-recordings and creations. The transcription of the audio recordings was done only for specific parts used in the study. Each meeting with my participants was documented as field notes taken during the discussion. We interacted in French, therefore all quotes from them and their work were accurately translated in English by myself.

Due to the Covid19 pandemic at the time of this study, communicating with my participants had been made through phone calls and professional emails rather than in person. The first meeting, the hand-in of the cultural probes and the workshop were done in person. The museum installation had been designed and made with the sanitary conditions in mind.

4 The design process

In this chapter, I will discuss the co-creative processes and playful techniques that were designed and implemented. The discussion is split into three parts, following the framework of Watkins and Russo (2007) for participatory design in museum practices: the discovery stage to meet my participants, the prototyping stage to co-create an interactive installation, and the evaluation stage to discuss the upcoming steps before placing the device in the museum.

4.1 Discovery stage

In this section, I will discuss how I initiated a dialogue with the museum staff about sensitive topics related to museum interactive installations, such as technology, playfulness and the museum space. To do so, I designed activities and handcrafted playful artefacts that were sent as cultural probes to my participants. I will first discuss how we first met, then how and why I made the probes, and conclude by discussing the materials I received and how they informed the next step of the participatory process.

4.1.1 Getting to know each other

As an outsider to the museum and its work environment, my goal was to enable my participants' ideas to be concretised in an interactive installation that would be respectful of their habits and relevant to the exhibition. As museum staff, they brought knowledge to the discussion regarding who the visitors are, how they visit, what they expect and why, as something they acquired during their long career of at least 20 years in this museum. However, after my first visit, I noticed some constraints: the new sanitary measures to consider regarding Covid19, including touch and movement, the limited space of the museum and the non-digital curation. I started with an idea of the interactive system, but without any on what the installation would be about. As a designer entering an experimental collaborative process, I had to enter into a conversation with my participants and their situation for which I design (Lange-Nielsen et al., 2012). The process was not meant to be one-sided where I would be a sort of contractor. Rather, it was a process of connecting our ideas and expectations as we were getting a foothold in the specific museum context of interactive design together. To do so, it was crucial to get to know each other not only regarding work but also regarding our personalities. As Lange-Nielsen et al. argue, empathy is key when designing for utility and pleasure even though "[it] might seem out of place, irrelevant and unprofessional" (Lange-Nielsen et al., 2012, p. 3), as it

opens up the design space for exploration while having the possibility to miss the mark. This notion of empathy as a designer for their participants (or users) had been the central motive throughout this study.

My participants and I were also not familiar with each other; for two of them, it was the first time we met, and for the third, we had never worked together prior to this project. I discussed with each of them individually at the beginning of this study, at a place of their choice, to briefly introduce ourselves and talk about their relation to the museum. My participants were also not familiar with the field of game design or how it would contribute to the making of an interactive installation. They communicated a sense of genuine interest, but also scepticism. I therefore had to introduce this domain, which opened up discussions on games. Topics like *Fortnite* and how to handle video games as parents were mentioned by them, thus establishing a link between their everyday life and my field of study. Judging by their intrigued interest in game design as a field of research, this discussion acted both as an ice-breaker and as a signal of them being open to argue and criticise the relevancy of play in the museum.

We also exchanged on the common aspects of making a game and curating an exhibition by finding common challenges; according to them, the museum is a space where visitors willingly wander around, reading and inspecting the collection put on display and highlighted by the curator to convey some sort of message. The curator, who also does the job of a museographer in a one-room local museum, is therefore creating an experience for the visitor similarly to a game designer creating a world and mechanics for the player. We identified that adding an interactive installation to the museum could be compared to adding a new mechanic into a game. The similarities of the professions showed that there was a common ground and intersected expertise among me and them, and contributed to a bonding moment.

Even if the staff wanted to add a new layer of interactivity to the exhibition, they expressed uncertainty on how to approach it. Their motivations for adding digital devices were not directly probed for, but were discussed during the workshop later in the process. Overall, it was a mixture of standardising to the digital transformation of curation and communication techniques of museums (Sandri, 2020), by exploring new possibilities to "re-actualise" the limited space of the museum. However, it was made clear that they were not able to add an installation before due to a lack of funds, time, knowledge and a previously bad experience with a contractor resulting in an unused device.

4.1.2 Cultural probes

As defined by Watkins and Russo in their three-stage framework, the discovery stage consists of "gaining the trust of participants; exploring working practices, goals, values via participant observation; depth interviewing" (Watkins & Russo, 2007, p. 5). The way this stage is approached is important, as one goal is to gain trust from participants; if I had placed myself as a distant 'lab coat' researcher, it might have been harder for me to get their insight on the sensitive topics that are connected to introducing a new technology in their well-known workplace. For them to be open on discussing their issues with technologies, how they impact the way they work and live, or what troubles them in the museum, the methodology had to facilitate this closeness between my participants and I. Approaching the methodology with playful artefacts allowed me to express myself as a game designer, but also aimed at inviting my participants to have fun and feel comfortable participating. Making descriptive artefacts within the 'third-space' is beneficial for "giving access and expression to the emotional side of experience", "acknowledging the subjective perspective" and "revealing unique personal histories" (Muller & Druin, 2010, pp. 40–41).

Four themes were identified as important to discuss with my participants as ice-breakers, while gravitating around the goal of making an interactive installation: their relationship with technologies, with the museum, with play, and with Covid19. The latter, however, had been discarded early in the process as I felt it could lead to information I would not be comfortable having. The situation had an impact on the museum, its staff, its visitors and the way we interact (usually by touch) in this space, and therefore must be considered, and arguably be central, for the design of the museum installation. But, avoiding this topic at this stage of the process left more space to focus on the others; the situation was already everywhere in our lives, the cultural probes could act as a capsule for my participants to think about them and their work without the omnipresent concern of Covid19.

Each package contained a probe for technology (the notebook), a probe for the museum (the slate), a probe for play (the *Pictoscope* and the letter), and a paper with an introduction and instructions attached to the cotton bag (see Figure 2). Each participant was attributed a colour for the cardboard used in the fabrication of their own probes. The language in the instructions also varied based on the familiarity with the participants as some were addressed as *vous* (formal) and others as *tu* (familiar). When designing the different artefacts, it was important to consider how much time they would have to invest in completing them. Their participation in this study came in addition to their already busy work schedule, and the probes

were meant to be done during work hours—as it concerned their job. Therefore, each probe presented next had been made with this constraint in mind.

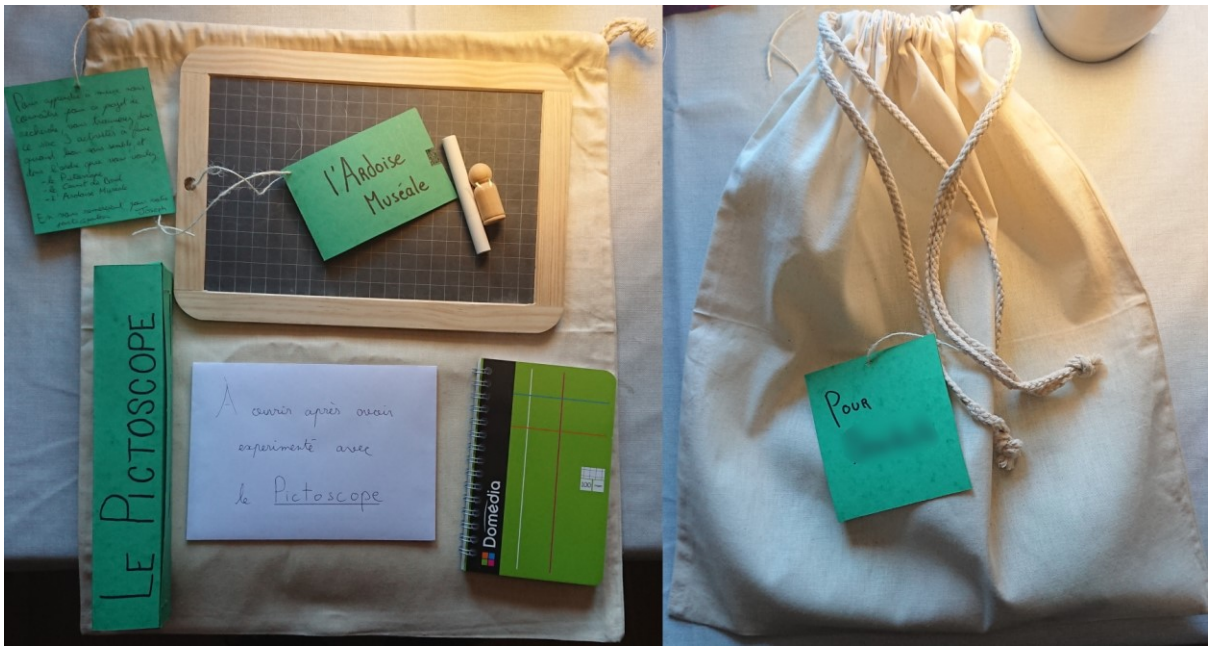


Figure 2: The cultural probes. On the left: content of the package with the technology probe (the notebook), the museum probe (the slate), the play probe (the *Pictoscope* and the letter). Attached to the bag, a cardboard with instructions on one side, and the name of the participant on the other. On the right: the package closed.

a. The technology probe

The main issue that comes with adding technology in the museum space is that techno-stress can arise from transforming non-digital practices into digital ones (Tim et al., 2020). Having an insight into my participants' relationship with technology was therefore crucial to determine the degree of digital complexity of the interactive installation. Probing for their comfort with technology implied two axes: how do they see it in their everyday lives, and how do they face issues when a device malfunction. The first addresses technology on a conceptual level, echoing the arguments of museum staff asking for it to be relevant (Sandri, 2020), the second addresses it on a practical level to gauge whether or not they would be comfortable manipulating and maintaining a new device in their work environment.

To probe for those two levels, the activity needed to leave as much space as possible for them to formulate their thoughts. Drawing inspiration from the probes of Lange-Nielsen et al. (Lange-Nielsen et al., 2012), I went for a diary so that my participants could self-document their relationship with technology, and thereby allowing me to catch "glimpses of the participant's world" (ibid., p. 4). For the practical part, they were asked to record moments

when “technology (mobile phone, computer, home appliance, *etc*.) failed them”, with at least a date to encourage logging it multiple times. The format in which they partook however was free as I was not familiar with their affinity with writing, drawing or any other form of expression. I therefore wanted them to express in the form they felt the most comfortable with. For the conceptual part, they were asked questions such as “what are the first three words that come to mind about technology” or “what if a device works as intended, do you notice it?” so that my participants would explore and share bits of their vision of technology with me. I decided to blend the two parts together; the diary was pre-filled with “Date” for the logging activity (the page on the right, see Figure 3), and sometimes, between two of them, there were pages dedicated to the questions (the page on the left, see Figure 3). By breaking the monotony with different exercises, I aimed at receiving more log entries from my participants that could have otherwise been bored by the repetitive aspect of keeping a diary.

