Exploring the Hedonic Quality of Slow Technology

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ABSTRACT
Pace is an inseparable part of all technologies and consequently represents an interaction design element. Various technology aspects can support hedonic qualities brought about from reflection transformed into unlimited unique experiences, mental rest, and inner peace. This paper argues different approaches to technology pace evaluation. Attributes that contribute to the hedonic quality of slow technology are presented and discussed.

Author Keywords
Hedonic Quality; Slow Technology; Evaluation; User Experience

ACM Classification Keywords
H.5.2. [Information interfaces and presentation (e.g., HCI)] User Interfaces: Evaluation/methodology, User-centered design

General Terms
Human Factors; Design; Measurement.

INTRODUCTION
Every technology has a pace. Thousands of years ago, Aristotle already described the manipulation of time in his Poetica. Going from early Greek theatre over literature to film, narrative pace has been the subject of analysis and theorizing in the humanities since ancient times until today. In the same line, video games can be seen as an extension of this narrative tradition: instead of telling stories (literature) or showing stories (film, theatre), video games allow the players to experience stories themselves.

Apart from this narrative tradition, all interaction implies temporality. Interaction is constant dialogue between the user and the system: a user performs an action, the system responds, the user acts again in response to the new system status, etc.

Already in the 1960s, McLuhan [22] stated that the medium influences the message that is being communicated. Computers, in their current form, embody a usability-oriented tradition in which technology is typically aimed at efficiency, and a fast pace. In this sense, the medium sets the expectations, and only the fast part of the pace dimension is implied. But what if technology could transform from an efficiency-oriented medium to a slower medium? How can we research interaction speed, and, more specifically, a move towards slower technology?

We first outline two existing approaches to the measurement of technology pace: one inspired by narratology, and one based on qualitative user research. Afterwards, we outline a mixed method work-in-progress methodology we are currently developing. The narratology-based method is an approach in which analysis focuses on the technology itself; the qualitative and mixed-method approaches, on the other hand, focus on the users' perception of time and temporality.

RELATED WORK: HUMANITIES-INSPIRED AND QUALITATIVE APPROACHES

Narratology-based approach
At least since Aristotle, time has been an important issue in literary theory. In theatre, as well as in literature, film, and more recently in gaming, the passing of time is an important aspect of the way stories are told. For instance, starting from examples such as the movie "Eternal Sunshine of the Spotless Mind" and the TV series "24", Lundgren and Hultberg outline a framework distinguishing between unbroken time, fragmented time and juxtaposed time [21]. They refer to games such as "World of Warcraft" and "Sim City" as games that handle the passing of time in different ways.

While Lundgren and Hultberg do not explicitly refer to narrative theory, we believe that grounding such a framework in narrative theory (e.g. the work of Gérard Genette [11]) can help in further developing such a framework. As technology can often be considered a

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remediation of earlier media [5], looking at existing narrative theory can offer valuable insights for an exploration of time in technology. This approach focuses analysis on the treatment of time by the system itself.

The framework by Lundgren and Hultberg is a one-dimensional framework, listing several time manipulations according to its 'close[ness] to reality'. However, in narratology, Genette [11] has created a more elaborate, multidimensional framework of temporality, distinguishing between concepts of *order*, *duration* and *frequency*. Furthermore, more recent work in narratology has put temporality into a larger context, and has focused on the relationship between temporality and causality [28]. We believe that a further, in-depth exploration of these concepts and relationships can provide novel insights into the treatment of time in HCI.

