Sense and Sensibility:
Designing a museum exhibition with Visually Impaired People.

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Abstract. As a Participatory Action Research project stands at the crossroad between scientific investigation, design, and social change, we argue that to answer *when and what* this kind of project can be considered "successful" we have to reflexively analyze a Participatory Design action as a never ending process. The hypothesis discussed in this paper is, thus, that the result of a Participatory Action Research project is more the journey that led to a design than the "results" of a research or the "products" created by the project (them being of material of immaterial substance). In this paper, we will illustrate our point through the description of *SmartArt*, an action research project whose aim is to reduce inequalities by allowing access to art and culture to Visually Impaired People.

Keywords: Participatory design, ethnography and design, visual impairment, action research

1 Introduction: *the when and the what* of a Participatory Design action

In their paper "*What is a participatory design result?*" [1] Tone Bratteteig and Ina Wagner raise some interesting questions about *when* a Participatory Design (PD) action can be considered successful. The *when* addressed in the above mentioned paper call upon not only a temporal dimension, but also a reifying dimension taking into account what has been produced (considering in the larger sense: new artifacts, knowledge, skills, and so on). *The when and the what* of scientific results acquire for the authors a particular importance in any Participatory Design project. In an ideal world, the project outcomes should be evaluated in a real use situation, when users have had a chance to integrate the results into their everyday lives. Reality is that many PD projects are not in a position to take this step beyond project time. Thus, the *when* and the *what* of Participatory Design actions are, at best, discussed as "potential for" (impact, change, adoption…and so on) and, at worst, not even addressed: what is evaluated is purely the usability of the created artifacts/systems [2].

The authors of this paper would like to reflect on *the when and the what* of Participatory Design actions, in the specific context of an Action Research project they conducted during the last two years. As an Action Research project stands at the crossroad between scientific investigation, design, and social change, pushing further the above mentioned paper's reflection, we argue that the answer to *the when and the what* cannot pertain to (and thus can be evaluated by) only one of these approaches. For example, the scientific approach normalized in computer science and other scientific disciplines insists on the *results* and *reproducibility* of a scientific investigation, excluding from the picture the uniqueness of the research journey that brought to these results. It is the same to say that, in accounting for a scientific action, what is being described is not the science as it is being made *in situ*, i.e. "science in action", but the already-made science [3,4]. On the other hand, in Participatory Design projects, we often use methods (like ethnography or co-design techniques) which do not pertain to the positivist model. Most of the time, this incorporation is considered as "yet-another-neutral-method-to-use" (pretending a seamless insertion of these methods in between the positivistic ones). However, their addition is not neutral at all and it creates multiple tensions, in particular for evaluation purposes, that deserve a reflexive discussion.

In this paper we propose to reinterpret the *when* and *what* dimensions in a Participatory Design Action as a never ending, *in fieri* (in progress) act, created by the tension between the methods used and the performing researchers. We propose thus, that the result of a Participatory Design action in an Action Research project is more the whole journey that led to a design, i.e. the whole participatory research process as well as the evaluation of the research by the participants who were involved in it, rather than simply the "products" created by the project (them being of material of immaterial substance).

As the basis for our discussion, we will use as example *SmartArt,* a participatory Action Research project we have been involved in for the last two years. SmartArt's objective is to reduce inequalities by allowing access to art and culture, in particular to Visually Impaired People (a category of people who are normally excluded from this kind of milieu). Pragmatically, the project aims to create an exhibition that could be experienced by Visually Impaired People naturally *together with* non-visually-impaired people. In order to design an art exhibition that makes sense to everybody, the *emotional* aspect created by art (rather than the rational one) emerged as the most relevant hypothesized dimension to be examined empirically. In this context, new ways of making art accessible were explored, examining not only techniques of presenting artwork in a manner that can be appreciated using all five senses, but also emphasizing what people *value* when visiting a museum. In order to design these new museum experiences and interaction modalities with art, the project adopted a Participatory Design approach, *involving* different stakeholders at all times, examining aspects of art, technology and social inclusion.

The rest of this paper is structured as follows. The next section will specify the theoretical grounding that guided our analysis. Section 3 will briefly describe the project's background and the general context. Section 4 presents the methodological reflection guiding this research. In Section 5 and 6 the actual methods and techniques used as well as the insights produced out of mobilizing this specific methodology are

described in detail. Finally, Section 7 draws some conclusive remarks and discussions on the Participatory design journey we held in this project.

2 A reflexive stance on Participatory Design actions.

Before entering into the actual description of the project, we believe it is important to clarify the perspective taken during the project. The two authors of this paper - who are the ones who defined the Participatory Design actions to be taken during the project - come from two different disciplines: computer science (and in particular Human Computer Interaction) and sociology. These two disciplines place different values on different aspects of research. As scientists, human-computer interactionists are trained to seek explanations of existing phenomena, as engineers they are trained to provide technical solutions to *well-defined* problems, and as designers they are trained to explore a design space and find solutions that "work"[5]. There is thus, for a Human-computer interactionist, a constitutive tension between science and design (see e.g., in [6] the tension between "finding the truth" and "pursuing the non-existent" [7]).

The same tension exists among sociologists (especially in the French academic context, of which the authors' are part) as scientists or practitioners. This tension between different definitions in ways of doing, role and utility of Sociology, gives rise to different forms of Sociology, with different objectives [8]. At one end of the spectrum, a purely scientific perspective inspired by Durkheim [9] aiming at generating knowledge for itself, regardless of the social utility of the studies. At the other end of the spectrum, Sociology as producer of advice and expertise, answering a 'social demand' or 'client'. In between the two, different types of practices aiming at scientific and/or social utility [10]. Concerning the analysis and design of interactive systems, the use of sociological methods and sociological reasoning have become more prominent since the 1980s [42], including ethnographic studies of work in a number of application domains [43].

Coming from these different perspectives, when conducting the research described in this paper, part of the journey - and specifically the set of methods that will be described - was created by the continuous adjustment between the researchers' habits and beliefs, even if they will be presented in a disinterested way. The reflexive approach we would like to promote in this paper consists thus of an awareness and a throughout examination of our own respective approaches – both in terms of methods used and analytic perspectives, that were complementarily used in this particular project. What will be described in the rest of the section is the synthesis of several discussions the two authors had during the project. While some of these statements were evident for us from the beginning of the project (e.g., the role of Participatory Design as a tool for empowerment in the context of disability and social participation) others (like our non-neutral stance when conducting research) emerged from this confrontation. Since we are aware that the techniques and the actions we took during the project, as well as the analyses we could make out of the same data, are conditioned by our personal stances – personal, cultural and disciplinary background - we believe important to account for them before presenting the actions and the results

of the project, as the actions taken will be presented in Sections 5 and 6 in a "neutral way" (i.e., without any of the variations that conducted to this path).