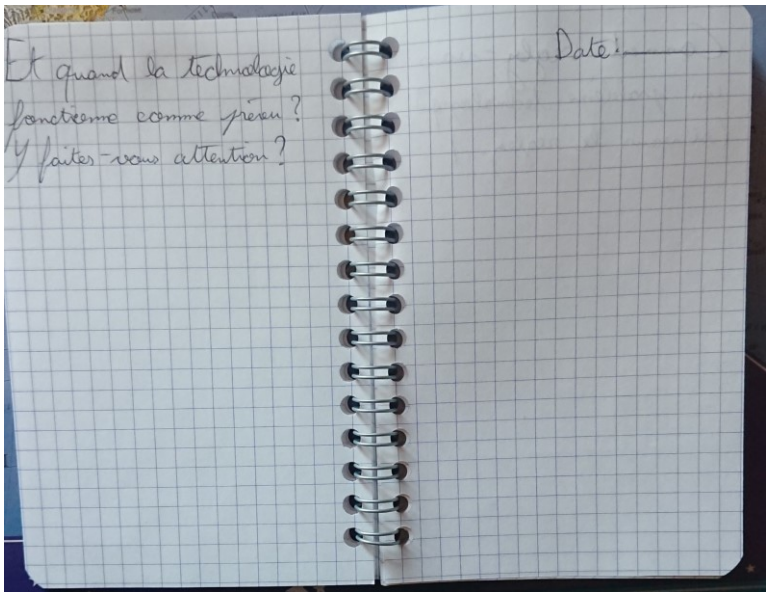


Figure 3: Blank content of the notebook for the technology probe. On the left, a question for the participant: “And when technology works as intended? Do you notice it?”. On the right, a page prefilled with the date for them to log their activity.

Lange-Nielsen et al. argue that “the designers should pursue to put part of themselves in the probe design” to emphasise the closeness with the participants (Lange-Nielsen et al., 2012, p. 4). The design made by Lange-Nielsen et al. (ibid.) opted for including personal anecdotes in the diary by adding small windows in them for the participants to discover. As my participants and I had already shared some common thoughts on games during the first individual ice-breaker meeting, sharing my thoughts on technology with them through similar windows seemed coherent (see Figure 4). I answered the same questions they were asked, thus

participating in the same exercise. It was not possible for me to ensure that they would open them at specific times, so I did not include any information about when to open them. Whether they opened them before answering the questions to get some ideas or whether they opened them at all was impossible to determine; hopefully they had an impact on their usage of the diary (curiosity, motivation, proximity, …).

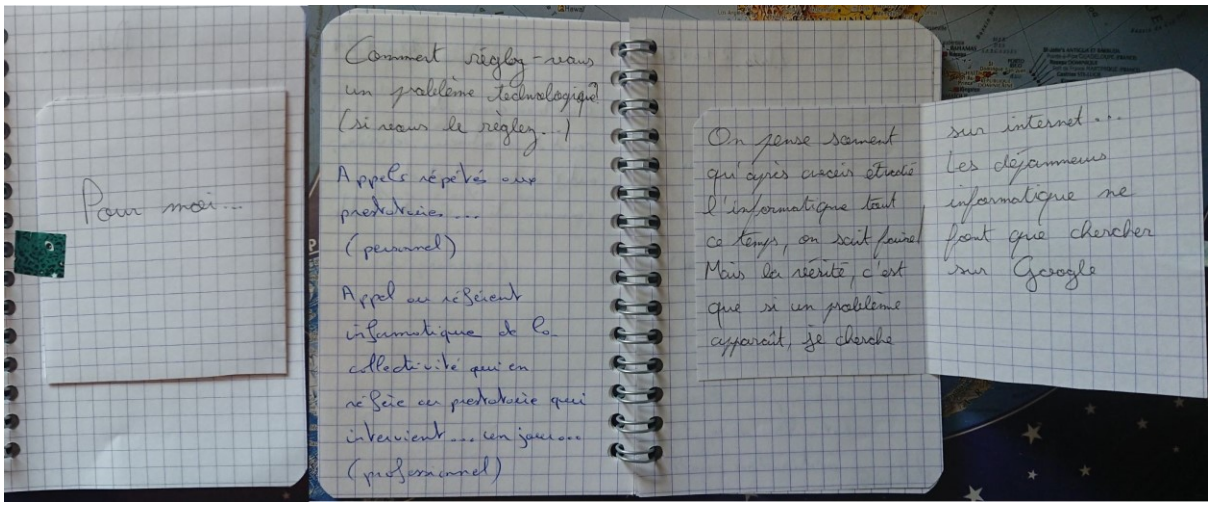


Figure 4: Example of the technology probe. On the left, the window closed saying "For me...". On the right, an example of a participant's answer to the question “How do you solve a technological issue? (if you solve it…)” with the window with my anecdote opened.

b. The museum probe

Including an activity about my participants’ relationship to the museum and its collection aimed at letting them talk about their work. The purpose of the discovery stage is to explore participants’ working practices and values; having the possibility to describe what they liked in the exhibition thus gave an insight on how they perceived the museum, but most importantly allowed them to share with me something personal. Only a few words were exchanged regarding them personally before the probes, leaving me with little to no clue about what they thought of the museum. To design an interactive installation with and for the museum staff, I had to know a bit more about who I had been working with.

The initial idea I had of a device after visiting the museum implied a small figurine given to the visitors as a means of interaction to avoid touching surfaces directly. Whether this figurine would represent an avatar of the visitor, an avatar of what was depicted, or something completely different was not yet defined. As I had this idea in mind, I decided to include one of those figurines into the probe and for it to represent a visitor and a Gallo-Roman. To get information about my participants’ work environment, I asked them to perform one activity for

each representation of the figurine: “if the figurine was a visitor, draw and/or describe what they should absolutely not miss in the museum” and “If the figurine was a Gallo-Roman of Oedenbourg, draw and/or describe what they would be doing”. The first aimed at allowing them to share an artefact they liked, cherished or were proud of, and the second aimed at giving a broader interpretation of the exhibition. With the museum presenting many archaeological artefacts used by the Gallo-Romans that lived in the area of Oedenbourg, there were plenty of choices, and thus allowed me to have a highly personalised response.

For the medium of the probe, I went for a slate and a chalk (see Figure 5) that I named “l’ardoise muséale” (*the museum slate*). With the technology probe already centred on writing, I wanted a medium that afforded intrinsically another means of expression, that is drawing. I knew that some of my participants had been school teachers and that some were also doing the guided tours of the museum to children’s groups, going for a medium that is related to childhood and primary schools reinforced the core idea of applying special care to the design of the cultural probes. Additionally, the slate afforded the two-fold activity of answering two questions by having two sides to draw. Drawing using chalk also allows mistakes to be corrected, even though I would lose information about their thought process. Here, the goal was for them to present something they wanted, and not to evaluate how they got there.

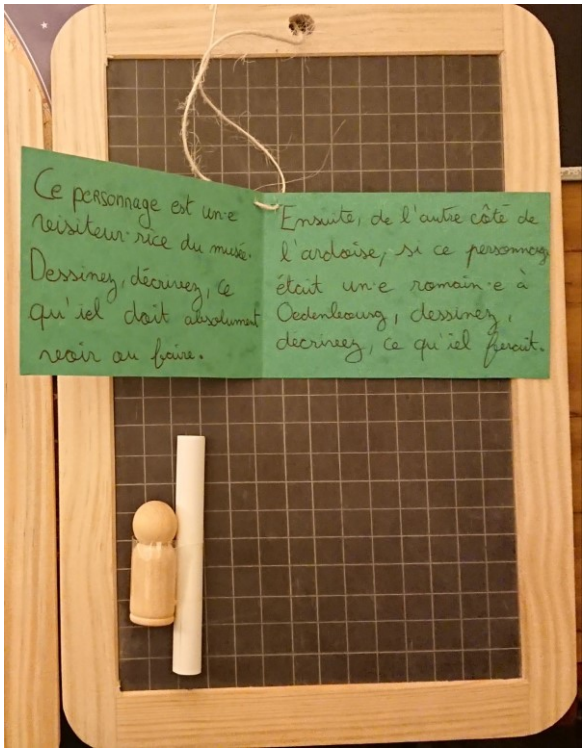


Figure 5: The museum probe consisting of a slate, a chalk and a wooden figurine, named "l'Ardoise muséale" (*the museum slate*). The folded coloured cardboard, presented closed and sticked, stating the instructions for each side of the slate.

c. The play probe

To kickstart the design process with my participants, I wanted a probe that acted as an interactive artefact on its own while querying their relationship with play—and therefore similar interactive experiences. Hornecker and Ciolfi argue that museum interactive installations must "foster learning and reflection, while also being engaging and motivating for visitors" (Hornecker & Ciolfi, 2019, p. 62). From this definition, for the probe activity to be comparable to an interactive installation, it had to make my participants ponder on a topic while being engaging to interact with.

Play as a topic is quite large and ambiguous, even more so that French language does not have a word to distinguish *play* from *game*, and therefore no translation of *playful interaction*. However, discovering my participants by asking how they define play aimed at accentuating the closeness between us. Play and games are nowhere near their work environment, therefore discussing a personal topic that were, apparently, not often approached in their personal social interactions meant sharing thoughts and experiences they did not share often. Also, having insights on how they perceive the activity of play gave an idea on how they might see the introduction of playful interaction in the museum.

The bias of going for a playful interaction came from the ten rules of Funology from Blythe and Monk, particularly rule 3: “don’t think ease of use, think enjoyment of the experience”, rule 4: “don’t think buttons, think rich actions”, and rule 8: “don’t think affordances, think irresistible” (Blythe & Monk, 2018, pp. 11–13). Even though all the rules are intertwined, those specifically inspire interaction to be rich and engaging, thus arguably playful. With the probe mimicking my idea of what a museum interactive installation should be, my participants could grasp, physically and conceptually, my thoughts on the matter and therefore initiate a discussion.

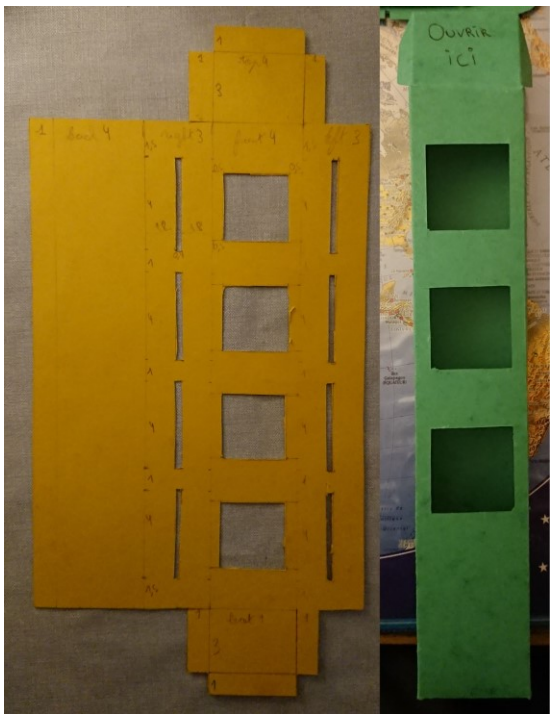


Figure 6: On the left: the design pattern of the *Pictoscope*. On the right: the *Pictoscope*.

As defining play for someone not used to discussing this topic might be unsettling, I decided to give a limited set of concepts for them to combine. Taking inspiration from a child’s toy that displays a slideshow of pictures when looking through it (usually in the form of a camera or a tube), I created the *Pictoscope*. The *Pictoscope* is a handcrafted cardboard tube with open windows on the front and openings on the sides to insert strips with pictures on them (see Figure 6). By sliding the strips in the tube, one can select a picture from each strip that will be visible through the corresponding window. This toy affords combining concepts together in a playful manner. To improve the handling of the *Pictoscope*, the last window of the tube had been removed so that the person could manipulate the toy without obstructing the openings (see Figure 6). Naming the toy also aimed at provoking and intriguing my participants; in

appearance it looked like a cardboard tube, but by calling it the *Pictoscope*, it legitimated the artefact by giving it singularity.

