

# Designing Hybrid User Interfaces with Power vs. Reality Tradeoffs

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## Abstract

In this paper we would like to discuss the process of designing hybrid user interfaces with explicit power vs. reality tradeoff decisions. We further propose to ground these tradeoffs in a firm understanding of embodied practice. To support this, we describe a design study which was grounded in explicit tradeoff decisions derived from an observational study.

## 1 Introduction

Theoretical frameworks such as Reality-based Interaction (RBI) provide guidance for designing user interfaces that build upon the knowledge and experiences of people in the “real world” (Jacob et al. 2007). RBI is based on the assumptions that people’s interactions in the real world are highly practiced and robust and thus require little effort to learn and perform. We think that in the design of hybrid user interfaces that combine physical with digital elements, designers and researchers therefore may consider power vs. reality tradeoffs, with the goal “to give up reality only explicitly and only in return for other desired qualities” (Jacob et al. 2008).

However, in many current research projects, decisions to give up or preserve reality are often made implicitly without stating their relation to embodied practice. We argue that by making these decisions explicit we can learn more about the consequences of our designs. We would like to support this argument by describing a design study that had the goal to examine important characteristics of embodied practice as a foundation to explicit tradeoff decisions that were eventually used in design and evaluation.

## 2 Design Study

Our design study was in the domain of collaborative creativity support systems. We studied the brainstorming technique Affinity Diagramming since embodied actions and physical artifacts are crucial factors for the success of such techniques. The goal of our research was to develop a design methodology that will allow *keeping the original workflow* of the creativity technique whilst at the same time introducing *additional functionality* that does *not conflict* with important characteristics of embodied practice.

### 2.1 Observation

From an observational study of traditional practice (see Figure 1, left), we examined crucial characteristics of physical and bodily interactions as well as social and environmental awareness according to the four themes proposed by RBI. From a quantitative and qualitative analysis we could identify properties that are crucial for the success of the activity. However, we could also identify areas of possible improvement with the use of digital qualities. From this knowledge, we developed a variety of possible tradeoffs that we loosely classified along a power vs. reality spectrum. We placed tradeoffs that seek to *preserve* important aspects of reality closer to “reality”, while tradeoffs that seek to *support* or *increase* power were placed towards “power” based on their degree of virtuality. These tradeoff decisions were then mapped to the design space of hybrid interfaces in an iterative process (see Figure 1, right).

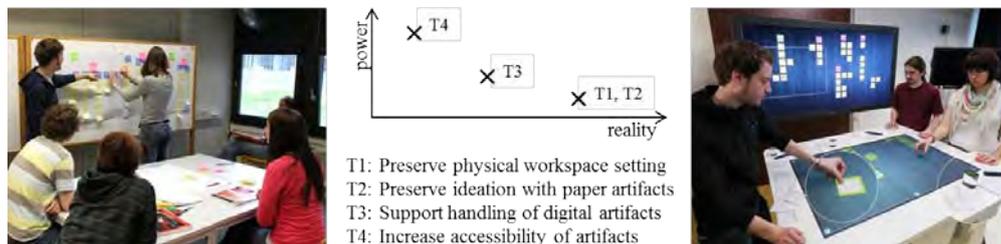


Figure 1: In our design study, we derived explicit tradeoff decisions from observations of embodied practice.

### 2.2 Design Process

In our design process, we approached possible tradeoffs along the spectrum from reality towards power in an iterative way (see Figure 1, center). As a first step, we designed a physical workspace setting (Table, Board, Paper) based on tradeoffs that we identified as most important for preserving embodied practice (T1, T2). In a second step, we designed interaction techniques for supporting the basic activity, but with hybrid artifacts (T3). This step was a prerequisite for realizing further tradeoffs towards more sophisticated digital support (T4). Using this incremental approach, we could increase the power of the interface gradually without violating crucial properties of physical practice. Furthermore, by iterating

this process, we could compare different design variants derived from our tradeoff decisions. Thereby, each design alternative itself sets foundations for possible interaction techniques that are further along the spectrum towards power. This ensures that the envisioned designs are adequate and do not conflict with characteristics of embodied practice throughout the course of the design process.

### 2.3 User Study

While we think that our approach was helpful in designing hybrid interactive systems, we also found that explicit tradeoffs can be used for studying our design in user studies after completing the design process. Accordingly, we observed the effects of our final prototype implementation along each tradeoff decision. Therefore, each tradeoff can be translated into claims. The user study then placed focus on the questions if these claims were effectively implemented in a prototype and if they really did achieve the intended outcome in relation to traditional practice. Using this approach, we can learn about the consequences of our design decisions in relation to embodied practice and the modifications introduced with digital functionality.

## 3 Conclusion

While our example only covers a very specific application scenario, we still think that many hybrid user interfaces or interaction techniques can be designed and studied along power vs. reality tradeoffs. However, in the future we may improve our design methodology by firmly grounding tradeoff decisions along the “qualities of power” proposed by Jacob et al. (2008).

### References

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