Qualitative Approach

Huang and Stolterman in 2011 [13] spotted the need for an improved analytical descriptive tool regarding temporal pace issues in interaction. Therefore, they have analytically approached temporality to examine and explore any potential technique that describes and analyzes temporality in interaction. With this intention, they proposed a new qualitative approach to research interaction pace, where they discussed user attention fragmentation over time for various different technologies. This study provided a comprehensive view of temporality in technology by using compound way to describe its usage; *(i) graphical representation of time as descriptive tool*, *(ii) qualitative approach:* asking users to report their usage of email technology over time supported with in a graphical representation. In this self-report, behavioral patterns over time emerged, giving an indication of the temporality with which the technology caught the users' attention. And *(iii) discussed any potential development of a descriptive approach to be used in analyzing temporality in technology.* Interestingly, the results of this qualitative approach reported a number of different temporal terms that users used to describe their usage over time (e.g. duration, in-between, before, and after). These terms had been compared to graphs that users had to produce. It was found that both interviews and graphs described the same events or usage in interaction.

A qualitative approach to technology pace, such as the one described by Huang and Stolterman is useful for providing a holistic picture of temporality in interaction, as it can study data that is based on time points and intervals, and derive a qualitative description that can be used in the system model for data validation [13, 23].

MIXED METHOD

Although pace represents an integral part of every technology, it cannot be measured directly. Therefore we propose a mixed method where pace will be measured indirectly through the evaluation of hedonic facets of slow technology. Our own approach to technology pace assessment has a theoretical background in expectation-confirmation theory [26], hedonic quality [12], theory of flow [7], and user acceptance [9].

Theoretical Model and Related Hypotheses

The proposed model comprises three phases (Figure 1):

Before Interaction (expected experience): Expectation-confirmation theory (ECT) [26] is traditionally used in the literature for modeling users' post-interaction satisfaction and loyal behavior in marketing research. However, expectation was studied as a factor influencing satisfaction and loyalty between end-users and technology providers [6, 8, 26]. Satisfaction represents an overall impression of a technology being used [18]. Loyalty refers to the extent to which users are willing to continue to use a technology or recommend it to others [27].

ECT can be used to assess users' expectation in consequence of four different stages [3]; *(i) users initial expectation towards the technology prior to use*; *(ii) technology acceptance*, where users perceive the quality and performance of technology; *(iii) expectation assessment:* users compare their expectations with their interaction-based perceptions and assess the extent to which their expectation is confirmed; *(iv) users' satisfaction*, which is partially formed by (dis)confirmation of expectations, since the users' satisfaction is determined by both (dis)confirmation level and perceived usefulness [19]. Finally, ECT holds that satisfaction level and perceived usefulness are critical factors in shaping users' loyal behavior [4].

Therefore, ECT can function as an appropriate theoretical backdrop for the work of technology pace [30], where the role of expectation in shaping the experience of subsequent phases of interaction is explicitly recognized.

Expectation has an important role in shaping the experience of subsequent phases of interaction. Moreover, users' expectations towards technology can predicate the actual technology usage, confirmation and eventually the overall satisfaction [18, 27]. Therefore, our model considered the relation between users' expectations (before interaction), performance (during interaction), and confirmation (after interaction). Accordingly, the following hypotheses were formed:

H1. In the context of slow technology, users' expectation has effect on users' confirmation.

H1a. In the context of slow technology, users' expectation has a positive effect on users' confirmation.

H1b. In the context of slow technology, users' expectation has a negative effect on users' confirmation.

H2. In the context of slow technology, users' expectation has a positive effect on users' satisfaction.

During Interaction (usage assessment): The actual interactions with technology enable users to assess their expectations and influence their technology usage. Based on the experience and knowledge gained through the interactions, users can review and compare their expectations towards technology against its usage. In fact, a significant factor contributing to user satisfaction is the outcome of the confirmation assessment. In that respect, we propose following hypotheses:

H3. In the context of slow technology, users' confirmation has a positive effect on users' satisfaction.

H4. In the context of slow technology, users' confirmation has a positive effect on perceived usefulness.

H5. In the context of slow technology, users' confirmation has a positive effect on perceived ease of use.

H6. In the context of slow technology, users' confirmation has a positive effect on pleasure.

