Diverse Ecologies – Interdisciplinary Development for Cultural Education

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Abstract. We present a case study outlining development efforts towards an interface ecology to be deployed in museums. We argue that the problem at hand calls for a highly interdisciplinary design process. Furthermore, system design in the domain of cultural education poses a unique set of challenges. At the same time few existing design methodologies are suitable for addressing this special environment of system design. We outline a set of tentative methodological elements aimed at informing adequate interdisciplinary development processes. The discussion is embedded into a critique of existing methodologies while being orientated towards inviting critique itself. The guiding insight steering our methodological developments is that fundamental differences between project participants and other stakeholders should be construed as assets. Rather than trying to integrate them or covering them up, the dynamic friction between differing viewpoints can be rendered productive by means of poietic practices.

Keywords: interdisciplinarity, museum informatics, design for cultural experience.

1 Introduction

Devices geared towards product development aim at producing artefacts amenable to concepts such as efficiency, effectiveness and usability. Cultural contexts usually require a different development perspective. Most interfaces constructed for exhibition spaces do not aim at enabling the user to fulfil specific and predetermined tasks as quickly as possible, but offer the possibility to explore and experience the exhibited artefacts or the narratives connected to them. They have to enrich visitor experience and at the same time need to refer to the context they are placed in. Therefore, the actual situation of deployment and use gains enormous importance. It consequently needs to be accounted for within the design process at an early stage. What is to be observed on the contrary is that technological developments for museums are often decontextualised during the process of design. They are frequently outsourced to

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external production companies, while cooperation between these companies and the museums during the design process remains rudimentary. This leads to the fact, that the highly deployment specific actual contexts of use for these technologies often are neglected. Consequently, many of the developed technologies are not well received by their end users, the museum visitors. In order to overcome the mentioned problems, we state the necessity of realigning technological systems with the cultural contexts they are to be operated in.

2 Project Context

The project described here is tasked with developing interactive installations and mobile applications for the domain of cultural education within museums. It is situated within a collective of researchers with diverse backgrounds. These range from informatics and engineering over psychology and sociology to philosophy, rhetoric, and literary studies. Installations are developed in close collaboration with a local museum of industry, while collaborations with other museums exist as well. Among the installations developed are tangible user interfaces, mobile applications and multitouch tables. The design processes are informed by an exploratory pre-study and a concurrent ethnography. Some of the results of the pre-study and their implications for design will be outlined in the following.

Concerning new media and interfaces in museums and exhibitions the discursive focus often lies on learning [1]. What can be observed empirically on the contrary, is the importance of the visitor *experience* during a museum visit. This experience is influenced by several factors. Not only is the museum an environment for cultural education, but also one for strolling, interaction and communication with others. The museum environment connects visitors to those far in time and space: to past events, persons deceased, artefacts, concepts and narratives rendered strange by the passing of time. At the same time visitors have to interact and connect with those close to them in space and time. This includes interaction with other visitors as well as the interactivity with exhibits and technical artefacts. It is this dynamic interplay of times, spaces, persons and artefacts that forms the unique ensemble of situations that constitutes the museum experience itself. It is characterised by the contrast of an immersive present environment with the invoked feelings of something far removed. Consequently, the aim of our design process is not to transform the experience of the museum visit in a spectacular way, but to support it gently and on a playful basis.

In the subsequent phase of the project, prototyping techniques were deployed in order to generate ideas for improvement of existing systems. The overarching narrative was that of a museum-visit. It exhibits a three-part structure: preparation, actual visit and recapitulation. It has proven essential to develop overarching scenarios in order to contain specialists' affinities to disregard context specifics and to selectively optimise their respective system components regarding technological impressiveness and feasibility.

Among the prototypes developed were:

1. A recommender engine, trying to foster communication by pointing users towards fellow visitors, possessing relevant knowledge.
2. A multitouch-table installation, allowing users to engage in playful interactions with exhibit related information.
3. An interactive role-playing device. Optical recognition of props present in the museum is used to present users with relevant narratives.