The object(s), the subject(s), and the process

One particular element that emerged in our discussions (which is fundamentally an epistemological reflection) was our attempt to avoid the separation between theory (*epistêmê*) and technique (*technê*), or the notion that inquiry essentially divides into substance and process. From this separation viewpoint (characteristic of a positivist approach), substance stands as the subject matter of thought, that which is to be known, has real content, and feeds into existing bodies of knowledge, theoretical or empirical [11]. The "already-made" science approach is exactly excluding all the divergent paths from the accounting of the knowledge of the substance.

On the contrary, the authors of this paper believe that it would be important to account also for all the deviations: we (as researchers) can elaborate only a mediated knowledge of reality. That is to say that we can construct objects that have never been observed, seen, or experienced as such by the people in the project, not only by creating new artifacts, but also by *interpreting* the collected data. It is nevertheless important to understand that this interpretative work does not intervene after the empirical battle of collecting data, but *before*, *during* and *after* the production of data (for example selecting which data should be considered and the methods used for such gathering). Therefore, data are constituted as such by a series of *interpretative* acts [12]. Thus the journey (process) that led to the final interpretation (or design choices) is as important (if not more important) as the final results.

A non-neutral stance on Participatory Design actions

In addition, the authors of this paper insert themselves in the "political stream" [13] of Participatory Design, where *empowerment* and *meaningful involvement* for stakeholders in the design of the systems they will use, is as important as the created artifact/system itself (we will come back on this statement in Section 7, discussing the role of Participatory Design in the project). In addition, we take the same posture as Participatory Action Research (see e.g., [14]) taking on us that Participatory Design in an Action Research project is not neutral [15], contrasting with research methods emphasizing disinterested researchers and reproducibility of findings. On the contrary, *we claim that in Participatory Design the action and their interpretation make an action research unique, as the journey to the particular result is unique.*

3 Introducing the project: *SmartArt*, an Action Research project *for* and *with* Visually Impaired People

The primary aim of *SmartArt*[2], the French action research project we will describe in the following pages, is to reduce inequalities by allowing access to art and culture to

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Visually Impaired People (VIP). In addition, the project aims to create an exhibition that could be lived by VIP seamlessly *with* non-visually-impaired people. The aim of the *SmarArt* project was thus to create an *inclusive* exhibition, and not to create an exhibition *for* Visually Impaired people. Having this objective, larger than simply considering accessibility or usability dimensions in designing an exhibit, allows to reflexively examining the questions of social relations and discrimination.

The project consortium was constituted by two VIP associations (SAVS Michel Fandre of Reims, Lire Aussi) two technological Universities (IFTS of Université Reims Champagne - Ardenne, UTT- Université de technologie de Troyes) and one museum (Musée de l'Ardenne) which hosted the exhibition.

3.1 Some specific elements of the context

Even if handicap is an important form of exclusion from culture, it is far from being the only one. Indeed, according to official statistics, 50% of the French population does not have access to cultural practices. Informed observers' opinion is that this number is even higher: 80% do not have access to living arts, nearly 100% never went to the opera [16]. Each year, less than one out of four French citizens pushes the door of museums. Higher socio-professional categories and elder persons are four times more present in exhibition halls than working class and young people.

Most museums have to cope with a decreasing attendance, at best with a stagnation in the number of their visitors. The "everyday" and traditional visit reveals to be less and less attractive, and some museums are trying to adapt. Some attempts have been made to take advantage of digital tools as a development factor [17,18]. Despite mitigated results, sometimes these tools allow a different experience – e.g., in terms of active participation – which otherwise would not have been possible. For example, augmented reality allows access to medieval places and characters in a much vivid manner than a written text. Also, digital tools allow a better artistic education before and after the visit, including the use of pedagogical content online or available on the smartphone [19].

Based on state of the art and art experts' analyses, access to art and culture appears to be neither a technological nor a financial question, but rather a question of social inclusion [44]. This observation was unanimously agreed upon by the participants – the then French Minister of Culture and artists - to the debate "How to reach/touch the culturally excluded[3]?" as part of *Le Monde Festival* [16]. In this scenario, exclusion can take several forms: at a more political level, like geographical imbalance (Paris in particular, and more generally large cities vs the rest of France), prestigious institutions being privileged at the detriment of local culture; or at an individual level, where people do not have the means to be "consumers" of cultural practices, or suffer a kind of "inferiority complex" which prevents them from taking advantage of events even when these are free. Thus, creating an art exhibition that makes sense to everybody does not only mean to allow access to the exhibition to people living with

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[3] « Comment toucher les exclus de la culture ? » The verb « toucher » in French has this polysemic meaning – reaching, touching and stirring emotionally – which is precisely the pun of the title.

disability, but most and above all allowing culture to continue playing its role as a vector of emancipation and creator of social ties.

In this wide scenario of cultural exclusion, disability becomes a specification of a wider social problem, and not a problem *per sé*.

In addition, the state of the art cannot bring much knowledge about Visually Impaired People's experience of art that we can use as a basis. Since the 1970s, research has been published about the visual perception of pictures (e.g., the foundational work of Gibson [20]). However, publications about how Visually Impaired People perceive embossed or engraved images with their hands are very recent [21]. Also, while co-designing museum exhibitions is not uncommon, or that art exhibitions addressing a Visually Impaired public have been experienced several times [22,23], co-designing exhibitions accessible for people with visual impairment is at its preliminary phases [24]. Therefore, unlike for the actual introduction of technologies in real life contexts - whether the design of novel CSCW technologies or the application of specific technologies to specific settings (following Schmidt's distinction) - use cases and knowledge about both the co-design of art exhibitions and the multimodal perception by visually impaired people, are mostly lacking. As a matter of fact, we were not able to find a stabilized set of knowledge to adapt to our particular case. In addition, as the main aim of our project was not only to create an accessible art exhibition, but to reduce inequalities and support social inclusion by allowing access to art and culture, the lack of studies on actual usage in a real context brings us back to the issue of *the when and the what* of Participatory Design that we discussed at the beginning, and which is central to the reflection presented in this paper.

4 On the methods and techniques used in the *SmartArt* project

The question of how to create such an inclusive experience needed thus to be investigated further. One possible solution that emerged out of the observation of required methodologies during our analysis of the state of the art, was co-designing with final users, from a User-centered or a Participatory Design perspective. User-centered design addresses the design process from an "expert perspective", in which trained researchers observe and/or interview users, whose contribution is to perform instructed tasks and/or to give their opinions about product concepts that were generated by others [25]. Even though these users and their needs are at the center of design considerations, users' role as informants is largely passive, and their implication moderate/limited.

The participatory approach, the practice of *collective creativity* in design, has been around for nearly 50 years (research projects on user participation in systems development date back to the 1970s). Participatory design (PD) is thus a cooperative design process, with a focus on enabling different stakeholders with different perspectives and competencies to cooperate [2]. PD is generally united by an ethos of empowerment and *meaningful* involvement for stakeholders in the design of the systems they will use. Indeed, research in PD focuses both on the conditions for user

participation in the design and on the introduction of computer-based systems [13]. This is partly pragmatically determined: it is believed that systems stand more chance of success when those who will use them have been able to have a stake in their development (like User-centered Design), but also partly politically motivated, i.e., in terms of social democracy. Being given our research hypothesis and the specific needs of Visually Impaired People, it was thus kind of natural for us to lean towards a Participatory Design approach in our context.