Apart from pragmatic quality, which is focused on the evaluation of usability goals, hedonic quality deals with the assessment of user experience aspects such as aesthetics and pleasure [12]. Aesthetics refers to an extent to which technology is visually appealing [20]. The most commonly used synonyms for aesthetics are attractiveness and beauty. According to prior studies, aesthetics is a predictor of pleasure experienced during the interaction [15, 33], overall preference [31], and perceived usefulness of a technology [33]. Pleasure is an extent to which an experience of interacting with technology is enjoyable [10]. Previous studies found that pleasure affects users' satisfaction [10, 17, 25] users' loyal behavior [17, 25, 34], perceived ease of use [34], and perceived usefulness [34]. Consequently, the following hypotheses were formed:

H7. In the context of slow technology, aesthetics has a positive effect on pleasure.

H8. In the context of slow technology, aesthetics has a positive effect on perceived usefulness.

H9. In the context of slow technology, aesthetics has a positive effect on users' satisfaction.

H10. In the context of slow technology, pleasure has a positive effect on perceived ease of use.

H11. In the context of slow technology, pleasure has a positive effect on perceived usefulness.

H12. In the context of slow technology, pleasure has a positive effect on users' loyalty.

H13. In the context of slow technology, pleasure has a positive effect on users' satisfaction.

Research on playfulness is mainly based on Csikszentmihalyi's flow theory [7]. He defined flow as an experience of total absorption in an interaction with a technology [7]. Playfulness as a motivational characteristic represents an extent to which the user perceives that her or his intention is focused on interaction, is inquisitive about the interaction, and finds the interaction fun or interesting [24]. Researchers argue that playfulness influences satisfaction [1, 29], loyalty [2, 24], and enjoyment [1, 32]. Therefore, the following hypotheses were formed:

H14. In the context of slow technology, playfulness has a positive effect on pleasure.

H15. In the context of slow technology, playfulness has a positive effect on users' satisfaction.

H16. In the context of slow technology, playfulness has a positive effect on users' loyalty.

The aim of the technology acceptance model (TAM) is to predict users' adoption and use of a new technology [9]. According to the main postulates of TAM, behavioral intention to use a technology is determined by perceived ease of use and perceived usefulness, while perceived ease of use has a significant impact on perceived usefulness. Perceived ease of use refers to the extent to which user believes that the using a technology will be effortless [9]. Perceived usefulness is defined as the degree to which a user believes that the use of a technology will enhance her or his job performance [9]. Accordingly, the following hypotheses were formed:

H17. In the context of slow technology, perceived ease of use has a positive effect on perceived usefulness.

H18. In the context of slow technology, perceived ease of use has a positive effect on users' loyalty.

H19. In the context of slow technology, perceived usefulness has a positive effect on users' satisfaction.

H20. In the context of slow technology, perceived usefulness has a positive effect on users' loyalty.

After Interaction (post-use behavior): Several researchers have pointed that users' overall satisfaction can ultimately affect users' intention to use the technology in the future [6, 16, 26]. Therefore, users' overall satisfaction is a predictor of users' loyalty. Consequently, the following hypothesis was formed:

H21. In the context of slow technology, users' satisfaction has a positive effect on users' loyalty.

