Examining Interdisciplinary Prototyping in the Context of Cultural Communication

Michael Heidt

Chemnitz University of Technology, Research Training Group crossWorlds, Thüringer Weg 5, Chemnitz 09126, Germany
michael.heidt@informatik.tu-chemnitz.de
http://crossworlds.info/mitglieder/kollegiaten/michael-heidt/

Abstract. Designers typically have to operate in the environment of highly interdisciplinary teams. However, at the same time mindsets of project participants frequently remain framed within disciplinary and professional boundaries. We argue that interdisciplinary communication processes can be improved upon by further theorising the differences between disciplinary cultures. Prototyping offers unique opportunities concerning these situational configurations. It allows to make differences productive on the level of practice whose incommensurabilities often preclude integration within the realm of theory and conviction. We thus provide a tentative set of communicative and methodological tools aimed at improving the communicative process in these scenarios. Instead of trying to establish a common language or common toolset, we try to render the dynamic friction between disparate perspectives productive. Our positions are illustrated by discussing them in the context of a case study in the domain of cultural education.

Keywords: prototyping, interdisciplinarity, cultural informatics, critical technical practice.

1 Introduction

Interdisciplinarity is heavily promoted throughout the scientific world while already being commonplace within professional settings. Despite this operational ubiquity, teams in the field tasked with design projects frequently find themselves confronted with a startling lack of methods explicitly accounting for interdisciplinary perspectives.

We will outline how far reaching differences in individual and disciplinary perspectives can be rendered productive on the level of practice. The device used to accomplish this goal is a prototyping approach informed by Value-Sensitive-Design, Critical Technical Practice and Embodied Interaction. Our efforts are aimed at providing conceptual and methodological building blocks towards enabling multiperspectivity on the levels of artefact production and artefact usage alike. To this end, a case study in the field of cultural education is discussed. The discussion will highlight both problems encountered as well as communicative devices employed to address these challenges. The development project described

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was conducted as part of the interdisciplinary research training group crossWorlds, combining perspectives from the fields of computer-science, philosophy, psychology, social-science, design, rhetoric and engineering.

In accounting for interdisciplinarity the text finds itself confronted with a fundamental difficulty. While it has to tell a coherent story, its subject, the multitude of perspectives, presents itself as inhomogeneous and non-linearisable. This of course is a situation every designer is familiar with - she must deal with the messiness of a chaotic world, hoping to make strife productive by embodying it into design and artefact.

2 Prototyping Approach

2.1 Examined Prototyping - Project Inception

The respective subproject was initiated by a participant with a strong background in philosophy. Initially, concepts were to be grounded within Jürgen Habermas' theory of communicative action [8]. This enterprise however soon proved to be too ambitious, since his ideas turned out not to be accessible enough to those without prior training in philosophy or social sciences. At this point first discussions erupted concerning the worth of the philosophical perspective, as well as a perceived incomprehensibility of philosophical discourse in general. Subsequently, ideas from ancient greek philosophy were introduced into the discussion process.

Since the early stages of the design process centered on identifying tacit assumptions guiding individual perspectives, the character of Socrates was used as an illustrative device. Following his famous adage stating that the unexamined life is not worth living (Apology, 38a), the approach to prototyping was dubbed *Examined Prototyping*. Philosophy served as a constant reminder throughout the project that untested assumptions should be identified and articulated.

3 Cultural Prototyping

After initial discussions had focussed on the general approach, in a subsequent step relevant sites for artefact deployment were examined.

3.1 Analysis of Museum Context

Analysis of museums creates unique challenges with respect to prototyping. Technological artefacts within museums neither are consumer products, nor are they part of a workplace and thus immediately accessible to criteria such as productivity. Rather, their function within the domain of analysis is notoriously hard to identify. In order to address these uncertainties our inquiries commenced by examining the historical dimension of the problem. We thus tried to retrace developments and frictions of user conceptions within HCI literature.