The strips were stored inside the *Pictoscope*, which could be opened from the top where "Open here" was written. This way, the participants had to familiarise themselves with the toy first to access the strips that were visible through the windows. The concepts drawn on the strips were either pictures or words, with one being left blank if the participant wanted to visualise something else. From top to bottom on the Figure 7:

- A strip with concepts, such as 'curiosity', 'laughs', 'children', 'to win'. These words are often linked to play in general without being opposed. By being complementary, the participant could relate to all of them and would have to think about them separately.
- A strip with three, two or one person, as games and play can be solitary or with others.
- Two strips with items and objects often related to play, such as a ball, a pawn, a die, or cards.
- A blank strip inviting the participant to draw or write anything else that would help them define play.
- A strip with the instructions of the probe: "by using the strips, can you define what play means for you? You can insert them by the side". It was placed on top of all the strips when stored inside the *Pictoscope* for it to be read first when one would take them out.

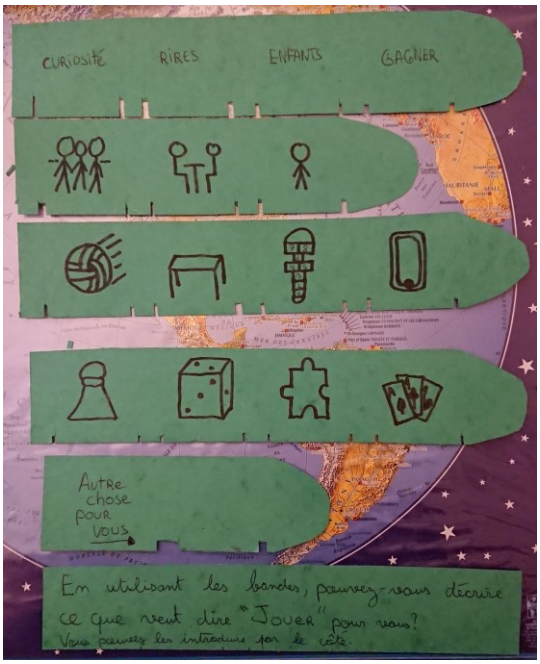


Figure 7: The strips with pictures, concepts, and instructions stored inside the *Pictoscope*.

However, manipulating the toy and selecting pictures were processes that I could not observe after getting the probe back. For me to have an insight on those relevant processes, I added a sealed letter in the package where it was written "To open after experimenting with the *Pictoscope*". Inside, there was a piece of paper asking my participants to describe their choice(s) made with the *Pictoscope* such as a souvenir or a specific game. Having this letter in the probe could be compared to escape games in boxes where content is often artificially locked behind players' progress. It also aimed at encouraging my participants to manipulate the *Pictoscope* to unlock another item of the probe.

4.1.3 Interpreting the results

The cultural probes were not meant to be analysed, they were meant to be "inspirational data [...] to stimulate our imaginations rather than define a set of problems" (Gaver et al., 1999, p. 5). Similarly to the probes from Gaver et al. (ibid.) and from Lange-Nielsen et al. (2012), the cultural probes and their artefacts gave a subjective interpretation of my participants and mostly aimed at familiarising ourselves with each other, with the topic at hand—here the museum interactive installation, with their environment—here the museum, and with the playful methodology used throughout the study. The material filled and used by my participants told stories about some aspects of themselves that helped inform the design of the prototyping stage, whether that was for the workshop or the interactive installation. It is also important to note that inspiration did come from observing the results of the cultural probes, but also from all the interactions before and after handing the packages to my participants.

First of all, when receiving the probes individually from each participant, they all communicated how intriguing and exciting this activity was. They had never participated in a similar experience before in their career. They also all told me that answering the different probes was so unusual because they had fun discovering and using the materials; one said that it did not even feel like working, and that it was very welcomed during those times. The three of them also politely apologised and shared insecurities, which were apparently counteracted by the fun of these unexpected activities. Even though the materials were handcrafted and handwritten—thus imperfect, my participants noticed the special care in the artefacts and the overall quality of the package and its activities. Imperfections in the craft arguably contributed to create a personal and informal feeling, and as Gaver et al. argue, the artefacts are thus "[escaping] the genres of official forms or of commercial marketing" and are "[revealing] the energy we put into them and expressed our tastes and interests to the groups" (Gaver et al., 1999,

p. 6). Before going into the specificity of curious details, those first interactions indicated receptivity towards playful activities, and therefore arguably reinforcing from their point of view the interest and the legitimacy of the study—and myself. From now and onwards, each participant will be referred to as participant A, B and C, because each of them had unique ways of answering the three probes altogether.

a. The technology probe

Each participant had a unique usage of the notebook and therefore will be described individually first before addressing the general takeaways.

Participant A used it by answering each question and completing most of the pre-filled pages dedicated to logging the moments when technology failed them. The overall vocabulary tended towards a negative view of technology, with words like “uncontrollable” or “voluntary servitude”, but counterbalanced by an utilitarian and satirical view with words like “practical”, “handy”, or “they are meant to work (in principle)”. They shared work related issues with the slowness for computers problems to be solved by contractors and by the city hall, but also few personal issues with subscriptions services. Their last contribution was a message addressed directly to me wishing me “a good reception of [their] participation”, but also “hope[d] that [I] would not be disappointed by [their] shabby delivery” as they were “not used in their professional daily life to do such activities”. This note showed a sense of illegitimacy in their contribution.

Participant B described with many details each time technology failed them and apparently did feel comfortable sharing personal information that led to those situations. They wrote about their reactions, their feelings and how they handled them. The vocabulary was mostly negative with words like “inconvenience” and “distress”. There was a post-it on the front of the notebook saying to look at the end of it for their reflection on play (see Figure 8); the content will be discussed later as it was complementary to the play probe.

Participant C did not log any moments but answered the questions, with one revealing a lot on their usage of technology as they said that “[they are] looking for solutions, then letting time pass, then looking again for solutions, and finally asking [one of their children] for help”. However, they filled the rest of the notebook with plenty of themes explored in the museums but also ideas for the museum interactive installation, thus tackling both the museum probe, the play probe, and other topics. With this participant, we sat down as they wanted to go through the notes together. The interactive concepts were: “visiting with headphones” to explain the exhibition and combined with interactive terminals, and “visiting with iPhones” to explain

items with QR codes. The notes were also about an imaginary “roman eVisitor”, asking questions about each type of collections in the museum, such as “what was the clothing trend because we can see those jewellery” or “who was the emperor at that time, based on the coins”. Additionally, they described how they usually visit museums by looking for artefacts that are “beautiful, intriguing, bizarre, exotic or fake”; they addressed looking for fake as their own game they play in museums by searching for mistakes in numbers, in historical data and anachronic information. They noted specific items to see in the museum, the specificity of the archaeological sites with dates, summarising the different concepts of the museum (military, religion, everyday life, death rites, craftsmanship, and numismatic studies) and how they approach guided tours. They mentioned orally that this notebook helped them formulate their thoughts for and of the museum.

Figure 8: The technology probe of participant B; a post-it on the front of the notebook saying "Playing (turn the notebook)".

The main observation to make regarding the probe is that each participant appropriated the notebook to serve the purpose they wanted. They answered the questions with varying density and logged their situations with varying attendance. It is however difficult to make any conclusion on the choice of activity; having few entries in the notebook does not specifically mean a lack of interest. Moments when technology failed them could have not occurred often, or they might not have thought of documenting them in the notebook. Nonetheless, each of them shared personal thoughts and reflections on the topic of technology and how they perceived it. As inspirational and ethnographic data, their perception of technology in general conveyed the feeling of unease and negativity, even if they considered it as necessary. Regarding the museum interaction installation, I interpreted that the installation should be as

unintimidating as possible, and remain simple to maintain and manipulate. Regarding the global aim of the cultural probe, that is getting to know each other by letting us communicate through the material, the technology probe provided encouraging results. Participants A and B discussed personal problems, and participant C took time to explain their notes, showing confidence and trust towards me. Participants B and C used the notebook to explore topics outside of the initial purpose of technology, indicating that the medium chosen for this probe indeed allowed space to formulate deeper thoughts.

b. The museum probe

Each participant did draw on both sides of the slate, with participants B and C writing additional explanations. I told them in the instructions that they could describe and/or draw to answer the questions; the medium seemed to correctly invite them to the drawing exercise of depicting what a visitor of the museum should see, and what a Gallo-Roman of Oedenbourg would be doing. Participant A put their slate in a plastic sleeve for the chalk to not be erased by the bag (see Figure 9 and Figure 10, the first one from the left). This special intention—and the fix of a design issue of the probe, showed care in the material and in the resulting dialogue.

On one side, for the first question, participant A drew a plan of the museum, marking the multiple points of interest and the recommended path through the exhibition. Participants B and C drew famous, and less famous, items of the collection that they considered important to see as a visitor. All three drawings indicated a deep connection to the museum; participants B and C implicitly shared with me their favourite artefacts, and participant A shared that the museum space was thoughtfully done—supposedly by them (see Figure 9). This probe therefore contributed to the goal of being an ice-breaker, and the goal of sharing parts of their work with me.

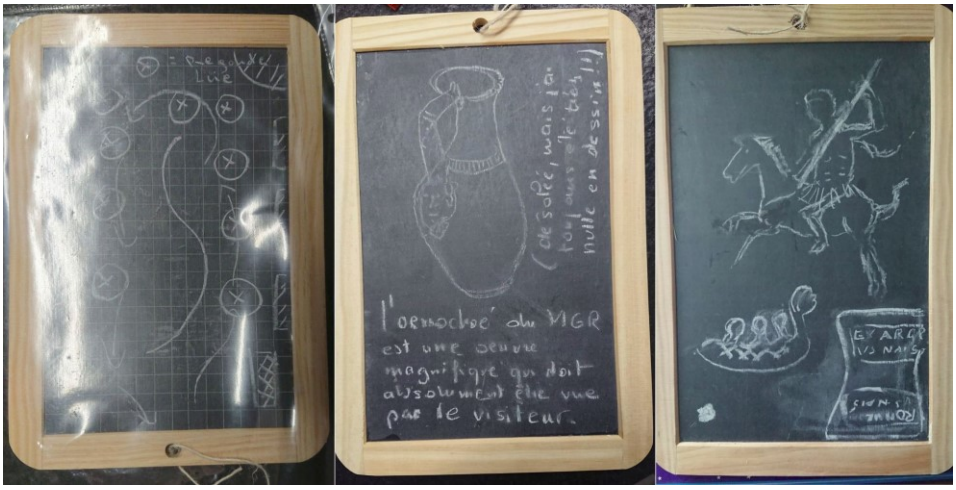


Figure 9: The three participations of the museum probe about what the visitor of the museum should absolutely see. From left to right: participant A, B and C.

On the other side of the slate (see Figure 10), participant A drew a scene of a cemetery in relation to the part of the exhibition about death rites in Gallo-Roman culture. Participant C drew a religious temple with the names of the divinities presented in the museum. They both shared their interpretation of a specific theme of the exhibition. Participant B decided to print and taped a picture of the scene "[they] wanted to draw, but [were] not capable of", showing romans enjoying food in a luxury environment. This ingenious solution to the problem resonated with their apologies written on the front side of the slate about them being "always terribly bad at drawing". This discomfort was important to be aware of for the next steps of the collaborative process; I should not enforce a drawing activity for the workshop to avoid any embarrassment for them.

Figure 10: The three participations of the museum probe about what the Gallo-Roman of Oedenbourg would be doing. From left to right: participant A, B and C.

c. The play probe

All three participants highlighted the crafting of the *Pictoscope*, with participant C adding that they could "see that [I] had put a lot of thinking and effort into it". Participant B taped the strips onto the cardboard to 'save' their choice and for me to see it (see Figure 11), similarly to participant A and the plastic sleeve for the museum probe. Even though the strips were made to be interlocked on the toy, they could have moved when being put back in the package. With my participant finding a solution to an issue with the design showed added care to their response as well as dialoguing through the material.