4.1 Meaningful involvement: researching *with* people using Participatory Design

In terms of empowerment, the common distinction in PD is that participants are not researched *at*, but are researched *for*. Rémy C., who worked on 3D modeling in the *SmartArt* project, and who is himself visually impaired, makes this testimony. He says that, often, when confronted with badly designed exhibitions based on low relief thermography, Visually Impaired People do not dare to give an honest feedback. VIPs explain to him: "*We don't say anything* (i.e. the exhibition is extremely bad), *otherwise, they won't do anything for us again*". What appears important in this verbatim for us is the preposition "for", as the VIPs perceive themselves as the passive recipients of an action. There is thus a risk of non-complete empowerment with the *designing for* attitude.

The authors' systematic posture and aim in *SmartArt* was to avoid this "passive recipient" design attitude and establish the right conditions for mutual trust and collaboration. The objective in succeeding in establishing trust and collaboration was twofold: from a pragmatic perspective, truthful feedback is the condition for good design; from a political perspective, VIP's position would not be "*SmartArt* is doing something *for* us", but rather a position in which VIPs are active actors contributing to a project for the *common good*. This *common good* dimension emerged also from the workshops we held, and appeared by the end as absolutely important to the participants involved[4]. The research "participants" (and by no way research "subjects") [26] have been actively engaged all through the whole process of conducting and finally evaluating the research they participated in.

Therefore, considering that this research is being done *with* the Visually Impaired participants', the way their involvement is considered and categorized is reversed. From being receivers of the final solution, they should become active participants and contributors, or better, *partners* in the project. From being the ones who suffer a deficiency – and are potentially excluded because of their handicap – they are considered as the experts of their disability: they are the most proficient to inform researchers and design about their perception, values, and therefore needs.

This approach to Participatory Design is in line with what Wobbrock and al. call "Ability Based Design" [27]. The idea behind ability-based design consists in focusing on ability - more than *dis*ability - throughout the design process in an effort to create systems that leverage the full range of human potential. The concept of ability-based design, because of its focus on *empowering* what people *can do* and not

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[4] See as a reference the summative video on SmartArt https://youtu.be/LL_HeXTW2xU

focusing on what they are not able to do, can in our opinion be extended beyond the disability aspect to address all non-expert users, creating a very global empowering approach.

Initial considerations on techniques to *design with*

As Martin & al. [28] describe, techniques using socio-technical approaches to design have increasingly become part of the PD repertoire. Tools and techniques for analysis include questionnaires, interviews, establishing long term working relations and, increasingly, ethnographies. Tools focusing on system design such as scenarios, mock-ups, simulations, prototyping, etc. can be used in a complementary way. Their advantage is to avoid the overly abstract representations and more easily and efficiently experiment various design possibilities [29].

However, given the heterogeneous character of PD and the wide range of practical techniques that can be used for enabling active user participation in design [30 as cited by 29] we can ask ourselves: what are the most appropriate techniques to use in our specific setting?

In the *SmartArt* project we are indeed confronted with two main difficulties:

1. There are no actual practices to observe (Visually Impaired People usually do not go to museums, and the social innovation of the project is precisely to reverse that situation) and no well-defined problems; thus a classic longitudinal ethnographical approach will be of scarce utility in this setting, and the same goes for a positivist approach (which variables should we vary?).

2. What the exhibition will enclose is not known beforehand/at the beginning of the project (it could for some part be technological, or not at all) and the aim of the project is to find a way to let the most preferable solution *emerge* empirically, out of the needs analysis led with the involvement of the Visually Impaired participants. Yet the content of the exhibition is limited to the content of the *Musée de l'Ardenne*.

Indeed, when prototyping – which has been used as part of the PD techniques in the project – the orientation is towards the *future*. However, if the focus is solely on imagining the *future ideal* art exhibition, i.e. what participants consider desirable or relevant, many important aspects may be missed out (also because of point 1).

Finally, like for systems design, concerning the design of an art exhibition that makes sense to VIPs and other persons, there is the risk of the "tunnel vision", i.e. designing the perfect (technological) solutions to wrong problems. Therefore, an adequate reflection concerning the methods proved necessary.

Thus, one first research questions we were confronted with in the project was: *how can we let the most appropriate solution in this kind of project emerge?*

4.2 The different actions taken and their value in our research

The mixed methodological approach used, that will be described in the Sections 5 and 6 of this paper comes from a stepwise process defined by the authors of this paper. It mixes classical HCI methods (e.g., the firsts workshops mostly based on acting in a controlled setting and post-interviewing), with more explorative methods (like the guided tour, which takes inspiration from Korn's walkshops [45]). The steps that will be described (from controlled to less controlled and back to controlled in the final

evaluations) were voluntarily temporally chained this way to: 1) quickly bootstrap the research to generate some premises/hypotheses based on an adequate understanding of the needs of VIPs, in order to create adequate prototypes; 2) observe the users in non-controlled settings in order to gain knowledge about their needs in an actual context, and, thus, to be able to understand if we were missing some important element in our hypothesis; 3) check the appropriateness of the final solution with respect to the participants' needs.

Thus, the qualitative orientation to research we adopted aimed at gaining an in-depth understanding of the "constitutive practices of how people do what they do, the 'interactional what' of their activities" [31] as well as their values and emotional feedbacks. The workshops we held in more controlled settings allowed us to test hypotheses and design solutions. Even if, we will see it by the end of this part, the ethnographical approach permeated all the actions we took.

While in the previous paragraphs we explained the planned steps in a neutral way, they were actually the result of several discussions the two authors of this paper had during the project. As a matter of fact, we had to compose our will to create societal change (which demands a political active stance), with the *publish or perish* imperative (which demands neutrality and reproducibility of the experiments), with the different methods and disciplines the two authors comes from (ethnomethodology being more qualitative than quantitative for example), and finally with the imperative of finishing the project within two years. Just as an example, an ethnographical approach as bootstrapper would not have been relevant in this case for several reasons. As said 1) there are no current practices to observe, 2) express hypothesis only from observations would have demanded a longer observation period than the one of the project. Still, observing everyday practices, as we will see, was very important in our stance, so we needed a seamless way to integrate this kind of practice within the other methods. That is to say that, even if we can assert that the spurious steps we used could be generalized for usage in this kind of project, their relevance is strictly linked to the particular context we addressed, the researchers who conducted it (in terms of disciplinary background, personal preferences, personality, and how this interaction between the two authors led to these specific discussions and choice of issues to be addressed), the participants who were involved (i.e., the specific persons participating), the stakeholders of the project (consortium partners), the paintings available at the *Musée de l'Ardenne*, and so on. Therefore, considering all these parameters, the design we arrived up with and the type of research led is situated and context-specific. Let us dare this comparison, that, finally, the SmartArt project - both the result and the journey/process - is more like a unique piece of art, than a research protocol that could be replicable to another research process.

