Pete and Repeat were sitting on a fence: iteration, interactive cognition and an interactive design method

Ron Wakkary

This paper proposes a new design method. Key aspects of the method are the concept of “framing the problem”, and the need to design “in-the-world” throughout the design process. The method is based on Henrik Gedenryd’s notion of “interactive cognition” and Donald Schön’s ideas as embodied in his concept of “reflective practice”. The paper discusses the related elements from Gedenryd. It describes preliminary principles for an interactive design method, and presents examples from a research project on an augmented reality interface for museums, known as ec(h)o.

Keywords: interactive design method, design method, interactive cognition, iteration, augmented reality

“The important thing is to make a start.” (Umberto Eco 1997)

Introduction

This paper is about the exploration of an alternative design method. The exploration arises out of the awareness of the need to invest more design energy and creativity in the area of “framing the problem”, and the need to design “in-the-world” throughout the design process. The exploration and discussion is based on a design method concept of interactivity. This concept of interactivity, not to be confused with interactive design, i.e. web and interface design, is based on Henrik Gedenryd’s notion of “interactive cognition” and Donald Schön’s ideas as embodied in his concept of “reflective practice”. The paper discusses the related elements from Gedenryd. It describes preliminary principles for an interactive design method, and presents examples from a research project on an augmented reality interface for museums, known as ec(h)o.

Iteration

Iteration is a process common to many design methods and it is often valued as critical if not quintessentially a part of “good design” practice. Iteration in design methods is almost universally seen as an exemplar of flexibility in current design. If a designer wants to point out the innovative or robust nature of his design process, he will quickly demonstrate its iterative qualities. That is, its ability to repeat. As the HCI (Human-Computer-Interaction) computer scientist Bill Buxton aptly states it, “keep trying until you get it right” (Buxton and Sniderman, 1980 p.72). To design iteratively means that the designer can repeat at each step in the design process, go backwards, or the designer can repeat the entire process again and again. The ability to go back to the beginning of a phase of a design or the previous phase if something “goes wrong” is seen to be the ultimate in flexibility and demonstration of the evolving corrective response mechanism within the design process. Another form of iterative design is the ability to “rush” through the entire sequence of the design process in order to get user feedback and to emulate designing “in-the-world”. The idea is to present the outcome to end-users as a prototype, thus facilitating the collection of data from end-users, so that the designer can repeat the process again and develop another prototype, and collect more data, repeating the process until the designer “gets it right”.

However, if we scrutinize the concept of iteration closer, we find that not only is it not an exemplar component of current design methods rather it is part of the undoing of the sequenced design method. Further, it is symptomatic of all that is wrong with most design methods today. Iteration is what the designer/cognitive scientist Henrik Gedenryd refers to as an “ad hoc extension” employed to overcome the weak and unrealistic aspects of most design methods (Gedenryd, 1998 p.97). For example, the need to repeat phases of the process such as “analysis” or “design” phases until ‘one gets it right’ may be more symptomatic of the typical lack of attention and energy put into specifying of the problem. Framing the problem is absolutely key to the entire design process yet typically it is not explored or worse yet, determined by others and adopted by designers as a given. The other form of iterative design, the "cycling" through design process many times in order to “iterate” prototypes and to have those prototypes come in contact with the “real-users”, is an attempt to design in a “real-world” context. However, it begs the question of why not “bring in” users, or more simply, people, into the design process earlier? Why design a process where the real context is not tested until the end, and therefore rush through the process so you’ll get to the end sooner?

The Model of Technical Rationality

Henrik Gedenryd’s “How Designers Work” (1998) analyses the design process as validation of his theory of interactive cognition. While the aim of his thesis is cognitive science he found strong commonalities with design, such that his thesis comprised a joint critique of design and cognition. Gedenryd’s central argument is that the traditional models of cognition are based on a “pure mental model”, what he refers to as “intramental”, whereas evident in design practice, cognition is an interactive process that acts and responds to the world that it is in, it integrates and combines cognitive activities with events in the world in order to act and reflect “in the world”. He argues that a truer model of cognition, what he refers to as “interactive cognition,” lies within the genuine practice of designers.