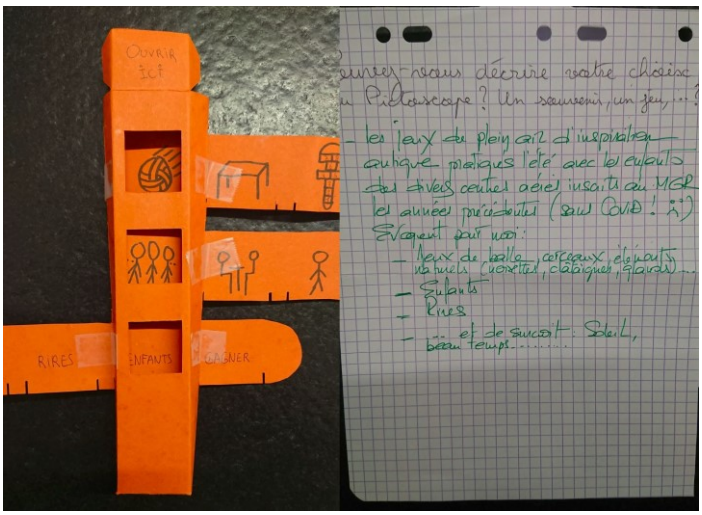


Figure 11: The play probe of participant B. On the left: the *Pictoscope* with the strips stuck in place. On the right: their contribution to the letter asking them to describe their choice of the *Pictoscope*.

They also all wrote down more about their thoughts on what play meant to them in the letter. This additional paper was supposed to give insights on how they used the toy to formulate their ideas and share their memories. Participants A and B shared souvenirs; one about family sessions playing the board game *Risk*, the other about playing outside with children during summer camps. Participant C made two series of concepts using pictures from the strip; a series using "two players", "cards", "table", "to win", and one about their approach of playing in museums explained in the notebook using "one person", "dice", "curiosity" in addition to their own words such as "visit", "discovery", "travels", "museum". With my participants openly sharing intimate memories and their definition of play, the probe seemed to effectively stimulate their thoughts regarding play and games, and therefore regarding my field of studies.

Participant B wrote more on the topic of play at the end of the notebook from the technology probe (see Figure 12). They listed “diverse states” of play: “to relax”, “to laugh”, “to concentrate”, “to learn”, “to win”. They also described the mindset and the games we play at one player, two players, more players, and in teams, referring to the strip of the *Pictoscope* depicting multiple characters. In contrast to their participation in the technology probe, there the vocabulary was brighter: “empathy”, “respect of the other”, “rest of the spirit while having fun”, “friendliness”. Their relationship with play seemed beneficial to them, as they conclude with “playing is not reserved to childhood, adults also need to play. Their mental health will only be better”. Reading this statement, at this stage of the process, was encouraging to say the least. Engaging my participants in playful activities seemed to have hit the mark; they were invited to think critically about play and games, they were reminded of memories, they appropriated the probes by connecting the activities as they seemed fit, and they had an insight in how game design and human computer interaction (HCI) could contribute to their work environment—or at least probe for information in an enjoyable manner.

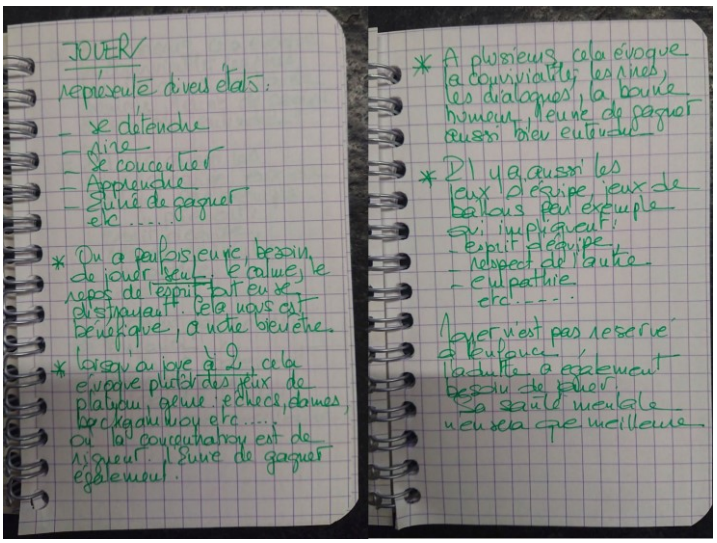


Figure 12: Additional thoughts of participant B regarding the play probe, noted at the end of the notebook from the technology probe.

4.2 Prototyping stage

In this section, I will discuss the design and the results of the future workshop done with my participants to imagine the concept of an interactive installation for the museum. Based on the observations made throughout the study, I will then explain how I approached the creation of the prototype, focusing in particular on the accessibility for the staff.

4.2.1 Workshop

Following the framework by Watkins and Russo for participatory design in museum practices, the prototyping stage consists of "co-creative prototyping with participants to produce ideas, concepts, and new co-creative media forms for use within their institutions" (Watkins & Russo, 2007, p. 5). As the goal of this project for the museum was to produce a museum interactive installation, this phase was dedicated to explore the field of possibilities and define one that would fit the museum, the visitors, but most importantly, the staff. As highlighted by the cultural probes, my participants had different approaches in term of answering questions (drawing, writing), in term of solving and appropriating the material (the plastic sleeve, taping the strips, using the notebook to write ideas), and in term of addressing the topics at hand (issues with technology, their relationship to the museum, their definitions of play). This variety of observations showed interest and engagement in the study, leading to involvement in the making of the interactive installation. To collaboratively design an installation with my participants, I decided to make a workshop as it "can bring all participants together, and enable them to plan for dedicated time to give to the process, rather than fit project-related activities into their work" (Hornecker & Ciolfi, 2019, p. 94). The workshop took inspiration from the future workshop methodology as it helps inexperienced participants, which mine were in museum interactive installations, to find alternatives and solutions to issues of their environment while inviting them to be creative (Vidal, 2005).

The first phase of a future workshop is the preparation phase consisting in identifying the themes, the participants, the methods, their rules, the time table, but also the room where the workshop will be done (Vidal, 2005, p. 5). The aim of this workshop was clear: have a concept of a prototype to develop at the end. To achieve it, my participants and I needed to go through a process that fostered both understanding the context and issues of doing a museum interactive installation, and inspiring creativity for ideas to be explored and discussed. These two axes delimited the workshop in two distinctive parts, and the overall length of the session

had to be of two hours to fit in the schedule of everyone involved. As a facilitator of the session and not only a participant, I had to make sure that the schedule was followed, and that the power dynamics of the group did not impede on the issues and creativity of everyone.

Given the positive reception of the playful activities from the cultural probes, the workshop followed the same orientation; each activity aimed at being fun for my participants to engage with. Based on the results from the play probe, my participants seemed to link games with childhood or family memories, and some to traditional board games (playing cards, *Risk*). Activities of the workshop however had to be considerate of my participants, thus avoiding being draw-centric and overly creative focused as they seemed to be doubtful of their capabilities. I drew inspiration for the structure of the workshop from the goose game, a widely known familial board game where players race on a trail by throwing dice in turns to move their pawn forward. Here, the game was not meant to be used as such—the workshop was not supposed to be competitive, rather it was taken as a reference for my participants to catch on and to emulate playful behaviour while physically representing the process. The workshop planning was thus symbolised as a trail, each tile representing one step, and each participant had a pawn to move based on their progress (see Figure 13). To move their pawn, a participant needed to complete the activity and wait for all the others to join them before unlocking the next one. Materials needed for the activities were concealed into boxes or packages put on the table, and were only opened after all pawns were on the same tile to maintain curiosity going forward but also to avoid overwhelming my participants with content.

Figure 13: Playing board of the workshop in 12 steps, each tile representing one step.

4.2.1.1 The trail of the workshop

Twelve steps had been identified for the workshop, symbolised by tiles on the trail:

1. The initial tile was to present the goal of the workshop and its methods. I introduced the technicalities of this study, that are the audio recording and the possibility to take pictures, the duration of two hours for the session, but also the measures regarding Covid19 which included not touching each other's materials and the presence of a hydroalcoholic gel at their disposal. I presented myself as a facilitator who will guide them through the activities, but also as a participant sharing my issues and ideas to create a discussion between their individual expert knowledge and mine. To start the workshop, and after explaining the trail of the board game, I opened the first box revealing coloured pawns for us to pick from and to place on the first tile, simulating the first step of classic games of that form. One could move their pawn once they did not have any more questions.
2. Entering the critique phase of future workshop methodology addressing issues "to establish a critical understanding of the theme and the problems in questions" (Vidal, 2005, p. 6), pens and post-it were unlocked and distributed to write down at least two things we would like to have in the museum or for the project to be, and at least two things we do not like in the museum or should be addressed. This activity was similar to brainstorming techniques used to visualise and frame potential problems. After having written down at least two of each, one could move their pawn on the next tile.
3. Continuing on the brainstorming, the tile unlocked an A2 paper sheet to classify the post-it in categories, thus creating a *Mind Map*. Participants presented their notes and we collectively discussed to identify themes and to familiarise ourselves with the thoughts of everyone. Once one was satisfied with the classification, they could move their pawn.
4. To emphasise the closeness and empathy with each other issues and ideas, the tile unlocked for each participant six cubes of their colour. Those cubes represented votes that we could give to any of the identified categories on the *Mind Map*. The more one gave to a topic, the more they related to it. The goal of this activity was to invite everyone to get a deeper understanding of each other point of view regarding the museum by visually and actively attributing them cubes, as Vidal argues, "a prioritization of the importance of each topic by the participants is needed" (Vidal, 2005, p. 7). This activity was not meant to diminish any theme compared to the other, rather

it was to identify common causes that everyone could see being addressed either during this study—or later. After using all the six cubes, one could move their pawn.

5. Now that a set of potential themes for the museum interactive installations had been identified, I wanted to create a discussion around who might be the users of such a device. The tile unlocked the same wooden figurines as the ones from the museum probe but this time hand painted as a range of plausible humans—children, adults and seniors. The goal of this activity was to pick at least one figurine and write their persona. The personas made by the participants would guide the creative process of designing the interactive installation by acting as a lens through which we would discuss ideas. The pieces of paper given with the figurines were prefilled to guide the participants in the making of the persona; name, age, what are their interests, what do they like and dislike in life. Personas did not have to be ideal visitors of the museum; participants were even encouraged to imagine a person outside of the museum environment. This way, the personas would contribute a new point of view when looking and interacting with the prototype. Once one or more personas were done, one could move their pawn to the next tile.
6. After creating the personas, the participants were invited to present them by placing their figurines on the small stand that had been unlocked. This activity aimed at meeting the personas of each other thus making the participants aware of the different points of view that they would have to consider later. One could move their pawn after their presentation was done.
7. At this stage, the workshop lasted for approximately 50 minutes; the tile represented a break, where one could move their pawn after coming back.
8. In future workshop methodology, after the critique phase, there is the fantasy phase where participants "should suggest solutions without reflecting about restrictions, traditions or other barriers, that is search for unconventional solutions" (Vidal, 2005, p. 7). This part of the workshop was therefore dedicated to explore ideas for a museum interactive installation that would fit the museums, its visitors, and its staff. I explained the aforementioned goal to the participants while emphasising usage of the work already done; the post-its, the themes and the personas. At our disposal for prototyping, I prepared a wide range of low-tech material; paper, cardboard, *Lego* bricks, scissors, tape, coloured pens, post-its, boxes of different sizes, playing cards, strings, construction items used in museography, and so on. Using low-tech prototyping materials as a 'third-space' "enhanced incorporation of new and emergent ideas through

the ability of participants to express their ideas directly via the low-tech materials" (Muller & Druin, 2010, p. 43). With only half an hour for this activity, the purpose was to kickstart prototypes. When all questions were answered, one could move their pawn to the next tile.

