

Temporal artifacts in user-centered interaction design.

Joshua David McClurg-Genevese

The Ohio State University
Department of Industrial, Interior and Visual Communication Design
Last revised: 01/19/05

Abstract:

This paper attempts to introduce the notion of time as a key variable for the investigation of user-centered interaction design methodologies. It begins with a general discussion of time as it relates to user interaction, and continues by exploring one practical approach to building interaction design methodologies around such a concept.

Introduction:

User-centered design promotes anticipating the needs of the user; accommodating their tasks and goals is an inherent part of the user-centered design process. Interaction design is at the heart of the user-centered philosophy, examining behavior and decision-making in an effort to enhance the overall user experience.

The study of user interaction necessitates the understanding of cognition – the mental processes that are exhibited in human behavior such as: perception, memory and emotion and the relationship that exists between the mental processes of the user and the physical response of the body. It necessitates the understanding of the computer as a tool with advanced interaction capabilities, and it necessitates the understanding of the environmental factors that can contribute to the overall wellbeing of the cognitive agent.

User interaction constitutes a dynamic system that evolves over time. It is not a static system of inputs and outputs governed only by the mind, but rather a continuously changing system governed by the user, the computer (interface) and the environment that both are in.

When researching user interaction, we need a methodology that can support such dynamic factors. The variable of time gives us a basis upon which we can build such a methodology. Because user interaction occurs in real-time, we can use the variable of time itself as a cornerstone for user research. If we can better understand the temporal aspects of human interaction, we can design for more successful user behavior and better predict future behavior.

The variable of time can be used as a descriptive or predictive parameter to show what aspects of a given design allow for efficient and successful interaction. It can also be used as a generative parameter to provide new insights into how best to design for successful user interaction. One example of the use of time as the key variable for analysis is though

the identification of **temporal artifacts**, and the use of illustration and modeling techniques to identify patterns of behavior.

Temporal artifacts:

Temporal artifacts are markers in the time series of any interaction that highlight a disparity (or incongruity) in the behavior of the user as it relates to a specific design. By looking for temporal artifacts we can both highlight areas of cognitive difficulty or success, and highlight areas of emotional accord or frustration. It is possible to then build upon this data to illustrate patterns of behavior on a larger scale.

Highlighting areas of cognitive difficulty or success.

Using a one-dimensional time series it is possible to identify areas of success or failure across the span of an interaction. We can find:

- A. How much time is taken between decisions
- B. How much time is taken overall with an interaction

These measures allow us to identify the average speed of a users decision-making process, and subsequently of the interaction as a whole. This average number acts as a control for comparison purposes. Any number (either between interactions or overall) significantly above or below this average number represents a potential area of difficulty or success. It is possible to then identify, based on screen capture recording, where in the interaction the user was when this temporal artifact occurred and whether it points to a success on the part of the application, or an area for further development.

Highlighting areas of emotional accord or frustration.

Using a two-dimensional time series it is possible to identify areas of success or failure across the span of an interaction as it relates to various emotional factors. In addition to the measure of time, we can add a second variable for emotion to gain a cross reference between temporal artifacts and emotional states. This helps to identify in even greater detail the potential causes of the success or failure of an interface or application to correctly anticipate the needs of the user.

Identifying patterns of behavior.

Using illustrative devices such as flow diagrams, trajectories and geometrical modeling it is possible to build upon the time series of any interaction to create a conceptual map of the tendencies of users, thereby describing patterns of behavior.

These patterns of behavior can provide insight, on a much larger scale, as to where the users are tending to navigate and how the interface might be helping or hindering this process. These patterns can also help in predicting where deficiencies may lie in the overall structure of an application.

Conclusion:

The goal of any user-centered interaction design methodology is helping the user successfully interact with an application or interface. User interaction constitutes a dynamic system, comprised of the user, the interface, and the environment, that changes and evolves over time. By using time as the key variable for analysis, we can create a methodology that supports such a dynamic system. This affords better understanding of the user's wants and needs, and subsequently for a better user experience as a whole.