Traditionally in the field of technology design, museums were conceived as places of learning. Following cognitive science, the function of information artefacts frequently was described as facilitating informational flow. Accordingly, their function was described as improving mnemonic performance of technology users. Within recent publications the focus has shifted from aspects of learning to that of user experience. Users are seen as demanding perceptually engaging media-installations.

With these developments in mind, our own explorations into the museum domain were informed by the concept of the *Blended Museum*, developed by Klinkhammer and Reiterer [13] at University of Konstanz. Highlighting both user experience as well as visitors' informational needs, Blended Museum focusses on the integration of medial effects between real exhibits and media installations.

3.2 Weak Spots

Following the predominantly conceptually oriented initial stage, the project moved on to integrate observations made in the field. Drawing both on aforementioned literature and observation alike our analysis highlights four key areas where traditional museums fall short:

1. Interactive possibilities remain severely limited. When they are presented at all, they usually take the form of 'special offers' and are typically poorly integrated with the immersive material museum experiences. Mobile technologies make for especially efficient remedies in this respect, since they allow for continuous interactive possibilities.
2. Visitors often harbour diffuse informational needs , calling for informational incentives. These typically remain unanswered in the museum environment. The system is designed to address these using a communicative reconceptualisation of recommender engines.
3. Museums frequently fail to provide ample communicative incentives. The challenge is met in the course of a restrained approach towards technological implements. Not machine-user interactions are facilitated, instead the system only provides incentives, relying on users to produce actual communication.
4. Users crave take-away-experiences which traditional museums frequently fail to provide [11]. Traditional take-away items like guides, books and souvenirs do not incorporate a specific user's experience or past communications. The problem is addressed by allowing users to incorporate digital communications with fellow visitors and system interactions into their digital self. To this end, presentation devices ranging from social networks, timelines, narratives and suitable diagrams are proposed.

4 Prototyping Process

In its initial form, the system was conceived as a traditional recommender system. The system was targeted at exhibit centered recommendation, providing its users with additional information to exhibits encountered or pointing to potentially interesting exhibits within the museum.

Low fidelity prototypes were developed, showing how smartphones could be used to diseminate exhibit centered recommendations. Goals in this state of the project were to highlight the importance of exhibits while trying to render technological presentation transparent.

Within the following phase the prototypes were interrogated towards the implicit conceptions they embody. The following notions were identified:

1. Museums are spaces similar to online-bookstores or warehouses.
2. Museums can be conceived as learning environments.
3. Users are seen as consumers of information items.
4. Exhibits provide information.
5. Knowledge is transformed from documents into users in the form of information.

At this point in the design process, the problem of meaning was discussed explicitly. Participants with backgrounds in psychology were engaged in heated debates with social-scientists. Consequently, representationalist conceptions of meaning were called into question. In order to generate a theoretically sound foundation for the discussion, project participants adopted the paradigm *Embodied Interaction*, developed by Paul Dourish [4]. Drawing on a varied set of methods informed by phenomenology, ethnomethodology and anthropology, Dourish argues for a conception of meaning as a situational effect. As a consequence, a new stance towards meaning was adopted:

1. Meaning is a situated phenomenon.
2. Knowledge is constituted by discursive practice.

At this point of the discussion another tacit assumption presented itself:

1. Users can sensibly be addressed as individuals.

Its identification proved to be important with respect to later stages of the design process.

It has to be stressed that insights obtained from cognitive psychology were not dropped or refuted, rather they were recontextualised. Statements concerning the restrictions of the human physiology for processing large amounts of input still inform presentation strategies. For example Miller's classical discoveries concerning internal information processing are embodied in UI designs [10]. However, the museum experience is no longer conceived as a problem of information transferral.