9. With the participants using the materials available, I, as a facilitator, had to guide them if they had issues finding a first hook on the topic: do they think of a specific medium they like to use in museums? Is there a part of the exhibition that they want to highlight? There were multiple approaches to the prototyping session, either coming from a device or a tool, or either coming from an artefact or a theme. After 30 minutes, we moved on to the next tile.
10. The next phase consists of the implementation phase where "the ideas from the last phase have to be seen with more realistic eyes and have to be adapted to reality, to achieve suggestions for one or more projects that are possible to implement". The participants presented their prototype and the others, using their personas as well as their own expert knowledge, discussed the concept. Having a little less than half an hour for such a complex exercise of assessing the feasibility of a project in terms of economical, technical, social and political limitations, some aspects were omitted. After having presented its own prototype, one could move their pawn.
11. To wrap-up the session, this step allowed space to discuss what sort of prototype we should settle on. Using the comments from the step before, I presented some practicalities to consider, such as the placement in the museum, or how to maintain the device. To conclude, we agreed on how to organise the follow-up phase, that is an "elaboration of a report that collects all the achieved results and presents the action plan" to be "[sent] to all participants" (Vidal, 2005, p. 9). This moment was also used as "an evaluation of each participant of the working process that has been gone through" (ibid., p. 9).
12. After moving their pawns to the end, the workshop session was done—or to follow the analogy, victory was achieved!

Even though the trail might suggest a rigid structure, the workshop is made to be adaptive to how participants react in the second part (step 8-11). Depending on their ability to create and develop, the prototyping phase was meant to be either individual or collective. As both a participant and a facilitator, I prepared examples of interactive installations to initiate creative discussion and to build upon their ideas.

4.2.1.2 Observations and results

My participants had happy reactions to the different materials revealed at each step. When picking a coloured pawn of their choice to place on the trail, some shared memories of *Monopoly* played with family; they seemed to get into a playful behaviour right after my presentation, indicated by their vocabulary around fun and by their laughs. One participant said that they did not know what to expect and they were eager to continue after they moved their pawn. Such comments were repeated multiple times at different stages of the workshop.

The activities were also new to them. Writing their issues and what they liked in the museum on post-its (steps 2-3) was the first time they shared this information to other staff members; they discovered the problems each other had encountered such as the quietness of the museum for the receptionist, the displays being too high for children, or the lack of accessibility for blind people. The making of the *Mind Map* (step 3) allowed them to share comments on the notes almost entirely to validate that an issue was indeed relevant. Four categories had been identified: “public accessibility”, “highlighting the collection”, “museum environment”, “technical limitations”. These constitute four central aspects of the museum interactive installation as they consider the visitors and their access to the device, items and topics to focus on in the collection, the constraints but also the added value of the museum space, and the feasibility and maintenance of the device. Voting with the cubes (step 4) had the expected effect of participants having to actively read and analyse the post-it as they gathered closely around the *Mind Map*. Each category ended up with five to eight cubes—public accessibility being the most voted one, and each participant attributing at least one cube to each (see Figure 14). With only six cubes for four categories, participants had to make choices which seemed difficult for some of them; they were hesitant on where to attribute fewer votes. It could be interpreted that they did not want to undermine the issues of others.

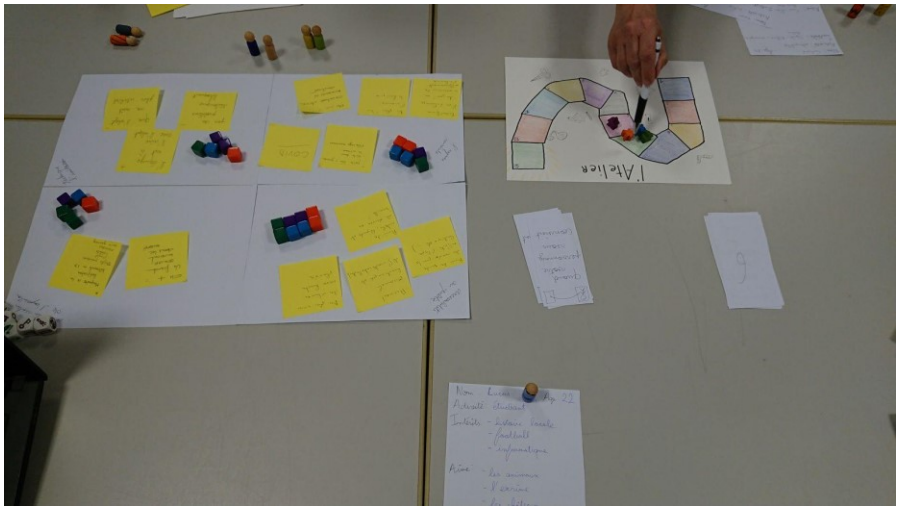


Figure 14: Picture of the participants moving their pawns on the playing board after completing an activity.

The personas (steps 5-6) were more welcomed than expected; they enjoyed looking at the wide range of painted wooden figurines, making comments on their appearances, sharing who they reminded them of, and selecting one that they liked. They had fun writing the characteristics of their persona even though they never did such an exercise before; one participant even made two after quickly completing the first one. We shared laughs during the presentations when describing their personalities and their interests, as some traits were obviously similar to participants who wrote them, while some reminded them of people they knew. We also made connections between them, such as children being classmates or adults studying at the same university. There were no senior personas, only children, young adults and adults were created even though there were figurines looking older. As the exercise was linked to the museum interactive installation, participants might have thought of younger generations being the target audience of such devices.

When reaching the tile 7 corresponding to a break, all participants wanted to continue, as one said: “usually we do not have this much fun at work”. In retrospect, the break should have been done nonetheless but at a different step of the workshop to digest what had been done until that point. Even though they all wanted to continue, fatigue was palpable after the prototyping activity (step 9). One participant shared to me after the session that they were not used to being active for that long, which actually worried them in comparison to the energy I had as a facilitator for two hours.

As I presented the fantasy phase (step 8) and unpacked the different available materials, they made comments on some of them, either visually or how they would make use of that. However, the mistake I made as a facilitator was to unpack them all at once on the table,

overwhelming my participants in possibilities. This part of the workshop could have been handled differently; having only few materials at their disposal, attributing specific materials, or having them pick one but at a different spot than the workshop table, thus inviting them to actively engage in one material at once. As they were apparently intimidated by this creative exercise, I guided them towards the post-its we discussed, the themes we identified, the personas they made and what they would like to use in the museum, the exercises they made for the guided tours, and so on. As they started asking me questions on how would I go about it, I decided to start my own prototype in front of them by vocally explaining my train of thoughts; my persona of 22 years old studied computer science, lived in Biesheim, did not like crowds, and enjoyed watching history documentaries during week-ends. How could I go around making something that interested him in the museum? I also showed another way of tackling the exercise by picking puff balls and cardboard to create something with buttons to press. The exercise was initially meant to be individual, but it shifted towards a collective prototype as they seemed to not have ideas at that time; one participant ironically said “see you in 7 days”.

My participants wanted to engage in the creative process but prototyping an idea was so unusual and out of their comfort zone that they were lost. The session became more like a focus group where we shared museum interactive installations we had seen and, for each of them, discussed what we thought of it. Mobile applications, QR codes, assemblies of devices, physical and digital games, electronic devices, adaptive audio guides, escape games in boxes, Bluetooth hotspots, and so on. From those existing concepts, they critically engaged in arguing whether that would fit in the museum or that they would like to have something similar for the collection. We used our own experiences as visitors, but also what they observed as museum professionals from their visitors, to criticise the examples. As a facilitator, I made sure that everyone contributed to the discussion as some participants were more vocal than others. We also added post-it to the *Mind Map* as we added new issues or ideas (see Figure 15).

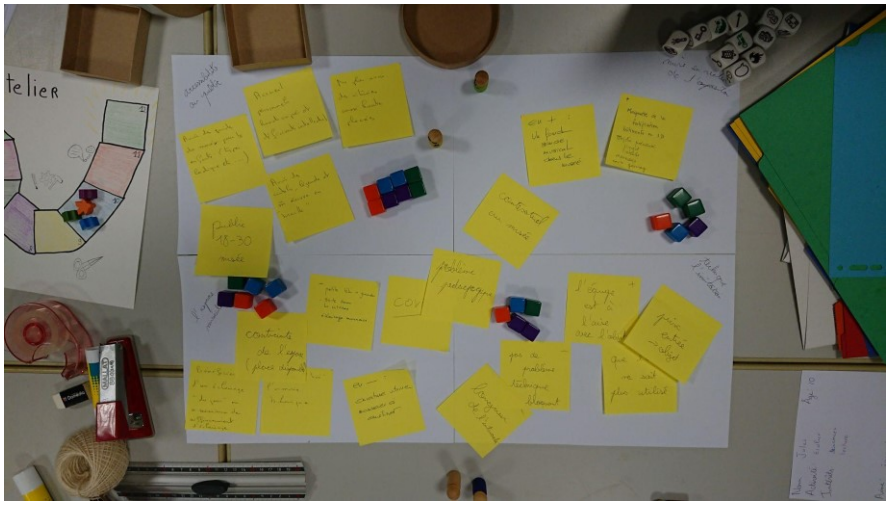


Figure 15: The *Mind Map* (step 4) at the end of the workshop, showing the cubes used for voting, the game board, and some materials.

By discussing the possibilities, I also presented them interactive solutions they did not think possible, mostly on how to interact without touch with sensors. They were intrigued by this interaction model, so I used *Lego* bricks to physically prototype the idea I had thought before of having a figurine to place on spots to interact with the device. It raised discussions around the idea of giving an item at the beginning of the visit to nudge them towards the installation, the idea of targeting the age range of 18-30 that were missing in their museum, the idea of adapting content depending on the visitor for accessibility, the idea of modifying content if the curation changed, the idea of a ludic and pedagogic experience that "does not obstruct the whole time of the visit". One particular characteristic they highlighted regarding the interaction with a figurine was that it could replace the ticket of entry; the price to print a ticket is around 1.50 euros for something that is thrown away after the visit.

We converged after 40 minutes of discussion towards a system of a quiz as they were used to create playful questionnaires for the guided tours and for the schools that visited in groups. It was also a solution that allowed the curator to create and select questions they would ask the visitors to highlight a new or unknown item in the collection. This solution also addressed their want of having a device that a visitor could try a few minutes, move away, and then come back later, thus creating short interactive sessions that would not impede on the museum space.

Even though we derailed from the initial trail, we managed in the two hours workshop session to have a prototype concept that everyone was eager to see, and seemed to appeal to everyone. We had ideas on how we could interact with the device, on what the device would be about, on where the device would be in the museum, and on how to maintain the content.

We concluded by briefly discussing and evaluating the session and the playful activities we did during the workshop but also during the cultural probes. Those observations from my participants will be discussed in the Evaluation stage section.