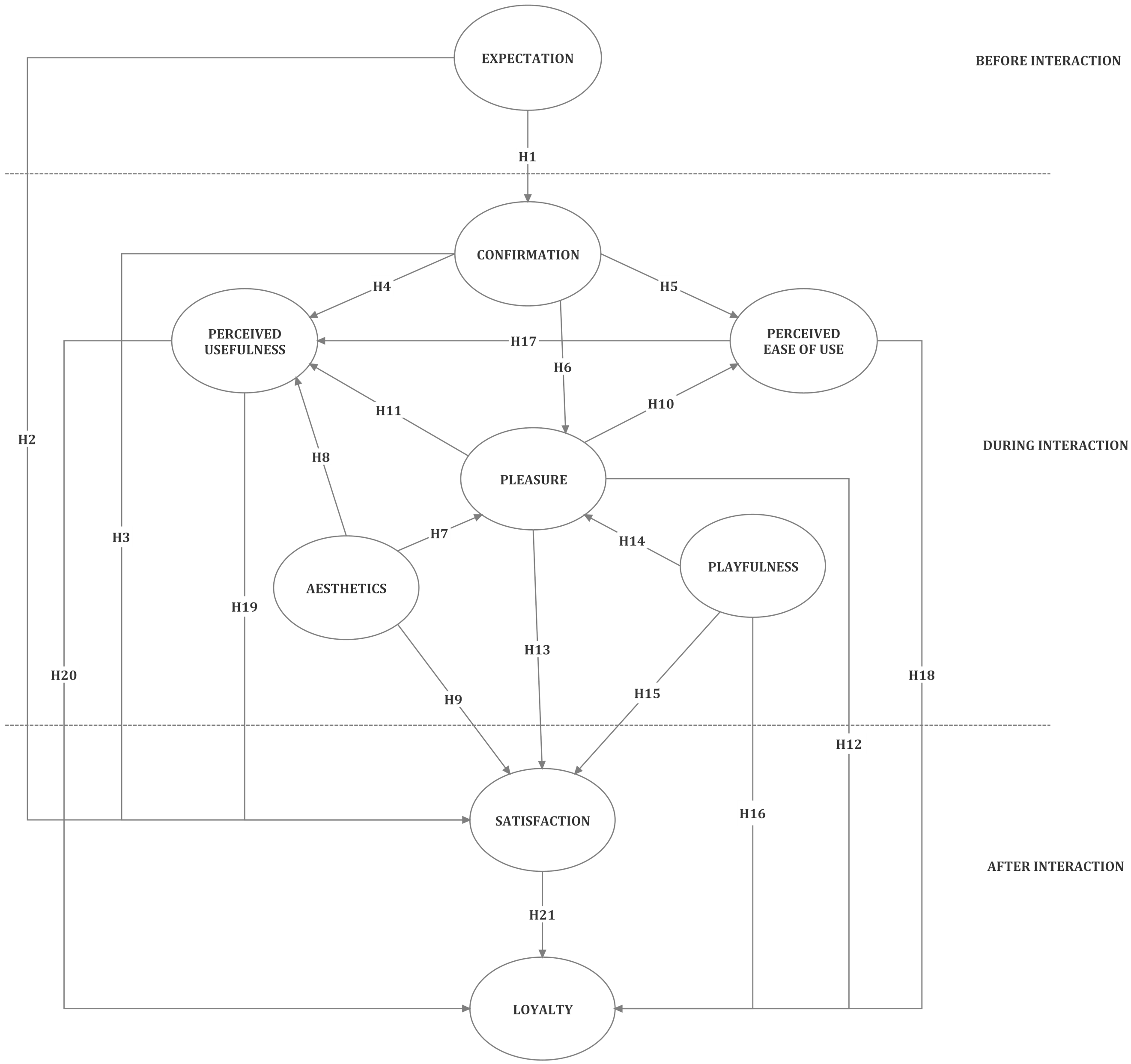

Figure 1. Hedonic Quality of Technology Pace.

FUTURE WORK

In our future work we will put an emphasis on empirical validation of the proposed model in the context of pace. The research methodology will comprise several steps. First, users will be asked to complete a predefined scenario of interaction with a piece of slow technology (e.g. game). Second, quantitative data related to all mentioned facets of hedonic quality will be gathered by means of a post-use questionnaire. Finally, qualitative data on user experience gained during the interaction with the selected slow technology will be obtained by employing the retrospective thinking aloud procedure. In that manner we will discover which facets of hedonic quality significantly contribute to user's satisfaction and loyal behavior regarding slow technologies.

CONCLUSION

By pursuing a design agenda to explore slow technologies, we can help designers, engineers, and architects to consider longer lifecycle issues and the sustainability of their designs. In addition, we can help individuals to reflect on their own values, judgments and beliefs as they relate to themselves, their families, and society. Slow technologies can help develop a sense of shared responsibility transforming individuals into active participants in their own lives, in society, and in the world.

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