The development of the first set of prototypes and scenarios was followed by interdisciplinary discussions. Subsequently and regarding the outcome of this exchange, the attempt was made to break up monolithic deployments into their conceptual and material parts.

To this end usage scenarios for individual prototypes were discussed. Considering the observations made by social scientists in the field, usage scenarios were elaborated into mini-narratives accounting for situational factors within the deployment context. These mini-narratives now can be composed in a non-linear fashion, thereby allowing for exploring possible patterns of system usage.

For example, the analysis unveiled that though prototypes i) and ii) had been developed with two distinct sets of goals in mind, they share a functional characteristic. Both facilitate communication between visitors. The recommender system does this by virtue of direct proposals for communication. The table installation reduces communicative inhibitions by allowing visitors to perceive each other during technologically mediated interactions. The analysis thus allowed for a more conscious and strategic utilisation of the communicative incentives provided.

In a next step individual elements will be orchestrated into new functional ensembles according to the requirements of the museum ecology.

3 Implications of Interdisciplinarity

The value of technological virtuosity is not to produce ever more spectacular displays of its own prowess. It is twofold in nature. First, it allows more degrees of freedom when designing technology. As social practice is diverse, reproduced within a web of disparate sites of practice, the technical possibilities for cultural embedding of technology likewise are diverse and disparate. It is an informatician's job to recognize and exploit these possibilities. This requires a vast level of mastery of technological skills – as well as insights in the social and cultural structures the developed technology will be deployed in. Therein lies one of the main reasons for interdisciplinary cooperation with social scientists in system development. Collaborations of this type are based on a high level of communication between heterogeneous actors – apart from information professionals and social scientists, system users and other professionals within the technological field itself have to be included as well.

The key in facilitating communication in these kinds of interdisciplinary working contexts lies in the realisation that system development too contains theory building aspects. Whenever confronted with a new domain, developers usually develop informal theories describing how this domain is structured. They do not do so by means of

ethnographic analysis and generally do not apply social theory. At this point, the theory building process is usually implicit and remains opaque to other project participants. This does not mean, however, that the theories themselves are unstructured or inherently informal. On the contrary, system designers with a background in engineering tend to construe social practices observed with the same formal concepts used to understand technical components. This creates potentials for misconstruction of the social. While diverse perspectives and ambiguities can have catastrophic effects within the sphere of the technical, understanding of social practice necessitates embracing diversity, heterogeneity, multi-perspectivity – and calls for acceptance of its inherent ambiguities.

The relationship between design, social science and informatics has been discussed extensively within the HCI community [2–4]. Following the authors cited, we acknowledge that there is tension inherent in the cooperation of engineers and social scientists. We argue, however, that this tension can be made productive by employment of adequate methodologies. Therefore, our approach does not try to integrate differing perspectives within one conceptual framework. We rather try to create sensitivity of project participants towards the perspectives of the others, as outlined in Fig. 1. We do not expect to achieve fundamental perspective transformations, but aim at repeated chiastic crossing of boundaries.

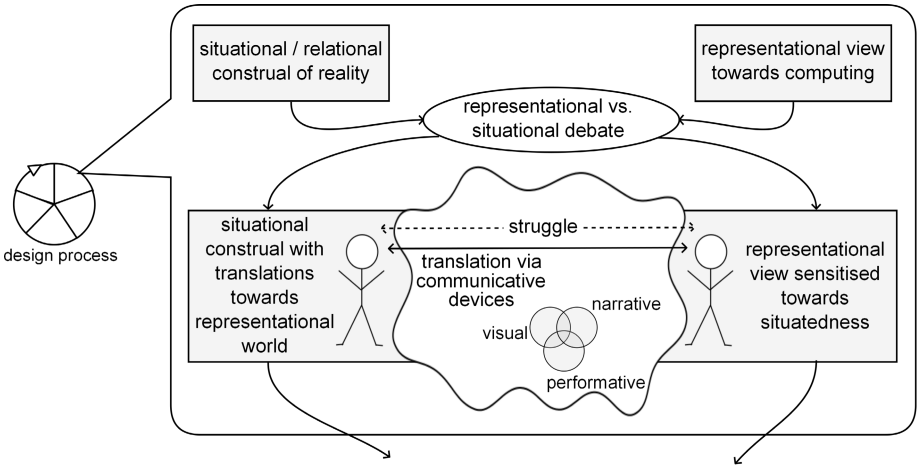

Fig. 1. Differing perspectives are made productive by means of translations and mutual sensitivity