4.1 Visual Communication

Visual communications devices such as diagrams proved to be especially valuable tools while trying to articulate differing perspectives on the design process. Due to the fluidity of the process itself, most of the devices detailed are exploratory in nature. They are described here in order to provide the discussion of the project

with intelligibility as well as inviting others to adopt and improve on them. In order to facilitate detailed discussion of differences, project participants were encouraged to generate simple visualizations of their notions and theories. These were subsequently reworked into semi-formal versions. Within the diagrams produced, the key concept or notion is denoted by drawing a dashed ellipse around it. Furthermore, concepts that appeared in discussions but were found missing from perspectives were subsequently drawn into a box at the lower right of the diagram.

We will give a short overview of perspectives articulated:

The *representational perspective* as detailed above is outlined in figure 1. It centers on the role of mobile appliances as mediators between data stores and the user. It consequently conceives users as information sinks and databases as information sources.

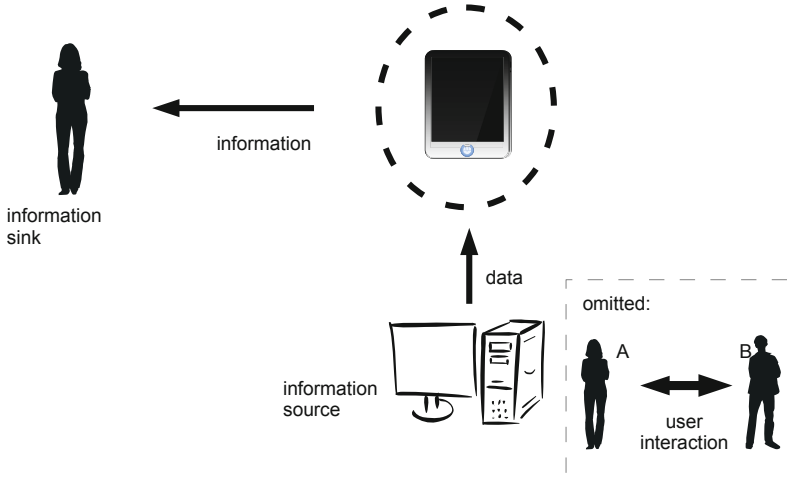

Fig. 1. Conception oriented towards informational flow

The *interactional perspective* as outlined in figure 2 focusses on the communicative-interactive relationship between visitors. Consistent with Embodied Interaction, knowledge is treated as constructed in an interactional and situated context. Technical appliances as well as the exhibits themselves were initially omitted from this discussion.

Both perspectives induced further discussions and led to a pragmatical reconceptualisation. The interactional effects of traditional recommender systems were depicted graphically as seen in figure 3. Contrasted with the interactional perspective, they were found to displace the intended communicative dynamics. Subsequent reframings gave rise to a second perspective, detailed on the right side of the diagram. Still bound to the recommender paradigm, recommendations are now routed through users. These reframings were facilitated by adoption of a systems centered view. The perspectives of representation and interaction could be integrated on the level of practice.