It is also relevant to explain at this point, that while several studies addressed the adaptation of existing visually based techniques for PD with Visually Impaired people (see e.g., [32, 33]) we had no need for such an adaptive approach. We assume that one of the reasons we did not feel the need to adapt existing techniques was the usage of the ability-based point of view, which pushed us to naturally select techniques able to give value to what people could do, i.e., their *abilities* - that is share their experience, explain their point of view, provide feedback, as any social actor, in and through interaction – and not bringing them back to a non-visually-impaired reference frame, i.e. their *dis-abilities*.

This empowering ability-based frame is, in our opinion, well-illustrated by the settings used during our research. Several actions we engaged were held at the visually impaired participants' association, in the common room. Therefore, the participants were in the usual environment where they usually meet: the actions were sometimes "interrupted" by the ongoing activities, coffee was served as usual, participants sat around the table at their favorite places.

While these action could have been held in a more controlled setting, we decided that this actual setting had a double value: it eased the interactions (while in a lab setting the participants are in a…lab setting/*space*, the association is their *place* i.e. a space that has a meaning [47]), and allowed us to collect information we could not be able to collect in a totally controlled setting. In addition, VIPs knew how to go around in the common room without help, and we could thus create a non-assistive environment. Observing the ordinary activities – like having coffee or lunch, walking in the street – allowed us to learn a lot about how the participants valued autonomy/doing oneself, what is the very subtle frontier between help and assistance, and how this is managed *in* and *through* interaction.

4.3 The mixed status of the collected data

Researchers working on social interaction, i.e., with an interest in analyzing language itself at different degrees, have discussed the differences between researcher-generated and naturally occurring data, and the distinction of focus between naturally occurring data to naturally organized ordinary activities [36]. Ethnography including a strong dimension of participant observation, the definition of "natural setting" cited above can be very fluctuant. The data and insights produced cannot be considered as only "researcher-generated". On the other side, since a workshop, even in a natural setting, is occasioned (people are invited) and organized following a research agenda (touching different materials and fabrics, experiencing audio description and sounds, going around a museum), the data are not "naturally occurring" either.

Therefore, a description of our PD approach during this "needs analysis" stage would be: **all the situations are occasioned**, i.e. organized by the researchers and somehow driven. Participants are invited to experience 'something', following a research theme - be it emotions, personas position of a painting on a sheet of paper, the touch of different fabrics etc. - *in* and *through* social interaction with the researchers and other participants. All participants contributing actively to the situation, which is loosely driven by the researchers but not 'provoked', **the situation that emerges is not *researcher*-generated,** but rather an ordinary activity that is naturally organized [36]. Based on observations of how people ordinarily and naturally interact with each other, understanding was gained, both about the workshop theme being examined, and, perhaps more importantly, about how the participants actually interact – what are the values that lie at the basis of these moments shared together; how social ties are produced. These observations mixed with the workshops produced thus valuable insights about the hypothesis of social inclusion that was both examined and aimed at.

4.4 Some specific information

The participants to the workshops were selected within the SAVS Michel Fandre association. They participated on a voluntary basis, and: had different impairments (e.g., tubular vision, blindness, degenerative disease), were in different age ranges (varying from 20 to 70), and there were about the same number of men and women. 10 VIPs gave their informed consent to participate in the project. To them, we added 4 of the SAVS collaborators because of their supporting role and their specific knowledge of visual impairment. Their presence was precious in observing actual practices (for example peer structuring).

Hereafter, Table 1 one summarizes the VIPs participants' contributions in the different workshops of the project.

Table 1. Participants, their characteristics and their participation in the different phases of the project

Part.	Age range	Type of impairment	Gender	Wks1 (emot.)	Wks2 (mater.)	Tour1 (city)	Tour2 (museum)	Mock exhibition
ML	60 - 70	Visually impaired following glaucoma at 48. Blind left eye, tubular view with right eye	Female	x	x	x	x	x
MM	60 - 70	Degenerative retinal disease. Blind right eye, slight perception of light and movement with left eye	Male	x	x	x	x	x
FS	50 - 60	Visually impaired from birth, losing sight with age	Male	x	x	x	x	x
MN	60 - 70	Visually impaired as a consequence of lupus. Close perception	Female	x	x	x	x	x
YL	60 - 70	Visually impaired following glaucoma. Blind left eye, visually impaired right eye. Perceives shadows and silhouettes, and main colours at short distance	Male		x	x	x	x
JF	60 - 70	Dystrophy of the cornea: cataract-like symptoms, sensitive to light	Male	x	x	x	x	x
FD	50 - 60	Blind. Lost sight in a car accident at 27	Male		x			x
VL	40 - 50	Visually impaired from birth	Female	x	x			
J-MH	60 - 70	Macular degeneration. Colour and form perception at short distance	Male		x			
AT	20 - 30	Visually impaired from birth (premature baby), who became blind	Male	x	x	x	x	x

5 The actual actions taken during the first phase of the *SmartArt* project

The actions we will be accounting for in this Section 5 constitute a whole with the actions described in Section 6. We use as separation point (more for the sake of reading that as an intellectual statement) the actual prototype, the reification of the observations made in the first part of the project.

5.1 Focus group on emotions

The very first action we held during the project was a focus group about emotions, *following the hypothesis that one key element in the relationship with art, independently from eyesight capabilities, is the emotional resonance of the piece of art with the self* (see e.g., [34]). Furthermore, Nathalie Heinich, in her book on art and sociology [35], asserts that it is necessary to explore, not what art is, but what it represents for the actors involved. As we were planning to create an inclusive exhibition, being able to define this emotional resonance in our particular context appeared as very important. In the focus group, all participants were invited to share personal experiences, views and souvenirs.

In order to understand in which way emotions should be taken into account in the creation of the art exhibition, the focus group was organized in three parts.

A series of specific questions was proposed to the participants in the first part of the focus group. The questions asked were mostly related to memories, and in particular to "pleasant" (and unpleasant) personal emotions. In the second part, we investigated emotions linked with being "together". Finally, we examined emotions linked to the act of creating something. The aim of this first action was to see under which situations emotions were generated. We did not limit thus the investigation area to art or to a specific type of emotion: which were the emotions they wanted to describe and in which context they emerged was left free to everyone.

From this focus group, different elements emerged as being commonly shared between the participants, in particular linked to the sources of emotions. In the first place, the relationship with nature appeared as noticeable: the noises, the smells and the substances connected with it, the seasonal changes. Secondly, the need for human contact emerged as an enabler to share pleasant moments. These two points, participants explained, allow the appeasement and the search for well-being.

Finally, a real need for autonomy has been described during creation and exploration, with the necessity of movements for a liberating purpose. It is a necessity and a great pride for visually impaired people to show that they are capable of achieving concrete things.