While it is not necessary for social scientists to fully grasp technical intricacies and engineers do not need to follow involved discussions of social theory or methodologies to their conceptual origins, it is paramount that project participants develop a feeling of 'how they are different'. Inside the disciplinary terrain the same demand needs to be made, as researchers from the same discipline can differ broadly concerning research paradigms, methods and methodologies as well as favoured theoretical approaches. We developed a set of communicative devices in order to highlight these

differences and make them tractable within the design process. These are detailed in the following subsection. Among the techniques employed are different forms of diagrams as well as other visual aids and narrative devices.

Communicative Devices

In order to aid the communicative process within the interdisciplinary setting, different forms of analytical description were employed. These ranged from formal-technical diagrams employing mathematical language over pictures and photos to informally presented narratives. It has proven both necessary as well as beneficial to encourage participants to discuss their work at an early stage. Furthermore, scientists had to explain their different backgrounds to each other, including previous work and methods employed. A multitude of mutual misconceptions could thus be caught at an early stage – while others may still be present.

Additionally, it has to be stressed that both spatial proximity of researchers from diverse fields, as well as their spatial distance to the surrounding everyday university processes, has proven to be an invaluable asset in producing ideas. As so often is the case, communal trips to the canteen, spontaneous doodle sessions during coffee breaks and seemingly random prototyping sessions in the printer-room have dwarfed official and semi-official design workshop appointments regarding creative power.

However, this should not point to the conclusion that informal talk is enough, rendering formal appointments obsolete. On the contrary, regular meetings have proven to be an integral and invaluable constituent of the communicative ecosystem. They provided helpful incentives to translate work into a language accessible to the other. Frequently, forcing to take these fresh perspectives resulted in the emergence of new ideas and a firmer grasp of the tacit assumptions underlying the own work process. Consequently, a practice similar to that of SCRUM [5] was adopted: Participants were encouraged to explain what they have been working on since the last regular meeting. Encouraging participants to pose questions to each other also proved to be helpful. Within these discussions it proved helpful to develop a certain discipline: Before presenting an argument, dialogue partners had to adequately sum up the position of their predecessor. Furthermore, conducting clustering sessions where participants had to cluster thoughts and concepts produced by researchers from another discipline furthered mutual understanding. A set of visual devices was also employed, these are detailed further in an accompanying publication [6].

The most essential communicative device was that of prototyping. Prototyping provides means to overcome communicative boundaries by employing the integrating power of the material. Thereby, prototypes produced create unique communicative opportunities. Problems and perspectives can be discussed across disciplinary languages and vocabularies with respect to artefacts, which literally are graspable. They allow researchers and developers to derive descriptions from concrete material objects. At the same time, they can be discussed as material correlates of ideas. In the outlined project prototypes were cut out of paper and cardboard, assembled using everyday objects forming structures bearing similarity to an assemblage or made from dough or lego bricks.

However, prototyping can also gloss over antagonistic perspectives: Since the prototype already has been built, utterances can easily be misunderstood by presupposing the own construal of the artefact at hand. Frequently, the opportunity to shatter and question presuppositions is missed during the process, especially if it is geared towards rapid development. Therefore, it proved imperative to embed the prototyping process into the network of communicative support detailed above. Every prototype developed has to be discussed prior to inception, during the respective prototyping session as well as afterwards during a regular meeting.

4 Related Work

At this point it is important to address the inherent contradictions of user-centered design (UCD). Central to the UCD process usually is an understanding of users' tasks and goals. However, in most domains the users' tasks will not be their own. They are determined by organisational and institutional settings. Actual users' wishes and desires will entertain a dialectical tension with those environmental requirements. Furthermore, we highlight the role of UCD as being rooted in a rhetorical situation. UCD is not employed by uninterested third parties but by persons and organisations wishing to achieve certain goals.