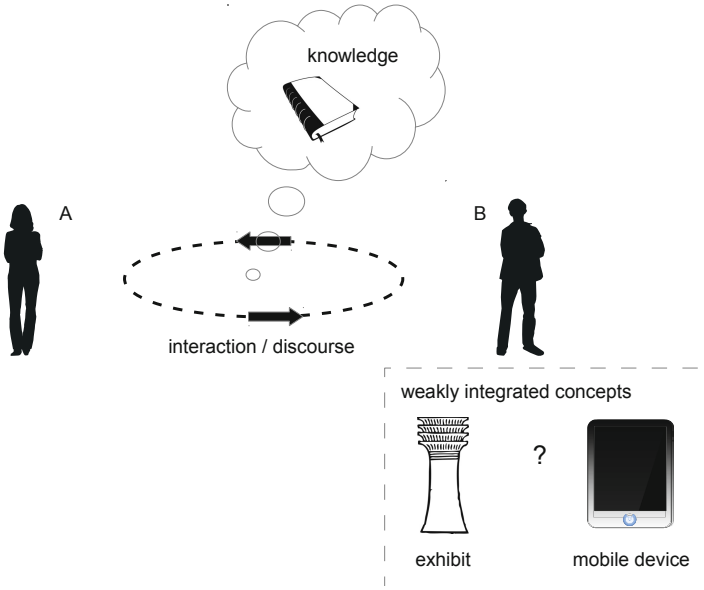

Fig. 2. Knowledge as interactional and situated phenomenon

5 Related Work

Embodied Interaction developed by Paul Dourish [4] proposes a blend of methods from social-sciences and humanities. Building upon a phenomenological understanding of the world around us, a processual conception of reality as well as a situational conception of meaning constitute key concepts.

Participatory Design aims at communicative integration of all stakeholders potentially affected by an artefact [12]. It centers on democratic discussion and deliberative processes. Our approach is informed by Participatory Design, while highlighting our own intrinsic motives.

Value-Sensitive Design [6,7] describes itself as an alternative paradigm to participatory approaches. Whereas Participatory Design highlights the need for valuing every participants opinion, here adhering to human values is given preference. Value Sensitive approaches emphasise the need to acknowledge tradeoffs between conflicting values. Consequently, the design process is aimed at enabling reasonable ethically informed decisions, while stating that these must remain publicly accountable.

User-centered-design is aimed at identifying the needs of end users, thus enabling successful product deployment [9,14]. It tries to overcome preoccupations with technology, while differing from the other approaches in refraining from ethical grounding or socio-cultural intervention.

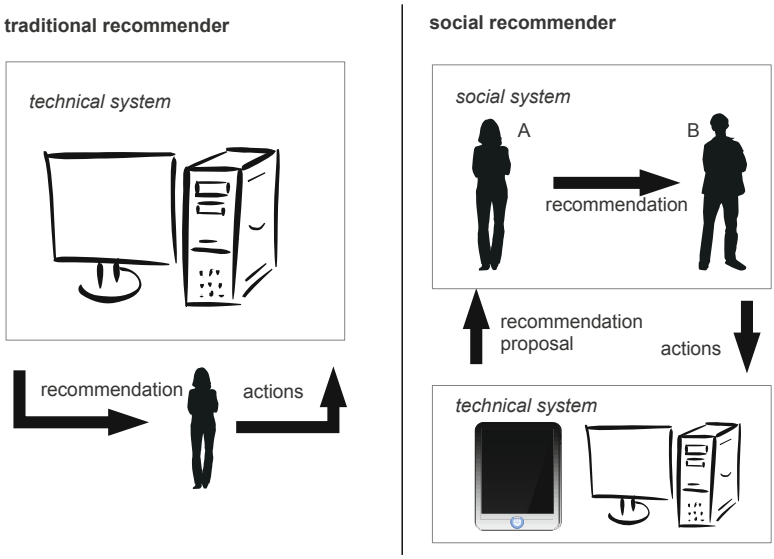

Fig. 3. Socially oriented design - contrastive systems perspective

Critical Technical Practice as initially put forward by Phil Agre constituted itself as an effort to reform the field of Artificial Intelligence [3,2,1]. Within these works, Agre argues for a situational approach towards AI problems, trying to highlight shortcoming of the idea of universal cognition.

Critical Technical Practice has since informed a multitude of concepts within the field of HCI. One of these influences is Reflective HCI [5], a joint effort of theorists affiliated with Embodied Interaction, AI centered Critical Technical Practice and other paradigms within the HCI community.

6 Conclusion

We have described how profoundly differing disciplinary perspectives can be integrated on the level of prototyping practice. Our ideas were demonstrated in the context of the development of a recommendation engine in the domain of cultural education. We observed that communicative processes should not be optimised towards erasing or bridging differences in perspective but rather should aim at rendering those differences productive and articulate. To this end, visual aids and semi-formal diagrams were identified as especially promising communicative resources. We see further potential in extensive dialogue between the disciplines and consequently invite scholars to collaborative develop a more extensive methods package.

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