5.2 Workshop with and on materials

The aim of this second workshop was to explore which materials were the most adapted to reify different descriptive and emotional elements in the exhibition (see

Figure 1). As for our methodological protocol, following [46] in our workshops, we tried to differentiate a maximum interaction and materiality.

To allow for a primitive form of touch-based interaction, a paper representation of two paintings (an interior scene and an outdoor scene) was realized using different layers and different types of papers (Figure 2). This rudimental representation allowed the participants to realize the location of the main characters of the artworks and to give a meaning to the scene (as creating a global representation of a scene is of particular importance for VIP) [21].

Fig. 1 a&b. Participants exploring different materials

Fig. 2. A participant exploring a paper representation silhouette

Interestingly, in this workshop, participants' attention was more focused on the authenticity of the fabrics than on its symbolic representativeness. The question arose thus as to whether this search for identification (and thus the focus on the particular) may or may not lead to difficulties in the recognition of whole image during the final exhibition.

5.3 Guided tours

Among the innumerable actions attributable to art works is the fact that they *move* the actors, from the emotion they prove, to the strolling they perform in the museum [35]. Apart from the above-described classical structured workshops (even if, as we said, our approach mixed observation of current behaviors with structured observations of the workshops themselves), we thus decided to hold some real-life-based experience to better understand how the VIPs acted in an actual setting.

For this particular observation, we invited the members of the association participating in this research to a guided tour in the authors' town: the old medieval town followed by a tools museum (which let visitors explore some tools by touch). The group was composed of 7 visually impaired participants, 4 personnels of the association, 2 members of the research team. The research objective was to gain insight about how visually impaired people walk and move around as a group, what kind of cooperation is achieved with sighted people, how the verbal explanations of the guide are perceived, what aspects are considered interesting (e.g., architectural description, historical context, the actual objects, etc.).

Previous ethnographic studies in museums, based on the observation of visitors' actual practices, revealed the significance of co-participation and collaboration in the museum experience. Indeed, museum visiting is a collaborative process: couples and family groups interact around exhibitions; they discuss artifacts with museum guides and other visitors [22, 23]. The ways in which people navigate in galleries, discover exhibitions, and draw conclusions, arise *in* and *through* social interaction.

Interestingly, we observed the same phenomenon during the guided tour. Moreover, we could observe how the binomials sighted-blind worked (there were 3, while the other visually impaired persons walked autonomously with or without white cane): the sighted person described pragmatically what she was currently seeing, while the guide's explanations were more on the historical or artistic context. This complementarity, the participants explained in a post visit discussion group, was much appreciated. The other important insight derived from this guided tour, was that blind people could not create a mental image of the tool inside the museum by the verbal description only. Touching the object proved to be necessary.

5.4. Re-Contextualizing discoveries for the Art Exhibition

In order to re-contextualize the findings from the workshops, we held an additional guided tour at the *Musée de l'Ardenne* (Figure 3), the museum in which the exhibition took place at the end of the project. The group was composed of 7 visually impaired

participants, 3 personnels of the association, 2 members of the research team. Table 3 details the VIP participants and their characteristics.

The experience in the exploration of the museum has shown findings similar to the exploration of the city, the main ones being: the role of narration of museum mediator was important; the participants aggregated themselves in pairs or groups. The *guided* tour allowed participants, as they explained, to obtain details they would not have paid attention to during a free visit.

Fig. 3. The participants following a guided tour in the museum

Following the group visit (the next day), a workshop was conducted with the same persons to collect the participants' feedback about the visit. In particular, the quality of the performance of the museum mediator was appreciated: participants' feedback focused on her involvement and her ability to convey her *passion* in her explanations. The workshop also allowed to choose the artworks to be augmented as part of the exhibition, as well as to reflect collectively, in a relevant way, on the works discovered.

5.5. Emerged elements and suggestions for design

Beyond the physical and material aspects of design recommendations (which are in line with accessibility guidelines for art exhibitions), the knowledge generated during the different observations and workshops allowed the identification of general aspects to take into account during the creation of an inclusive exhibition, aspects that are detailed hereafter.

Values
One interesting result of our analysis of the above described actions has been the identification of *values* to be taken into account when designing that art exhibition. The essential values that emerge from the workshops could be summarized in two points, which may seem apparently contradictory: *autonomy* and *exchanges*.
Indeed, visually impaired people have strongly expressed the need for autonomy - to

achieve things by themselves, individually, while at the same time being in a friendly group. For example, participants described experiences of help and exchange with non-VIPs, e.g. to design a cardboard table, or playing golf, underlining the fact that they were able to achieve the activity by themselves. With regard to museum visits and the presentation of the paintings, one of the recurring sentences was: "*I do not want the painting to be interpreted in my stead*". Also, during the guided tours and the interviews that followed, the importance of discovering by oneself, to make one's own mental image of the artwork came out very strongly.

As a result, the insight gained from this research is that: an *empowering exhibition* should be designed in such a way as to promote this autonomy. Indeed, the visually impaired persons should have the time and the opportunity to discover by themselves at their own pace, but should also be able to exchange with both the art mediator and other visitors.

Constituting mixed groups of sighted / visually impaired - so as not to marginalize the visually impaired, would allow the much sought exchanges and in particularly exchanges concerning the artworks. Also, providing adapted rest areas - which should be designed mainly as spaces for exchanges and sharing, and not only as rest spaces - can help discussion around / about the artworks (this latter aspect is usually used also in preparing exhibition paths for classical visitors).

The desire to *discover* emerged very strongly from the observations made: to discover new things, to meet new people. This discovery should be autonomous-individual, and progressive. The authors observed the pleasure and the concentration of a participant who discovered by touching a 3D molding of a monkey's head and, trying to identify what it was, interrupting another participant who wanted to help him: *"no, no, do not tell me"*. The space design and the organization of the visit should thus facilitate discovery of the artwork, not only by allowing the adequate space for exploring the artwork, but also e.g., limiting the size of the group and allowing the visitor to get out of a guided tour if he finally wants to make his discovery alone.

Between aural- and touch-based discovery

Another essential insight that emerged out of our analysis is the importance of a multisensory approach to the exhibition discovery.

VIPs' feedbacks about their practices of audiobooks, the importance of description when discovering tactile books, the interest in the guide's comments during the two guided tours etc., demonstrate that an audio description is absolutely essential. When asked about the possibility to choose between an audio guide and the live commentary of a mediator, the preference went to the live mediation during a guided tour. Indeed, the mediation at the *Musée de l'Ardenne* was perceived as "alive", allowing to "see the characters in front of us", transmitting the guide's passion, and thus allowing a global understanding of the paintings.