4.2.2 Prototype

Following the workshop session with my participants, I elaborated the concept of the museum interactive installation we agreed upon, and presented a concept document. After they all validated the design decisions, I created a working prototype for them to experiment with. The concept document and the prototype will be discussed in relation to the considerations made for the museum staff. This study focuses on the design decisions made with and for the museum staff, and does not explore all the decisions made for the visitors.

a. Concept document

To formulate and concretise the concept we developed during the workshop session, I realised a concept document (see Appendix 2: Concept document of the prototype (in French)) containing the topics we valued, a schema of the installation, a use case diagram, a solution to adding questions to the quiz system, and an opening on accessibility. The goal of this concept document was for the participants to validate the museum interactive installation, but presented in an accessible way; the explanations were concrete, simple, and the whole document was meant to be read in a few minutes only. To illustrate the document, I used materials we fabricated during the workshop sessions as a way of reminding them of their contribution. I made a *Lego* brick construction showing an adult and a child in front of a table with three pedestals and a screen (see Figure 16); the screen would show the quiz interface, and the three pedestals would be spots where visitors would place their figurine to answer the three choices questions.

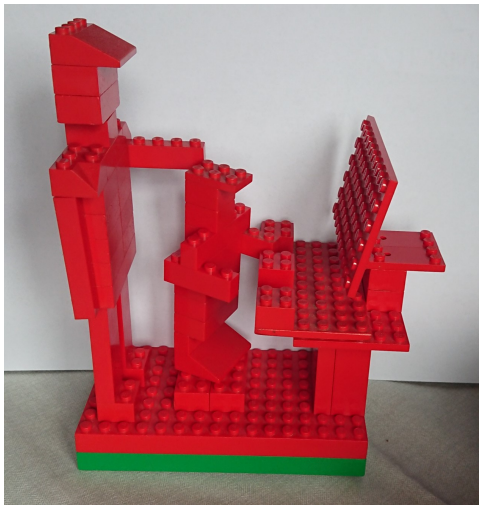


Figure 16: *Lego* construction using the materials from the workshop, depicting the idea of the museum interactive installation. Some parts were made by the participants and I during the workshop.

I summarised the important themes from the session:

- The need of interactivity and ludic activity in the museum
- The inclusivity of all age groups
- The showcasing of the exhibition
- The added notion of souvenirs to the museum experience
- The simplicity of usage and maintenance for the museum staff
- The respect of sanitary measures
- The adaptivity to constraints of space within the museum
- The sustainability of the device

In addition to the themes, I detailed one solution to create questions for the quiz as it would be the responsibility of the museum staff. Instead of going for a cloud-based solution or a software, as those were already dismissed by the staff due to a prior failed experiment, I proposed a file-based system where the staff could create text files following a predefined structure to input their questions. The structure would be written in YAML, as it is a human-readable data-serialisation language that avoids complicated mark-up tags as the staff was not well experienced in the domain. This solution also allowed organising questions in folders—thematically or not. I presented the advantages and the drawbacks, such as creating the questions on their computer and only having to copy paste them on the device through USB, or that the YAML structure would have to be strictly followed, aiming at creating a discussion with my participants.

After sending them the document individually, I gathered the feedback through mails and phone calls, and they all validated the concept without any modification. The solution presented for the questions seemed adequate yet new to them, and the interaction model looked "fun", "engaging" and "original".

b. Making the prototype

The goal of the prototyping phase was to have a working interactive installation showing how to interact with the quiz (see Figure 17) and how to input the questions. Design decisions were motivated by the accessibility for the museum staff to maintain and update the installation; the curator, with the help of the archaeologist, should be able to add questions with themes and pictures, and the receptionist should be able to guide visitors experimenting with the device without any technical issues.

Considering the limited knowledge in informatics and their reluctance to technology shown by the cultural probes, I opted for a system where the museum staff would need to intervene on the device on specifically rare occasions, that is to add and curate the questions in the quiz. To do so, the device was made using a *Raspberry Pi*—a small single board computer used for electronics, basic proximity sensors to detect the figurines, a screen to display the quiz, and a keyboard and mouse for the staff only to access the system. The *Raspberry Pi* acts as a personal computer, meaning that, even if it runs on Linux, the museum staff could apprehend the device as technology they were familiar with; a desktop, a file system, a web browser if needed, *etc*. These systems are also widely known and used in computer science for embedded systems, allowing the project to be enhanced or transformed later if the museum or the city hired a contractor. The quiz was made to run in a web browser as it allowed the organisation of the page and its style to be modified easily by someone having basic knowledge in *HTML*, a mark-up language, and *CSS*, a style sheet language, both widely spread in web design, without impeding on the programming. The logic of the quiz, the interpretation of the questions, and the communication between the sensors and the web page were done in *Node.js*, while the visual effects and the feedback that the visitors could see were done in *javascript*. All functions and variables in the programs were named and detailed in French to be readable to a wider range of persons who could access the device. The code and the documentation had been made public and free on *Github*, a hosting service for software, for others to see and build upon. The quiz, even if it was shown on a web page, was not accessible outside the museum space; it ran locally on the *Raspberry Pi*.

The only action required by the museum staff on the device was to copy paste their questions in the corresponding folder and restart the device. The computer would automatically start the *Node.js* server at launch as well as the web browser in full screen, thus hiding to the visitors the interface of the computer. The format of the questions, according to the concept document, had to follow some criteria: one folder per question, with inside a picture and a text file containing the actual question, its category, the three possible answers and the correct one, and an explanation. The quiz system would cycle all the questions indefinitely to allow all kinds of sessions for the visitors; only answering one question, answering multiples, answering some before and after the visits, *etc*.

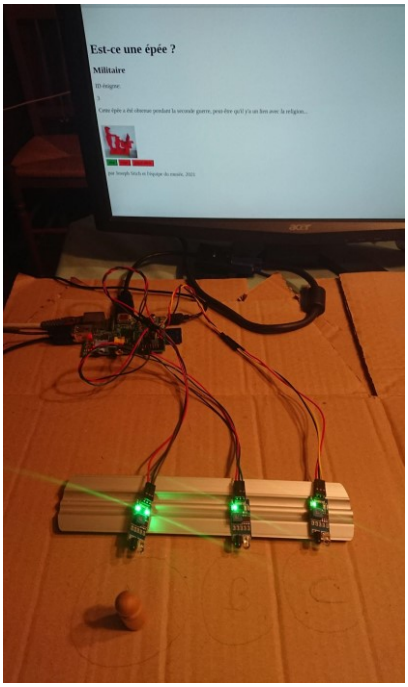


Figure 17: Prototype of the museum interactive installation: a quiz system where one can answer the question on the screen by placing an object in front of one of the three proximity sensor.

The prototype was barebone but functional. Before actually putting it in the museum, I had to evaluate the device with the staff. We needed to define the style of the web page, create a collection of questions, craft the three pedestals for the sensors, hide the cables and the computer, and determine how to approach the accessibility—translating the questions in French and German, having questions for all age groups, and writing explanations of different complexity. This evaluation will be conducted as future work, explained in the Evaluation stage section.

4.3 Evaluation stage

In this section, I will discuss the future evaluations to conduct with my participants regarding the methodology, the prototype and the final museum interactive installation.

4.3.1 Future work

The framework of Watkins and Russo define the evaluation stage as a way for participants to "explore, evaluate and discuss comparative co-creative artefacts via surveys, focus groups and workshops" (Watkins & Russo, 2007, p. 5). The co-creative artefacts made during this study implied the cultural probes, the workshop and the prototype. The workshop session concluded with a brief follow-up phase meant to have individual feedback of the process we just had been through (Vidal, 2005, p. 5). This phase was also meant to "discuss the idea of organizing another workshop for some specific issues" and to raise the question of "communicating to the external world the achieved results" (ibid., p. 5).

a. Evaluation of the methodology

During the follow-up phase of the workshop session, one participant shared that "after primary school, we do not create anymore, and that is dramatic". They continued by saying that "nowadays, when you are at work, you are not allowed to play". Those statements entered in relation to other feedback received on the cultural probes where participants mentioned that they did not have such playful activities in their work environment before. One participant added the example of the slate from the museum probe where they were asked to draw; they realised that "[they] did not draw anything for decades" even though "[they] drew well before".

As my participants seemed enthusiastic when completing playful activities such as the *Pictoscope* or the personas, I will conduct individual stimulated recall interviews using artefacts they created throughout the process to probe their thoughts on playful participatory design. It will also be relevant to explore solutions on how to incorporate playful activities in their work environment as they were so receptive to them.

b. Evaluation of the prototype

The concept of the prototype was accepted by the staff, but they did not have the opportunity to see the functional device. Before installing it in the museum space, an individual presentation followed by a collective presentation will be handled to gather feedback on the

visual and functional aspect of the interactive installation. Those presentations will imply experimenting with the device as visitors, but also maintaining it by adding and removing questions. The curator also mentioned that it would be beneficial to include the person in charge of the communication at the city hall; not only because they could incorporate the new installation in a city communication plan, but also because they could add a new point of view to the project. This new point of view could be combined with a playtest with selected visitors.

c. Evaluation of the museum interactive installation

After the modifications of the prototype based on the feedback received previously, the final museum interactive installation could be placed inside the museum. At this stage, an official review of the device by the city hall will be necessary as we made a contract prior to this study allowing me to work with the museum if I contributed to its digital modernisation.

5 Conclusion

Museums are going through a digital transformation to attract new audiences, but also to keep up with the introduction of interactive installations in curation techniques. To accompany the transformation of the Gallo-Roman museum of Biesheim, I engaged in a playful participatory design process with the staff with the aim of co-creating an interactive installation that was considerate of their needs and apprehensions.

By using cultural probes as a playful ice-breaker to share our views on sensitive topics, I created an empathetic dialogue through the material and its appropriation from the participants. Some of the results were difficult to translate into data as cultural probes are arguably not meant as an ethnographic method, but rather meant to foster inspiration for the rest of the design process. In that sense, it did provide information on the participants to create activities that were respectful and stimulating for them. The future workshop in the form of a game with playful activities contributed to the development of an interactive installation by inviting the participants to a fun and creative experience that was very welcomed yet unexpected and far from their usual work practices. It also showed that such creative activity can be overwhelming if the participants are not used to it, and if the facilitation of the session is not responsive. Putting special care in the design and craft of those participatory processes was noticed and appreciated, resulting in a closer relationship between me and the participants, but also between them as they shared their experiences together. The critical exploration of the notion of playfulness in participatory design practices with museum staff gave perspective to game design as a hybrid way of experimenting in the 'third-space'. Game design can be expressed not only by creating games for the participants, but also by creating rich, engaging and fun interactions with unusual materials in unusual contexts.

There are still conflicting views within the museum space, most notably due to the plurality of discourses from the different stakeholders. Finding the correct balance and pace between a research-oriented experimentation with museum staff and the need of a tangible, sustainable product to install in the museum is therefore complex. An evaluation of this study is yet to be conducted to properly transform the prototype into a definitive interactive installation in accordance with the feedback of the museum staff, but also from visitors and from the city hall.

This study shows that the bridge between museums and participatory design still exists, not only to develop interactive installations that correspond to an audience shown by previous studies, but as a tool for the staff to regain control over their work environment, similarly to

the historical roots of this process. This study also hopefully highlights the enthusiasm created by introducing playful design and game design in museum practices, and its impact on addressing daunting issues.

Acknowledgements

I would like to thank my supervisor, Dr. Sabine Harrer, for their immense help and expertise on participatory design, on research through design and on playfulness in general, but also in academic guidance and cheerful motivation through all the stages of this study.
I would also like to thank the three participants of the Gallo-Roman museum of Biesheim for their openness and kindness in approaching this research project as unusual and unknown as it was for them.
I would then like to thank Dr. Doris C. Rusch for their support during all my studies at Uppsala University, Dr. Richard Bartle for their supervision, and all teachers and classmates who contributed to sharpen my critical understanding of game design related topics.