Our treatment of system design is informed by the notion that concepts have politics [7] and that artefacts facilitate social practices. System development cannot merely be considered as an instrumental process. It is a site of struggle, where different interests and views of the world engage with each other. Our methodologies try to account for these productive antagonisms while trying to enable productive discussion and struggle within the embodied practices themselves. Our goals are distinct from UCD in that we do not aim at merely identifying user expectations or desires. What we envision is not exclusive development for the user but a critical dialogue between project stakeholders *as well as* end users.

Embodied Interaction developed by Paul Dourish [8] proposes a blend of methods from social-sciences and humanities. He builds on a phenomenological understanding of the realm computing systems are part of. Drawing on Lucy Suchman's research [9], he develops a processual conception of reality in conjunction with a situational multi-level conception of meaning. The key concept is that of embodiment, reminding designers how each artefact always is used in the context of practice and that practice in turn takes part in a meaning making process. Dourish goes on to develop a set of practical design guidelines. We found the argumentation to be cogent and the specification of practical guidelines refreshing. Embodied Interaction provides a site for common understanding between social-scientists and informaticians, due to its roots both in anthropology as well as informatics. It has consequently informed our design process and proved to be one of the most beneficial conceptual toolsets. However, it focusses more on the analysis of the socio-ontological status of HCI artefacts while temporarily neglecting production processes. Consequently, we found that it needs to be combined with further methodological tools in order to realise its inner potential.

Participatory Design aims at communicative integration of all stakeholders potentially affected by an artefact [10]. It centres on democratic discussion and deliberative processes. Although our own approach is informed by Participatory Design, we do not conceive of our design project as an instance of public service. The design team follows convictions not identical with that of potential users. Consequently, we do not try to simulate a consensus. Rather, we try to articulate the privileged nature as well as the limitations of our own position as scientists, developers, designers.

Value-Sensitive Design [11–14] describes itself as an alternative paradigm to participatory approaches. Whereas Participatory Design highlights the need for valuing every participant's opinion, here adhering to human values is given preference. Value Sensitive approaches emphasise the need to acknowledge trade-offs between conflicting values. Consequently, the design process is aimed at enabling reasonable ethically informed decisions, while stating that these must remain publicly accountable.

Our design process is informed by extensive discussions of ethical implications. In contrast to Value Sensitive Design, we do not try to create a deliberative space integrating each and every stakeholder. This first of all is not feasible from an organisational perspective within our project parameters. While we do try to involve potential system users early in the process, this is not done in order to reach a consensus. On the contrary, we think it is imperative to make our own goals very clear and embody them into artefacts. These should be contestable in a wider realm of discussion. In effect, we view our design actions as being accountable to others, while not trying to speak from a position of consensus.

Critical Technical Practice as initially put forward by Phil Agre constituted itself as an effort to reform the field of Artificial Intelligence [15–17] . Within the works cited, Agre argues for a situational approach towards AI problems, trying to highlight shortcomings inhering in the idea of universal cognition. Our research efforts align themselves with some of the basic stances put forward by Agre. Namely, we try to reflect on the untested assumptions underlying practices of technology design.

Critical Technical Practice has since informed a multitude of concepts within the field of HCI. One of these influences is Reflective HCI [18], a joint effort of theorists affiliated with Embodied Interaction, AI centred Critical Technical Practice and other paradigms within the HCI community.

5 Conclusion

We have described an interdisciplinary development project in the domain of museum education. Highlighting the specificity of cultural contexts, we argued for the necessity of customising existing design methods. Viewing the diversity of differing perspectives as assets rather than problems, we have described communicative devices to inform interdisciplinary development. Consequently, our process aims for repeated chiastic crossing of boundaries in order to sensitise participants for the otherness of the other. We do not expect to achieve fundamental perspective transformations on a short or medium timescale.

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