On the other hand, a tactile exploration to understand the content appeared as unavoidable. The touch is, indeed, the modality that proved to be the most effective to apprehend the external environment. Also, the increasing number of studies about molding techniques and in 3D modeling allows a relatively high level of detail. This proved to be fundamental in VIP participants' search for autonomy. However, using only a touch based approach promises to be insufficient to convey the experience of

the artwork. Indeed, as explained above, the audio description appeared as essential, because of its ability to convey emotions. According to the tests we conducted, touching alone does not provoke any particular emotions: at least not as much as audio descriptions and sounds. In fact, it appears that it is the fact of being able to identify what the molding represents that provokes satisfaction and joy, and not the touch in itself. It is therefore a secondary type of emotion, linked in a more intellectual way to the discovery of the work rather than to the work itself. At the evaluation stage of the exhibition prototype, a participant explains how her binomial had helped her in the first guided tour in giving a lot of verbal details, but when she explored the artwork with her hands by touching the 3D molding: "the details, we have them there. It's more precious."

At the end of these observations, two research hypotheses emerged as relevant to be validated:

a)   A multi-sensory environment is useful for a better understanding of a painting by visually impaired people,

and

b) This kind of approach is generator of social exchanges based on emotional and not rational aspects.

6   The actual Artifacts and the Exhibition

The above-described workshops and tours allowed us to create a set of recommendations that were used not only to implement sensory augmented versions of the paintings, but also to design the whole exhibition experience. For example, discussions with the participants during the workshops helped to define very practical elements, such as the augmented paintings' inclinations for tactile exploration (information which is normally not available in already existing guides for creating exhibitions for VIP, as for the particularity of our artifacts).

The workshops gave us also the information about which medium to use to convey which information: in the final exhibition, the original masterpieces have been sided with written comments, audio comments, and a 3D reproduction of the painting. Each visitor was let free to choose their own favorite way to explore the masterpiece. One of the aims is for different visitors (visually impaired or not) to be able to exchange on their experiences and different points of view; using different sensory channels can thus act as a creator of a variation of points of view on the same content. The set of media used becomes thus not only useful as a discovery moment, but also as a sharing moment, as each participant can explore the art piece through a different combination of sensory channels, and thus discuss about the different engendered sensations.

The idea behind this global multi-sensory approach was one of the results of the workshops' observations. The sense of touch, when used in an exploratory setting (like the one of a painting reproduction, or a map exploration) appeals to the cognitive, rational part (the user tries first of all to make sense of what (s)he is touching, not to feel it, which prevents an emotional response to the exploration). The modular approach (as the user can choose whatever combination of sensory channels

he likes) to sensory exploration of a masterpiece, in some way, has the potential to bypass the cognitive overload problem.

Another aspect that emerged from the workshops is the need for autonomy of the visually impaired people (I want to explore *with* others, but I don't want the others to explore *for* me). The idea of modular approach was thus applied also to the global exhibition, as there is no pre-constructed path to follow: the visitors can move around as they want, thus constructing their own path through the exhibition. For the same reason, there is not a global audio guide, but mp3 readers that will be linked to each masterpiece reproduction.

6.1 The Actual Artifacts

The fabrication process (conducted by another consortium's partner, IFTS) of the 3D object mixed additive manufacturing (3D printing) with machine based carving. The main idea was to avoid to give the visitors a simple high relief of the painting (as done in other exhibition targeting visual impairment), accepting that whatever reproduction is a "translation"[5] [37], thus an interpretation of the original painting. The current "translation" reproduce the way an art expert is interpreting a painting, and was defined with the help of the *Musée de l'Ardenne* director: focusing on having a background layer, a central layer, and a front layer. These layers can potentially be read in an independent way, but most importantly they came together to form a unique spatial combination (versus a flat low-relief reproduction). A 3D (in the space sense, not the printing technique) exploration of the so-reproduced painting could thus be useful in order to create a mental cognitive representation of the painting.

Fig. 4. La teilleuse de chanvre, Eugène Damas

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[5] We use here the term translation as defined by Bruno Latour, that is: a process of arranging heterogeneous interests into a new order, thereby creating something new (as described in *Pandora's Hope* [37] *Chapter 2: Sampling the Soil in the Amazon Forest*).

In figure 4 we can see one example of this approach. "*La teilleuse de Chanvre*" (the hemp cutter) is a piece of a local painter from Ardenne region, Eugène Damas. From the point of view of a perspective analysis of the painting, we can see that we have clearly 3 layers. One first background layer is the part with the wooden walls. The second one is the one in which the cutter lady is sitting. And finally to the front we have the woman's feet with the small pieces of hemp and some type of vase. To contextualize the painting, the painter wanted to show the difficulties of this work, which can be seen in the tired expression of the woman.

One particularly interesting element from the pictorial point of view is the way the hemp is rendered (see Figure 5). As we can see, it is a matter of highlighted brush strokes to give thickness to the hemp stack.

Fig. 5. The hemp detail in the painting

The reproduction of this painting (see Figure 6) has been carried out by carving the background and 3D printing the woman and the front details.

Fig. 6. The 3D version of the painting.

Two particularly interesting details are the hemp pile that is in the hand of the woman (Figure 7 left) and the leftovers that are on her feet (Figure 7 right).

Fig. 7. Two particulars of the 3D printing

They way these two elements were rendered (a very spiky rendering), was meant to reproduce the non-pleasurableness of the activity. The rendering wanted thus to give an unpleasant feeling at the touch.

Still, as explained earlier, the 3D exploration as a cognitive one, is not able *per sé* to create an emotional response. This is the role of the narration (in the form of audio or textual narration) that will help to "give a soul" to the masterpiece.

The audio comment was thus constructed in the following way:

1) A first musical moment gives some time to explore (visually or in a tactile way) the painting. The choice of music pieces has been done with a musicologist teaching at the Ardenne music conservatory, and who is also used to teach braille for music. This first moment with only emotional and no cognitive content proved important, in particular for the Visually Impaired People who much appreciated it, as they have to create a mental image of the paintings using only their hands. This kind of appropriation implies a first global tactile exploration of the object to interpret, and a second moment when the VIP returns to the object to explore the details. For this reason, the mental effort at this moment is very high. To summarize, this audio part has been designed so that each visitor, at his own rhythm, will have the time to enter in the painting atmosphere.

2) The second part of the audio guide is a more rational description of the painting, ranging from what the painting is representing, to some contextualizing information on the painter's period.

6.2 Testing the Translations with VIPs in a semi-controlled setting

Before holding the final exhibition at the *Musée de l'Ardenne* (from June to September 2018), we went through a final workshop with Visually Impaired People. This final workshop was a mock exhibition, i.e., an exhibition that is in everything

similar to the final one, but was opened only for the participants to the project. We used this mock exhibition to discuss with the participants – within context and in a situated way – the *feelings* linked to the different sensory channels, as well as the global approach.

In this setting we wanted to observe if the research hypotheses which emerged from our first set of observations:

a)   A multi-sensory environment is useful for a better understanding of a painting by visually impaired people,

and

b) This kind of approach is generator of social exchanges based on emotional and not rational aspects.

could be pre-validated.