The critique is therefore aimed at the formal levels of the two disciplines. It assumes, quite rightly that a large gap exists between reality and the formal descriptions. More importantly, the formal descriptions share an underlying pattern that is a general model of rationality and rational action (Gedenryd, 1998 p.55). Gedenryd finds the rational model pattern by analysis of a wide range of formalizations, including classical design methods, software engineering, folk psychology, cognitive planning theory, problem-solving theory, and information-processing theory. Four principles emerge from the analysis. The principles are shared by traditional design methods and cognitive models (Gedenryd, 1998 p.115):

1. separation: the separation of the design process into distinct and isolated phases; in cognition, the separation of thought and action,
2. logical order: in design , the explicit order or sequence of activities; in cognition, thought precedes and determines action,
3. planning: the pre-specifying of an order in which to perform the activities within a phase; in cognition, plans as the mechanism that predetermines action in thought,
4. product-process symmetry: the structure of the process of design or thought is reflected in the outcome or action.

Gedenryd’s analysis and demonstration of the roles of these principles is more detailed, but for our purposes it is ample evidence to demonstrate the principles within the most generic models for design methods. Together, the principles of “separation” and “logical order” generate the basic three-stage design model of analysis, synthesis, and evaluation. That is each step is distinct, and takes place in isolation and follows a logical sequence. The more elaborate design model demonstrates the inter-dependencies between the phases or how strategies within one phase plan and structure the activities in the subsequent phase. For example, Gedenryd points out, a prototypical example is the final part of analysis plans the course of action for the synthesis or refinement stage before this activity even begins.
Not surprisingly, Gedenryd’s critique of design methods led him to consider formal
design methods as complete failures. Behind these failures was the false move of basing
design methods in the model of rational action, rather than the actuality of practice. While the
concept of design as a science has not gone un-criticized it is persistent at the foundational
level and continues to hold sway, particularly in the area of design methods.

Iteration again
Returning to the idea of iteration, we may ask how does iteration contribute to design
methods success or failure. In Gedenryd’s brief analysis, iteration is an idea that counters the
model it is intended to support:

…iteration is a prototypical ad hoc extension, that is, an ill-considered added feature
that handles a certain condition, but which in doing so goes against the original idea,
and is therefore incompatible with it—thereby, in reality it constitutes no solution at
all (Gedenryd, 1998 p.97).

We could say that iteration is a round about confirmation of Gedenryd’s critique of the
rational model. Gedenryd elaborates on how iteration disassembles the principles of
“sequence” and “logical order”:

By allowing for iteration, a stage model comes to saying that you can do anything, in
any order, as many or as few times as you like. By allowing for everything, it no
longer says anything about their order. But if you do that, you have given up what
was the purpose of these models in the first place: to specify what things to do, when
to do them, and in what order, so as to guide the designer. The only substance that
remains is a list of the activities that are included (Gedenryd, 1998 pp.97-98).

Iteration is a workaround that illustrates that the idea of separated and ordered activities do not
hold. Iteration utilized to the extreme reduces the typical design method to no more than a list.
Design methods become a checklist of activities that can be completed in any order, sequence,
and frequency. For Gedenryd, this confirms a central understanding of interactive cognition
and design, “design consists of several component functions that cannot be held apart, and that
display no general ordering principle among them” (Gedenryd, 1998 p.98). In addition, the
earlier discussion on iteration pointed out how iteration is symptomatic of two needs in design
practice, the need to invest more design energy in “framing the problem”, and the need to
design in the context of “in-the-world” throughout the design process.

Interactive Cognition
Key aspects arise out of the analysis of iteration in design. Design consists of several
component functions that cannot be separated and have no general ordering principle. Design
requires a great deal of attention and creative energy in “framing the problem”, and the design
process acts best within an “in-the-world” context. These aspects equally arise from
Gedenryd’s concept of interactive cognition. Gedenryd begins with the “extended ontology of
cognition” that moves beyond the classic model of “mind and cognition” to include not only
the mind but also action and the physical world. He advocates a shift away from the emphasis
on the extension of cognition into entities: mind, body, world and actions, to activities, or the
interactions between entities (Gedenryd, 1998 p.12). Gedenryd’s understanding of activity is
rooted in the pragmatic inquiry of John Dewey and Schön.