References

Allen, S. (2004). Designs for learning: Studying science museum exhibits that do more than entertain. *Science Education*, *88*(S1), S17–S33. https://doi.org/10.1002/sce.20016

Bell, G. (2002). Making sense of museums: The museum as' cultural ecology'. *Intel Labs*, *1*, 1–17.

Bitgood, S. (2013). *Attention and Value: Keys to Understanding Museum Visitors*. Left Coast Press.

Blythe, M., & Monk, A. (2018). *Funology 2: From Usability to Enjoyment*. Springer.

Bødker, S., & Kyng, M. (2018). Participatory Design that Matters—Facing the Big Issues. *ACM Transactions on Computer-Human Interaction*, *25*(1), 1–31. https://doi.org/10.1145/3152421

Bossen, C., Dindler, C., & Iversen, O. S. (2012). Impediments to user gains: Experiences from a critical participatory design project. *Proceedings of the 12th Participatory Design Conference on Research Papers: Volume 1 - PDC '12*, 31. https://doi.org/10.1145/2347635.2347641

Campos, P., Campos, M., Pestana, J., & Jorge, J. (2011). Studying the Role of Interactivity in Museums: Designing and Comparing Multimedia Installations. In J. A. Jacko (Ed.), *Human-Computer Interaction. Towards Mobile and Intelligent Interaction Environments* (pp. 155–164). Springer. https://doi.org/10.1007/978-3-642-21616-9_18

Desvallées, A., & Mairesse, F. (Eds.). (2010). *Key concepts of museology*. Armand Colin.

Falk, J. H. (2016). *Identity and the Museum Visitor Experience*. Routledge.

Falk, J. H., & Dierking, L. D. (2016). *The Museum Experience Revisited*. Routledge.

Fraser, M., Stanton, D., Ng, K. H., Benford, S., O'Malley, C., Bowers, J., Taxén, G., Ferris, K., & Hindmarsh, J. (2003). Assembling History: Achieving Coherent Experiences with Diverse Technologies. In K. Kuutti, E. H. Karsten, G. Fitzpatrick, P. Dourish, & K. Schmidt (Eds.), *ECSCW 2003* (pp. 179–198). Springer Netherlands. https://doi.org/10.1007/978-94-010-0068-0_10

Gaver, B., Dunne, T., & Pacenti, E. (1999). Design: Cultural probes. *Interactions*, *6*(1), 21–29. https://doi.org/10.1145/291224.291235

Hornecker, E., & Ciolfi, L. (2019). Human-Computer Interactions in Museums. *Synthesis Lectures on Human-Centered Informatics*, *12*(2), i–153. https://doi.org/10.2200/S00901ED1V01Y201902HCI042

Johansson, M., & Linde, P. (2005). Playful Collaborative Exploration: New Research Practice in Participatory Design. *Journal of Research Practice*, *1*(1), M5–M5.

Lange-Nielsen, F., Lafont, X. V., Cassar, B., & Khaled, R. (2012). Involving players earlier in the game design process using cultural probes. *Proceedings of the 4th International Conference on Fun and Games - FnG '12*, 45–54. https://doi.org/10.1145/2367616.2367622

Meunier, A., Luckerhoff, J., Allard, M., & Muse, P. (2012). *La muséologie, champ de théories et de pratiques*. PUQ.

Muller, M. J., & Druin, A. (2010). *Participatory Design: The Third Space in HCI*. 70.

Sandri, E. (2020). *Les imaginaires numériques au musée ?: Débats sur les injonctions à l'innovation*. MkF Éditions.

Taxén, G. (2004). Introducing participatory design in museums. *Proceedings of the Eighth Conference on Participatory Design Artful Integration: Interweaving Media, Materials and Practices - PDC 04*, *1*, 204. https://doi.org/10.1145/1011870.1011894

Taxén, G., Hellström, S.-O., & Tobiasson, H. (2003). *THE WELL OF INVENTIONS – LEARNING, INTERACTION AND PARTICIPATORY DESIGN IN MUSEUM INSTALLATIONS*. 24.

Tim, Y., Ouyang, T., & Zeng, D. (2020). Back to the future: Actualizing technology affordances to transform Emperor Qin's terracotta warriors Museum. *Information & Management*, 103271. https://doi.org/10.1016/j.im.2020.103271

Vidal, R. V. V. (2005). *The Future Workshop: Democratic problem solving*. 22.

Watkins, J., & Russo, A. (2007). *Participatory Design and Co-creativity in Cultural Institutions*. 7.

Appendices

Appendix 1: Future workshop schedule and notes

Future Workshop schedule

Goal: have a concept of a prototype to develop after that

Time: 2 hours

Date: 11th of March

How: based on the goose board game

- the board is made of 12 tiles, each tile is equal to one step in the workshop
- each participant has a pawn
- each tile has a "step box" with items used for the corresponding step
- each tile has an explanation on when to move the pawn to the next tile
- when everyone is on the next tile, reveal the step box and the explanation

14h00: introduction (5mn)

- technicalities: 2h, talk about the recording and taking pictures, avoid touching each other materials, you can interrupt me when I talk for too long, there will be a break in the middle
- presentation of myself game design, but that shouldn't guide what you think the artefact can be. my methodology is about games and playfulness.
  (hint about the game) by the way, this is my pawn of colour black; you will see why.
- presentation of the workshop goal: have a prototype concept for me to take home and develop
- explanation of participatory design practices
    - get ideas and points of view of each 3 participants, everyone matters
    - in big words "your expert and field knowledge, coupled with my design experience, to change the workplace and to empower you through it"
    - not here to just implement something, here to involve you in the process to make something that suits everyone to avoid any stress or conflict

- presentation of the steps:
    - step box: a coloured pawn for every participant
    - trail with each tile is one step in the workshop
    - -> you move forward when you don't have any questions, everything is clear

14h05: step "post-it" (10mn)

step box: post it for everyone, a pen

- to determine what do you want and don't want the prototype to be
    a) 2 things that you would like it to be (item, easy to use, highlight this, …)
    b) 2 things that you don't want it to be (buggy, tech, past experience, covid)

-> move pawn when written done

14h15: step "galaxy of post-it" (10mn)

step box: huge paper to classify the post-it

- reveal each post-it and read out loud
- identify a topic for each
- connects them together on in categories

-> move pawn when everyone thinks the post-its are correctly classified

14h25: step "cube vote" (10mn)

step box: 6 cubes of the corresponding colours

- use cube to determine to classify topics in order of importance
- 6 cubes each, the more the cube, the more important the topic is
- create discussion about the problematics
- ! leaving space to add new post-it and modify votes

-> move pawn when all cubes are used and everyone is satisfied with their vote

14h35: step "creating visitors" (10mn)

step box: wooden characters representing people (**visitors**, staff, stakeholders) (9 painted), piece of paper to write about them

- take a wooden character and a piece of paper and write some information about them (name, age, what do they do in life, what is their story, what do they like, what do they dislike, **needs and interests**), not specifically about the museum
- goal is to create tangible personas!

-> move pawn when one character per participant is done (more is possible too!)

14h45: step “presenting personas” (5mn)

step box: a small stand to put the character on

- everyone presents their persona

-> move pawn when presentation done

14h50: break (10mn)

step box: food?

-> move pawn when back and ready

15h00: step “prototype intro” (5mn)

step box: taking out the big pack of low tech material to prototype (not opening it yet)

- explanation of what’s coming
- use the materials and tools to create your take on what the prototype could be, by taking into account the galaxy of post-its we created, their importance
- the support: tablet, mobile app, table, something completely different ?
- craft it (stick windows, items, string together etc)
- basic if possible! only 25mn, use to kickstart ideas00

-> move pawn when everything is clear

15h05: step “prototyping” (30mn)

step box: open the pack of low tech material (paper, cardboard of colour, box, characters, cards, dice, string) and tools (pen, crayons, feutres, scissors, glue, ruler, tape)

- make a tool for the persona: what would they like to use/play with
- collective prototyping, guided by the notes and their importance

-> move pawn when collectively done with the prototype concept

15h35: step “using personas” (10mn)

step box: taking the characters + paper out again, everyone takes their own

- taking the personas, how would they interact with the prototypes made?

-> move pawn when done with the person they used

15h45: step “wrap-up” (10mn)

step box: big piece of paper, and a plan of the museum

- summarise the prototype, what does it do, what is it for
- where should it be placed in the museum [if applicable]
- leave space to discussion

-> move pawn to the end, **victory !!!**

15h55: conclusion (5mn)

thanks for your participation

there will be a playtest when suitable

keeping in touch for any question

List of material

step box 1: a coloured pawn for every participant

step box 2: post it for everyone, a pen

step box 3: huge paper to classify the post-it

step box 4: 6 cubes of the corresponding colours

step box 5: wooden characters representing people (visitors, staff, stakeholders) (9 painted), piece of paper to write about them

step box 6: a small stand to put the character on

(step box 7: food and coffee?)

step box 8: taking out the big pack of low tech material to prototype (not opening it yet)

step box 9: open the pack of low tech material (paper, cardboard of colour, box, characters, cards, dice, string) and tools (pen, crayons, feutres, scissors, glue, ruler, tape)

step box 10: the personas

step box 11: big piece of paper, and a plan of the museum

step box 12: end !

Sum

- the board of the game !
- the plan of the museum
- 4 pawns of colour + other pawns
- 6 cubes of pawn colours
- wooden characters
- a small stand
- post its
- paper (A4 in half)
- paper (A4)
- 2 big paper for boards (galaxy and wrap-up)
- cardboard of colour
- boxes
- bags
- cards
- dice

- string
- pens
- pencils
- felt pen and markers
- scissors
- glue
- tape
- ruler
- slate and chalk

