Designing for Slow Technology: Intent and Interaction

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ABSTRACT
I argue in this paper for the value of adopting some specific design approaches when creating slow technology, how to create long lasting relationships with technology, and how to design reflective or slow digital interactions. The problem I have addressed is how to design for long lasting technologies with changing users. My approach is informed by activity theory, which provides a theoretical and methodological perspective while design principles inform ideas of process, structure and interaction. The contribution to HCI is in the view of slow technology as demanding a unique set of design skills.

KEYWORDS
Slow technology, design methods, interaction design, activity theory.

INTRODUCTION
Slow technology is concerned with time and with speed, primarily with relation to how humans interact with technological artefacts. Slow technology is a way of thinking about human artefacts that emphasises speed of operation, pace of consumption and the length of time taken to obtain results. As a knowledge domain, slow technology has engaged with many different areas of technology including; (but not limited to) the lifespan of physical objects [14], the design intent behind creating slow technology [4], and how to connect technology with non-human and multi-generational timescales [3].

TECHNOLOGY
For the context of this paper, technology is taken to refer to any purposeful human invention oriented to the organisation of human activities. One way of framing a definition of artefacts and the social function they fulfill is provided by activity theory (AT). Activity theory in Human Computer Interaction (HCI) is a conceptual framework that offers some ways of addressing the interaction of human actors with, for example, software structures and other digital environments. AT takes human activities as a basic unit of analysis and places emphasis on three main strands of thought; hierarchy, mediation and internalization.

The limits of this paper prevent a wider exploration of AT and I will take up one relevant aspect; tool mediation. Ideas are formed and transformed when expressed through different media, when actualised in particular contexts [12]. Artefacts can be instruments, signs, procedures, machines and methods [8] and mediation by technology can take many forms, for example; learning, fulfilling tasks, increasing awareness and facilitating reflection. In the context of slow technology perhaps the latter quality is the most relevant, but it is important to realise that artefacts have no meaning in isolation, they are defined both by social function, by operation and by application in real world situations.

INTENT
The expressed purpose of technology designed to be slow can be difficult to determine, not because it is slow but because intentions may change over time. Social conditions at the time of development such as for example, literacy levels or class hierarchy, may alter radically over many generations of interaction with the same artefact. As framed by AT, if an artefact is defined by social context and by everyday use, when those factors change the character of the artefact itself also changes. What might that mean for design and the creation of technology?

Meanings and functions explicitly assigned to technological artefacts by designers should be framed in such a way as to retain an element of purposeful ambiguity [6]. This takes the idea of designing for interpretation further than handing over interpretative definition to users [5]. Interpretative flexibility has been explored elsewhere [1] [10] in the sense of design meaning evolving over time in the hands of successive generations of users. It is not necessary for the designer to discover latent meanings (those uncovered by users of the artefact) and assess them in the light of manifest meanings (those intended by the designer).

Given that in this vision of slow technology, designers could be 100 years distant, a technological artefact with in-built time resilience can be useful in changing contexts and conditions over long time periods.

Technology moves very fast (Moores law, Kryder's law, Wirth's law etc.) and ways of accessing information can be outdated within five years [3]. The design of a long-lasting artefact must then either be made with durable technology, (a significant challenge; who now uses floppy disks or writes Pascal?) or must provide a way for alteration, updating and change. Examples of this are found in the open source software movement where users of the many platforms (such as Drupal or Sugar) are encouraged to continually update and improve the base code for the benefit of all users, sometimes over many years.

The non-existence of universal information structures [11] shows how difficult it can be to create artefacts that survive long time-scales and changing contexts. The information structure of one age can be incomprehensible to subsequent generations e.g. pre-enlightenment astronomy or the logic of alchemy. Instead, I argue here for a perceptual approach to information architecture.

There is no lack of design principles that appear to hold true across ages and cultures. These include the appearance of the Fibonacci sequence throughout art and nature, archetypes (which have been used to design warning systems for future generations of nuclear waste facilities, with a design lifetime of 10,000 years) and use of mental models. I will focus on three principles relevant to the creation of durable slow technology, ending in each case with an open question for future researchers.

Modularity is a way of managing system complexity that involves dividing large systems into multiple, smaller self-contained systems [9]. As it is nearly impossible to foresee what elements of a slow technology will be rendered obsolete by time, managing information structure in discrete modules isolates system-wide failure from individual module failure. Most modular systems that exist today did not begin that way – they have been incrementally transformed to be more modular as knowledge of the system increased [9] e.g. the personal computer. The challenge for creators of slow technology is the socio-technical nature of the artefact. Modularity is not so much technical as sociological. What units of motive, action or operation can be made modular?

Visibility is a design principle holding that systems will be more usable when their workings are transparent, and when they clearly indicate their function and status [13]. The typical example is a red light to indicate current operation, as on a video camera. An ability to change or personalise visibility settings is important as is acknowledging designer bias. We have no way of determining which workings of the system will hold the most meaning for future users and therefore which ones to make visible. Not only that, but the cognitive processes of visual recognition may themselves change. How can we foresee the evolution of visual interpretation?

Redundancy prevents system failure by supplying multiple versions of the same elements [2]. *Diverse redundancy* is the most appropriate version for future situations when the causes of failure are uncertain or cannot be predicted.

Diverse redundancy means providing different kinds of media for the same information e.g. sound, video and visual feedback or stimulus for the same action. The problem to solve is; how do creators of slow technology determine which modes of communication to use and how many to put in place? How can we provide for multiple failure and prevent cascade failure?

INTERACTION

The speed of computer operations can often seem to contradict the intentions of slow technology. A single second delay each time you pressed a key would probably make your computer unusable [15]. Interactions however can take place over days, months, years or decades, independently of the speed of individual operations. An awareness of how the speed of operation affects the speed of interaction is an important skill for the designer of slow technology. Clicking a screen icon takes a millisecond and feedback is shown immediately to indicate the icon is activated, however the *effect* of that operation (the interaction) could take some seconds to appear, providing a visible metaphor of time scale, or reflecting real time processes by unfolding over some hours; a fundamental re-evaluation of digital speed. Network density, for example, is built up over time, but how much time is difficult to say, and can depend on user engagement, population growth, number of network connections etc.

Slow technology should be adaptive, it should emphasise flexibility and discoverability and it should be multi-layered. These could be seen as strategies for survival. Adaptivity means reacting to user interactions, flexibility means not fixing meanings and intentions and discoverability means leaving complex tasks to be easily discovered. Multilayering gives some guarantee of longevity when seen as part of a unified design strategy. The design of interactions should reflect all these qualities.

Interaction design for long-term engagement should also be activity-centred rather user-centred since future users (who are the majority) are unknown. The weakness of activity-centred design is that it often does not consider the wider context, focusing intently on specific actions. This paper thus argues for a context-aware, activity-centred design approach, one that keeps evolving social conditions in mind and treats knowledge as socially constructed.

CONCLUSIONS

I have outlined a definition for slow technology and identified a possible theoretical and methodological framework in activity theory. I have prioritised the nature of design *intent* in reference to slow technology and made some concrete proposals for what kinds of factors creators of slow technology could take into account. Finally, I have proposed an *attitude* to interaction design adapted to the demands of slow technology.

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