For the research question a), the complementarity of touch and audio commentary appears very strongly. However, the exploration phase of the 3D printed paintings got very different results if the person exploring it was blind from birth, or has become blind in older age, as the mental charge for the blind from birth person was higher. This result is compliant with what is already known in research [21]. Thus, having at the same time music and touch was very much appreciated by visually impaired but not by the blind persons. Figure 8 shows the exploration of one of the paintings in which this overloading happened, a Sisley's reproduction. In this particular case in addition, the blind person exploring the painting asked for additional information (other than the music and the prepared commentary), as even with the audio explanation, it was not possible for him to create a mental image of the painting. This preliminary result reinforces the need to leave everybody free to use whatever sensory channel they want in whatever moment they want.

For the research question b), when let free to explore the exhibition, the participants normally created pairs (visually impaired/blind; non-visually impaired/visually impaired; visually impaired/guide) or groups. We could thus observe the same behavior we observed during the different guided tours. This strategy was mostly used for a rational/cognitive understanding of the painting. It was thus possible to confirm the intermediate hypothesis of the collaboration between sighted and visually impaired, and the importance given by participants to these exchanges, both in terms of allowing to understand a painting, and as exchange trigger.

Fig. 8. A visually impaired person exploring the Sisley reproduction in the pre-exhibition

One of the participants talked explicitly about the emotional dimension: "*When we touch we have the impression ... not to touch a painting, but we touch, we live almost, because there are details. P. (non-visually impaired person with whom she formed a pair) described me in detail the painting, but here, the details, we have them! (...) So it's more precious. Finally, it's my feeling, huh. My feeling is I'm better living art because art, art it was like that, huh.* ".

Finally, we can observe the importance of these exchanges in naturally-organized situations, which are closer to real-life interactions than experimental: once the formal mock exhibition was finished (and thus the "serious" part, where they knew their feedback was valued, was finished), the visually impaired people started discussing about the expression on the face of a Rimbaud portrait made by Picasso. They were joking about where he was looking: "*I'm telling you he was looking over my shoulder*", "*No, I'm telling you he had strabismus!*", therefore generating the kind of conversation that ordinary visitors would have over a painting (which evidently was found fun, more than engaging, but this is not strange for a Picasso…). This kind of observation reinforce us in both, the idea that formal workshops only allow for a partial understanding of "results" of a research project, and the idea that the created exhibition has *in nuce* (at its core) the potential to create emotional (as fun and joy are particular emotions) sharing around the paintings.

6.3 The final exhibition

The last step of the project was the final exhibition which took place at the *Musée de l'Ardenne*. Figure 9 shows one example of painting in its actual context during the exhibition.

Fig. 9. The final configuration of *La teilleuse de chanvre* during the exhibition

For this final step, we conducted observations during the exhibition inauguration. The inauguration was structured by the *Musée de l'Ardenne* as any other

inauguration: with a formal speech, free entrance, and a buffet in a rear room. As other art exhibition inauguration it had thus 1) a role of political affirmation of the exhibition (through the presence of the press, the town mayor, and other political figures), 2) a role as "peak event" for the project (through the presence of all the members of the consortium), and 3) a role of dissemination as the general population and the members of other VIPs associations were present (the exhibition was widely advertised). Thus, it is not possible to give an exact number of the participants (a number in between 50 and 100, which, as in all the exhibitions, came and went), nor the particular disabilities the VIPs were subjected to.

The observations of the social and political dynamics of this inauguration could be the subject of a standalone paper (discussing for example the conflict/tension between the public validation of the results and the actual exploration of the exhibition). For this paper we will here only describe some elements that emerged from the observations during the exhibition and interviews we conducted during a debriefing workshop held a month later with the members of the VIPs association, and that reinforce our preliminary observations.

The exploration of the works has shown the same results as for the mock exhibition (e.g., with configurations of different kinds of binomials) with an autonomous solitary exploration of the multisensory elements and a following discussion with peers on the paintings. The high number of people, however, did not allow for an easy traveling between the works for the Visually Impaired People, who were obliged to ask for help. The negative impact of this kind of event was underlined during the following interviews, reinforcing our idea of the importance of *autonomy* for this kind of exploration.

Some observations on emotions can be made on the actual interaction with the paintings. One of the painting in the exhibition is the depiction of a black-smith intensely working in a forge. The painter - Simon Cocu, a local painter in his '90ies- visited the exhibition and interacted with the visitors.

Remembering the emotion she felt when discovering the painting, one of the VIPs who participated in the project explains: "*For the painting of the forge, there was a gentleman* (another VIP participant) *with us who explained that he knew the forges. He was talking[…], and we were in the forge. We were not hot, but it was almost that eh. It's extraordinary*". Another participant continues: "*We were privileged, because there was an exchange. In general, in museums, there is an audio guide, we listen to the comment, but it is rare that we have the opportunity to exchange.*" These feedbacks show the importance that participants give to human exchanges, and the role of these exchanges in the way of living art emotionally.

Finally, some interesting observations can be made on the moments after the current exploration of the works. The visitors (thus not only the VIPs participating in the project) went to grab a bite and then stopped in the garden dividing the exhibition room from the refreshment room. In this open space, they stopped discussing with people they knew about the paintings, about mundane things like family and work, and about…the fact that there was no place to sit down and rest, thus confirming the importance of third places (like the garden) in this kind of gathering to facilitate social exchanges.

7 The *when* and the *what* in the SmartArt Project

As a Participatory Action Research project, *SmartArt* involved a continuous reflection on the on-going experience. In our stance, a design action must consider the specific impact the designed artifact is likely to have on people in their environment. Design is thus an effect-oriented action. We must consequently consider how and to what extent the actions and emotions of the users will be influenced and how and in what ways the world will be changed by the design action. Indeed, the artifact does not simply "appear" but is the outcome of a complex and socially situated development and design process (see [38] for an in depth analysis on this subject).

Designing, thus, it is not simply thinking about means-ends relations but involves a complex prospective deliberation [39]. This is what we referred to at the beginning of the paper, discussing the difference between relating the science being made in situ, i.e. "science in action", versus relating the already-made science. While in a scientific paper we are "obliged" to rub out all the indecisions we had, all the conflicts, and so on, still we can underline in a reflective stance the approach a researcher should use. Insisting on the *results* and *reproducibility* of a scientific investigation in an action research project, in fact, excludes from the picture the uniqueness of the research journey that brought to these results and creates a fake expectance on the reusability of the results.

7.1 The importance of a researcher's reflective stance for an Action Research project

Some general consideration can be made on the collected/created data used to validate our hypothesis. The insights which emerge from workshop and interviews are sometimes coherent with what emerges from observations, and sometimes not. Since the objective of these insights was to inform the design of the art exhibition, we used the delta between these different findings as a tension, a matter of discussion which led us to the choice of the next methodological step. We integrated a reflection-based approach (e.g., iteratively doing interviews before and after specific activities, like we did for the guided tour, to elicit reflection from the participants on their own action) with a task-oriented approach (as for the mock exhibition which was aimed at evaluating the final exhibition), not only for the users but also for our work, both in a pragmatic objective of design, and a reflective research objective. We consequently played with the importance of the two level (general vs specific) workshops, interviews and activities in the specification of the research object. This kind of mixed approach revealed the particular interest for this Participatory Action Research project, as the continuous tension between methods generated new knowledge and new issues. This tension/readjustment is particularly important since, as researchers, we did not just bring interviewing skills, prototyping skills, etc., but also our background knowledge and literature on theories about social interactions, physical interactions, and so on, constricting the horizon of possible design choices. At the same time, this tension helped in constructing patterns and factors that guided and/or inspired the described co-design (as seen in [40]).