A formalization of the theory in four steps is included below in order to provide a
brief explanation of the concept of interactive cognition. Each step can be seen as a layer,
which is made possible by the layers before it, capitalizing on them to successively add further
advantages of the interactive mode (Gedenryd, 1998 p.115):
1. “The rediscovery of the world”: the advantages of dealing directly with the world instead of a surrogate. For example, “position fixing” in ship navigation,
2. “Manipulating the world—doing for the sake of knowing”: the advantages added by action and interaction with the world. For example, the game “Tetris”;
3. “Fine grained interactive structure”: maximizing the benefits of involving world and action. For example a conversation: “no to your right, no over by the quad, right there yah right there”,
4. “Pragmatism enables specificity and shortcuts”: a set of shortcuts made possible by drawing on the specific conditions of a situation rather than the general information a surrogate can only provide. For example, a conversation”
   “A: Do you read?
   B. Do I read?
   A: Do you read books?”
As an overarching example, Gedenryd sees in the process of sketching in design, the incorporation of all four steps of interactive cognition.

Interactive Design Method
In combination with emergent actions in practice and a preliminary framework drawn from Henrik Gedenryd’s notion of “interactive cognition” and Donald Schön’s “reflective practice” (not discussed in this paper) the author explored the development of an interactive design method. Principles of the method include:
- design process is lead by “frame experiments”;
- design components cannot be separated and have no general ordering principle among them,
- design process is done “in-the-world”.

The term “frame experiment” is from Schön. It is the framing of a problematic situation in order to make it more manageable: “When he finds himself stuck in a problematic situation which he cannot readily convert to a manageable problem, he may construct a new way of setting the problem—a new frame which, in what I shall call a ‘frame experiment’, he tries to impose on the situation” (Schön, 1983 p.63). The techniques within the method include a “frame experiment” in the form of scenarios, and interactive workshops. The design process is lead by “frame experiments” that take the form of a scenario. Like traditional use of scenarios in design, the goal is to envision a possible outcome or future as a response to the design situation. The different forms of scenarios include, role-playing, storyboarding, scripts/narratives, sketches, videos, and interactive works. Although the process begins with a “frame experiment” or scenario, subsequent scenarios are created whenever it is required, in order to address the recurring phenomena within the design situation of “complexity”, “uncertainty”, “instability”, “uniqueness” and/or “value conflict” (Schön, 1983 p.39).
The recurring phenomenon of the design situation is enacted in interactive workshops as a way of generating design responses. Key features of the workshop include:

- workshops are ‘planned one at a time’,
- following workshop is an ‘interactive response’ to the previous workshop, it arises out of the inquiry of the previous workshop,
- workshops often are a response to frame experiments,
- workshops can create the need for a frame experiment.

In addition, the workshops strive to adhere to the principle of designing “in-the-world”. To that end, people are part of the design process from the beginning. Workshops include potential end-users in a participatory design approach. The role of the designer is to design the workshop such that it frames for enactment. In order to invite the participation, the workshops adopt a low-resolution approach, such as a paper prototype or the inclusion of prototyping as a participatory act within the workshop.

The method is very simple, involving the two techniques of scenarios and interactive workshops, yet the resulting process is a complex non-linear structure that does not include separation of activities or inherent sequences. It does not privilege planning preceding action, or decomposition and analysis as a pre-requisite for synthesis. It is non-linear and more web-like in its structure. The exact sequence is not predictable but the overall pattern is. For example, while you may not know what workshop will follow it is clear that it will connect with “parallel” workshops and eventually a framing scenario. The workshops are structured to invite interaction and participation, this may be perceived as openness, yet at the same time, workshops are connected to scenarios that are quite closed.
Conclusion

In conclusion, the interactive design method replaces the linear sequence of separate activities with an interactive process. The result is a complex web of viable choices based on interactive engagement of designing in the world. Gedenryd’s concept of interactive cognition demonstrates the connection between cognition and the act of designing. A natural outcome of his work is to re-introduce it as a conceptual tool for better understanding the design process.

References


Ron Wakkary is an Associate Professor at Simon Fraser University in the program of Information Technology and Interactive Arts, and a doctoral candidate in the CaaiA-STAR program at the University of Plymouth. He can be reached by email at rwakkary@sfu.ca.