Notes

Questions to answer during the workshop

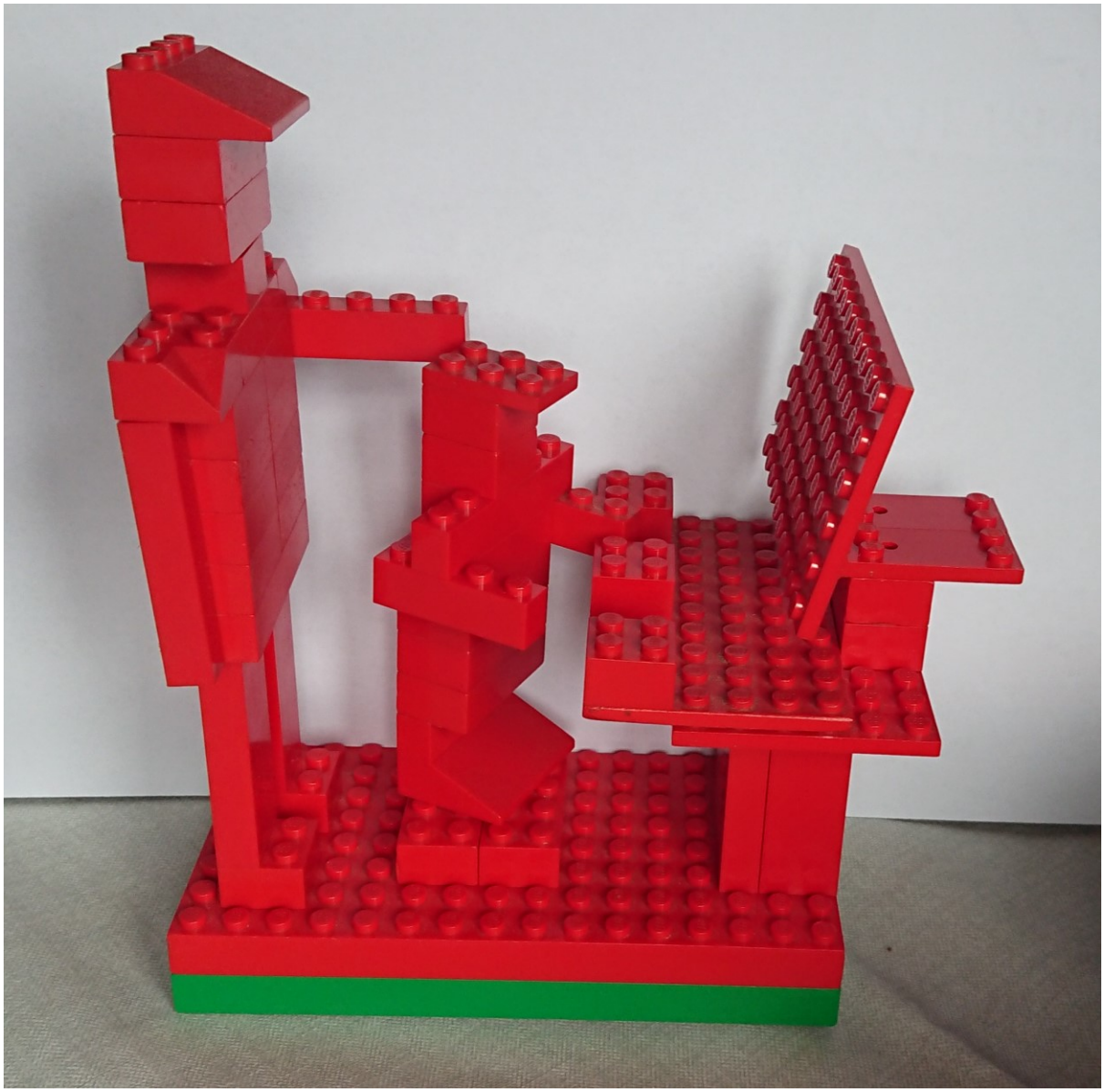
- what would you like to see in the museum?
    - a tool for easier curation
        - change what is exhibited without having to reprint everything
        - a display service that you can modify
        -
    - a game to engage with public
        - trivia questions that you put in
        - a specific item or part of the exhibition you want to highlight
        -
- the scope of the project:
    - a finished product
    - polish level
- the targeted audience:
    - who is it for: staff
    - who is it for: public
- issues with technology:
    - what would trouble you
    - what suitable method would work for you to use the device
        - excel
        - usb key
        - software

Appendix 2: Concept document of the prototype (in French)

Concept d'installation au musée Gallo-Romain de Biesheim

Joseph Stich - Uppsala University - Mars 2021

Joseph.Stich.7750@student.uu.se



Préambule

Suite à l'atelier participatif du 11 mars 2021, un concept d'installation au musée Gallo-Romain de Biesheim a été formulé. Le dispositif permettrait aux visiteurs de tous âges d'interagir avec un quiz dans le but d'éveiller la curiosité pour la collection du musée.

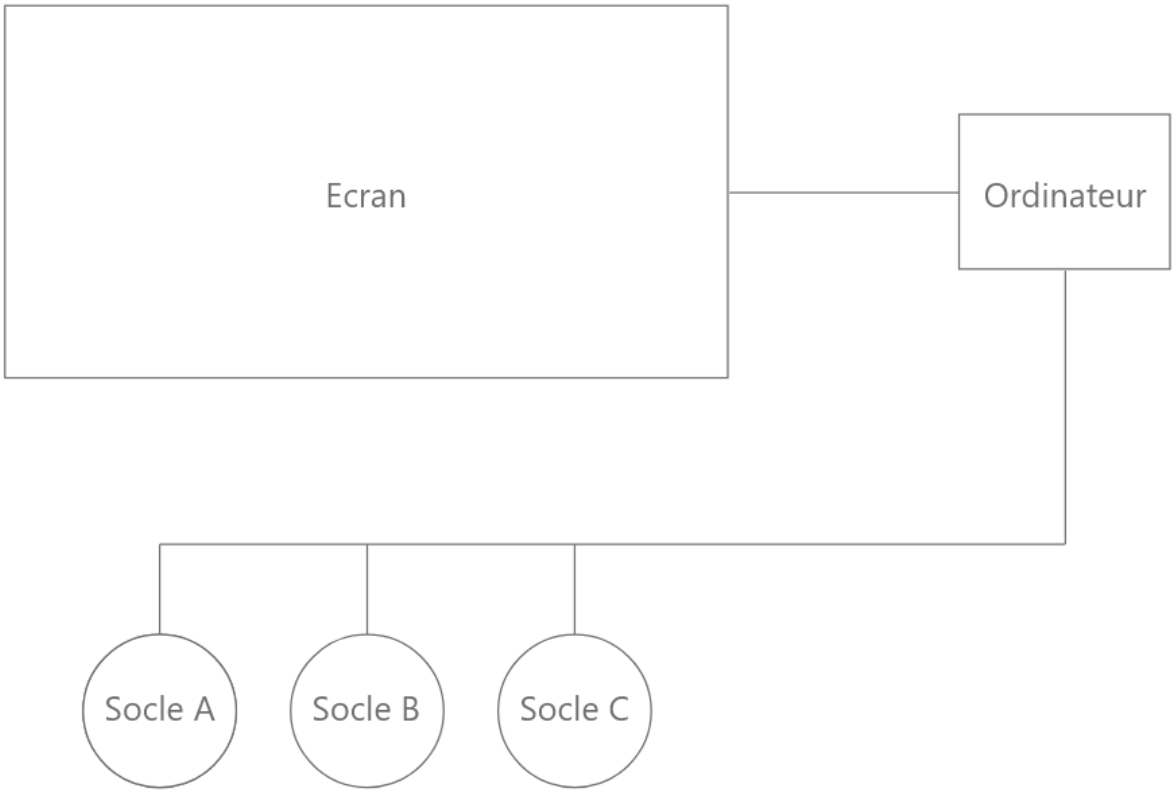
Ce concept relie plusieurs thématiques:

1. le besoin d'interactivité et de ludisme,
2. l'inclusion de toutes tranches d'âges,
3. la mise en valeur de l'exposition,
4. l'ajout de souvenirs à l'expérience muséale,

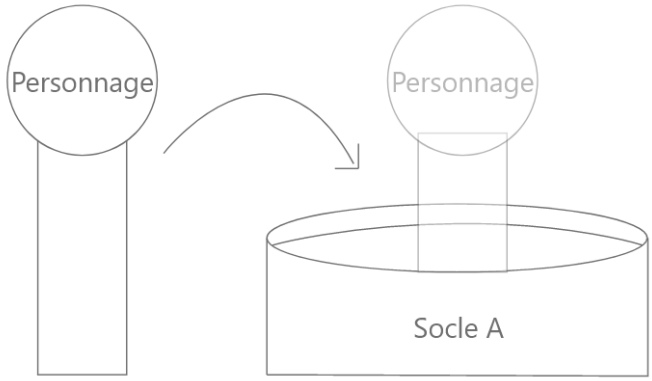
5. la simplicité d’utilisation et d’entretien par le personnel,
6. le respect des mesures sanitaires,
7. les contraintes liées à l’espace disponible,
8. la pérennité du dispositif installé.

Concept d’installation

Ce schéma d’installation correspond au concept de quiz interactif établi à la fin de l’atelier:



L’écran affiche les questions une à une, et le visiteur se trouvant devant l’installation peut y répondre en interagissant avec les socles correspondants (réponse A = socle A).



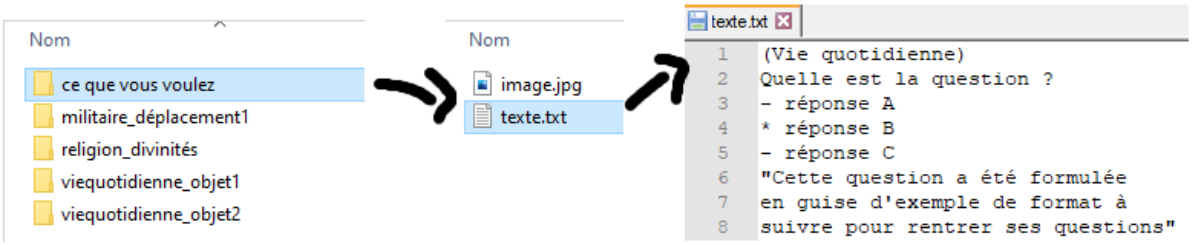
Pour interagir avec le dispositif, et donc répondre à la question affichée, on place notre personnage sur le socle correspondant à la réponse souhaitée. Ce personnage serait distribué à l'entrée afin d'inviter à utiliser le dispositif en respectant les mesures sanitaires.
Le passage à la question suivante est encore à définir (temps d'attente, enlever son personnage, …)

L'écran affiche la question en suivant un format prédéfini. Une "question" est composée d'un titre (ex. un thème, une catégorie, …), d'une image ou d'une vidéo, d'un texte explicatif, d'une question à répondre, et trois réponses possibles dont seulement une est correcte.

Cette proposition d'affichage est **temporaire**; où mettre la question, quand et où afficher le texte explicatif, est-ce que le titre est nécessaire… Ces questions seront explorées lors de la phase de prototypage.

Utilisation

Pour pouvoir rentrer les questions dans le dispositif, on peut imaginer une architecture de dossiers et de fichiers:



Chaque question correspond à un dossier de l'ordinateur. Chaque dossier contient une image (ou une vidéo) et un fichier texte (au format .txt). Dans ce fichier texte, les informations de la question y sont stockées selon un format:

- la catégorie entre parenthèse (1 ligne)
- la question (1 ligne)
- les 3 réponses possibles, avec une '*' pour la bonne réponse et un '-' pour les autres (3 lignes)
- le texte explicatif entre "" (autant de lignes que voulu)

Points positifs

- on peut faire ses questions sur un autre ordinateur puis venir les copier coller avec une clé USB sur l'ordinateur du dispositif. Cela limite l'utilisation de l'ordinateur qui peut être moins confortable.
- selon moi, simple d'utilisation puisqu'il s'agit d'organiser un dossier bureautique. Cela permet de gérer les questions disponibles sans nouvelle interface à comprendre et manipuler.
- facilite les sauvegardes. En effet, ces questions sont aussi sur votre clé USB, et sur votre ordinateur.

Points négatifs

- le format est à respecter scrupuleusement puisque l'affichage va aller lire le contenu des dossiers pour fabriquer les questions à l'écran.
- peut être difficile de visualiser les questions qui sont affichées si on classe les questions dans des sous-dossiers.

On peut penser à une solution aux points négatifs, comme un logiciel qui permet d'assister la création de questions. Ce logiciel pourrait être sur l'ordinateur du dispositif ou sur un autre ordinateur. Pour des raisons de pérennité, ce logiciel ne servirait qu'à fabriquer l'architecture de fichier ci-dessus. Il serait donc possible de développer ce logiciel plus tard dans la phase de prototypage.
On peut aussi penser à une interface à distance, mais l'ordinateur du dispositif nécessiterait une connexion internet, et cela s'apparenterait peut-être trop à un Cloud… que je préfère éviter.

Accessibilité

Afin d'aborder l'accessibilité à toutes tranches d'âges, la solution la plus simple serait de mettre une marche devant le plateau où sont placés les socles… (cf la construction en Lego)
Comme cela risque d'empiéter sur le chemin du musée, les possibilités seront explorées pendant la phase de prototypage.

Pour l'accessibilité aux personnes en condition d'handicap, on peut vocaliser les questions, les images et les réponses. On peut aussi penser à la possibilité de répondre à l'oral. Ces pistes seront explorées après la phase de prototypage.