7.1.1 Some general considerations on the used methods and techniques

By being involved and interacting in VIPs' everyday situations through our mixed methodological framework, it was possible for the authors to see the correlation between what the participants *say* and what the participants *do*. They declare that they value human contact, and in all their way of being with each other – from the moment they arrive and say 'hi', the way they share coffee and croissants, share jokes, interact with the workers of the association etc., - this human contact can be seen as being *lived into being.*

Also, in terms of examining values, it is possible to understand the very subtle frontier between help and assistance only by being involved in the everyday situations: in what circumstances VIPs accept help for mobility, how they refuse help to cut their food though they appreciate the proposal and caring, but accept verbal explanations so that they manage by themselves etc. How help is achieved in a very subtle way is always renegotiated in the situation itself, in and through interaction.

Also, since one of our research question and hypothesis is about social inclusion, it is interesting to look into the detail of situations, where the participants declare and can be seen as feeling integrated, considered simply as ordinary human persons and not as persons having a deficiency. How this is achieved, in practice, can only be examined in the details of how people talk to each other, greet each other, pass the cup of coffee, give directions and propose help, etc.,

What therefore is available for analysis is interactionally complex and rich. If design were to base itself on a simplistic "modeling" of actions, or declaratives, it could just result in inadequate design of what is *needed* in terms of interaction with the art mediator, interaction with the work of art, or interaction with other visitors in a museum. Understanding and taking into account this complexity has driven the way about how the art exhibition design has been informed, both in terms of general design or other sensory augmentations, be it 3D modeling or audio.

7.2 The importance of a researcher's reflective stance for empowering users

Linked to the pragmatic perspective of "appropriate design" – based on correctly understanding needs, perceptions and values – the political dimension of mobilizing PD as a means of 'empowering' visually impaired people, as active actors of research and decision makers of an art exhibition, is also reflected upon.

The place of participation in research is for us of special interest: making possible the participation of VIPs in places where they would not have come if not for the research project opens to a rich and dense experience, experience that is important, in terms of social participation. In order to create this experience, what is needed is not only an adequate understanding of VIP's physical and psychological needs (in terms of perception, types of information, interactions), but also being able to give the participants the feeling that they are actively contributing to the creation of the exhibition. It is therefore in terms of active contribution that the pragmatic dimension - which, in short, consists in "designing a good exhibition" - joins the second dimension, which is political.

During the project, participants explained how they were surprised by the methodology. They were expecting to simply choose the artworks to be made accessible and not to participate in the whole reflection to design the exhibition experience. As sometimes happens, it was difficult for many of them to believe that they are creative and part of a creative experience [25]. Throughout the project, however, participants felt invested in the participatory approach, which gave them an impression of contributing and helping in creating something. Participants of the project felt strongly their role in helping designing an experience 'for others'.

7.3 The *when* and the *what* in the SmartArt Project

In the final part of this section, we would like to go back to the question we asked ourselves at the beginning of this paper: what is *the when and the what* of this project? (i.e., what are the results that allow us to assert that this project is "successful"?)

The first *when and what* of this project is **our personal journey as researchers** through this project, which helped us to elicit several elements which could have stayed non-expressed. That is also to say that, apart from the specific used methods, one result of this research is the awareness of this tension between researchers (as human beings with a vision, values, knowledge, and so on) and research frames *that cannot be excluded from the account of a research project.*

We have in addition two other *when and what* linked with the Participatory Design approach. By the end of the project **the VIP participants felt** they were actual partners of the project, **contributing to the creation of the experience** of the final exhibition. In the words of one of the participants *"Seeing what it (the project) was I wanted to continue. I'm also happy to have met people. It's important that everyone gets along well and that's why I would be willing to continue on another project."* It's worth noting here that, on the one hand, we have the value given to the social exchanges during the project, and on the other the will to engage again in something (as their first experience with a participatory project was successful). The sense of empowerment here is thus linked to the ability of doing something for *the common good.*

On the other hand, it is important to avoid a strict separation between *the what and the when* for us as researchers and the VIPs as partners. An important pillar of PD is the facilitation of **mutual learning**. As Roberston & Simonson [41] put it, during a Participatory Design process all participants increase their knowledge and understandings. In particular, a *shared understanding* of the problem space and discuss potential solutions in ways that everybody understands [2].

And finally, for sure, one result of the SmartArt project is **the final exhibition and the artifacts it contains,** which reassured us on the relevance for the actors of the global experience. As a matter of fact, this exhibition will be able to travel all over France in the next months.

8 CONCLUSIONS

As explained at the beginning of this work, two dimensions coexisted in the Participatory Approach adopted in the *SmartArt* project: a political dimension - in terms of social democracy - and a pragmatic dimension - based on the belief that the systems built, or whatever is designed, will be more effective and better adopted when the people who use them were able to participate in their development.

From a pragmatic point of view, *SmartArt*'s goal in designing an art exhibition "adapted for visually impaired people" was to create something that *makes sense* for them. Enabling the inclusion of impaired people in participatory design projects is a research question that challenges the democratic stance of this field of research as well as the way of doing research and design. This involves not only to adapt the used techniques but also to highlight the work the researchers have conducted in order to adapt their own settings (research lab, town streets,…) and *their ways of acting*.

At stake here is the fundamental question about the tension between action and research, as the scientific field - like other fields - is a field of force endowed with a structure, and also a field of struggle to preserve or transform this field of force [3]. Apart from the pragmatic dimension of succeeding "appropriate design", the reason why – the authors believe – this PD research created interesting impacts on *the when and the what* is that, whatever the forms taken by this research, the authors were basically and mainly *human persons* interacting in "ordinary" social situations. By being involved and interacting in everyday situations, it was possible to analyze and understand what the participants' practices and values were. These important insights emerged empirically throughout the research, complementing the research questions that were examined (what is valued about art, how do emotions emerge, how different profiles – in terms of visual deficiency, personality, previous experience with art – perceive different modalities, what paintings touch them most? And so on.)

Nonetheless, if the Participatory Action Research experience was merely an intersubjective one, with no scientific validity, it would be easy to confine the results of this project on the emotions experienced by the authors and the other participants. If the action was merely scientific, that would be no problem in *validating* the results. But an Action Research Project is torn between a desire to "save the world" and a desire to create new knowledge. The real open question here is thus, how to widely apply the reflexivity non *ex post* on the results, but *a priori* on the modus operandi, to make operational the tension between these two aspects.

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