Multi-lifespan Information System Design: A Research Initiative for the HCI Community

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ABSTRACT
This CHI Note proposes a new research initiative for the HCI community: multi-lifespan information system design. The central idea begins with the identification of categories of problems that are unlikely to be solved within a single human lifespan. Three such categories are proposed: limitations of the human psyche, limitations of the structure of society, and slower moving natural time-scales. We then examine possible opportunities and roles for information systems to help construct longer-term solutions to such problems and, in turn, identify key challenges for such systems. Finally, we conclude by discussing significant real world problems that would benefit from a multi-lifespan design approach and point to open questions. This CHI Note's key contribution entails the articulation of a promising new research initiative for the HCI community.

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Multi-lifespan information system design, research initiative, design approach

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Design, Human Factors, Security, Theory

INTRODUCTION

Genocide. HIV/AIDS. Famine. Deforestation. Habitat destruction. Species extinction. Forced exodus. These problems share some commonalities. In one way or another, they entail widespread losses to human beings, to other sentient beings, or to the natural world; moreover, those losses are not likely to be made up within the time frame of a single human lifespan (if ever). It is also the case that information and the processes around information have much to contribute to the solutions of these problems. How then might we address this class of problems through information system design? What unique opportunities exist for information systems and what roles might they play? In a field known for cutting edge innovation, where devices over 5 years old are regarded as legacy, how do we begin to consider processes and solutions that will likely extend beyond a single human lifespan?

Granted there are many urgent issues with problem structures that suggest shorter-term solutions may be successful. Those problems should be pursued on those shorter timeframes. That said, for the class of problems identified here, we believe some resources and effort should be devoted to the longer multi-lifespan view.

This CHI Note takes up the multi-lifespan design challenge and, in so doing, proposes a new research initiative for the HCI community. First, we describe three categories of problems that are unlikely to be solved within a single human lifespan. We then examine some possible opportunities and roles for information systems to help construct longer-term solutions to such problems and, in turn, identify key challenges for such systems. Finally, we conclude by discussing significant real world problems that would benefit from a multi-lifespan approach and point to open questions.

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THREE CATEGORIES OF MULTI-LIFESPAN PROBLEMS

Category 1: Limitations of the Human Psyche

There are some harms that human beings commit against each other that are so profoundly deep that while one hopes for healing to occur within a single lifespan, given the human psyche it seems unrealistic. Consider the horrific harms that all too often result from civil war, genocide, and other forms of extreme conflict among human societies. The Palestinian-Israeli conflict represents one such situation. The tragedies in Ethiopia, Rwanda, Sierra Leone, and Sudan are a few other examples. In some cases there may be clear aggressors and clear victims but in most cases as the conflicts continue both sides eventually commit significant harms against the other. When neighbors have

killed neighbors, when people on both sides have lost children, it may be difficult if not impossible for persons who have lived through those horrors to fully heal and forgive those whom they believe committed the harms. Solutions for peace and rebuilding that move too quickly may be brittle and ultimately fail because they ask too much psychologically of the persons involved.

Category 2: Limitations of the Structure of Society

Societies are comprised of complex social structures with deep, intertwined interdependencies – what one might refer to as the "social fabric" through which people care for themselves and each other, pass along generational knowledge, and sustain human life. Certain events – of either a natural or human origin – can cause severe tears in the social fabric. Consider diseases that wipe out entire segments of a population (e.g., HIV/AIDS) or the loss of traditional knowledge when indigenous peoples are relocated. Or consider changes in social policy, such as the "one child per family" policy in China that in a single generation is remaking family structure in China; this policy will have widespread implications for the social structure that depends upon it (e.g., caring for elderly parents). Rebuilding societal structures around such widespread changes in population distribution requires time for both the changes to stabilize and the population to regenerate itself.

Category 3: Natural Time-scales that Move More Slowly Than a Single Human Lifespan

Nature moves at its own pace. Relative to a human life-span, some natural processes occur "in the blink of an eye". The lifespan of a fly is one example. Other natural processes can take hundreds of years, for instance the re-growth of an old growth forest or the revival of an endangered species with long gestation periods and few young. Many of the environmental crises facing the globe will require solutions that unfold over more than one human lifespan to reverse destructive trends and establish sustainable levels.

OPPORTUNITIES FOR INFORMATION SYSTEMS

What opportunities exist for information systems to engage the problems described above? What critical roles might such systems play? How might we begin to design and develop systems responsive to these considerations? What follows are some initial thoughts.

Preserving Knowledge

While allowing for long-time healing or for natural processes to unfold, there may be information or knowledge that society possesses now or which could be collected in the near-term that could enable a greater range of possible solutions in the future. For example, in response to species extinction, the eminent biologist E. O. Wilson and others have spearheaded an effort not only to protect habitat and endangered species but also to document the diversity of life on Earth. The online *Encyclopedia of Life* [3] represents one such effort. Currently an encyclopedia by "vetted curators", plans are in place to use principles from social computing and wiki technology to develop a "wikipedia" of biodiversity in which people from around the globe contribute descriptions, photographs, video and illustrations of the life forms they encounter. Documenting biodiversity now does not replace species extinction nor is it precisely clear now how such knowledge might be used in the future. What is clear is that if this knowledge – of species and their habitats – is not collected now, it will not be available to future generations when it might be of use.

Supporting Social Structure and Processes

As Winograd and Flores recognized when they wrote, "in designing tools we are designing ways of being" ([11], p. xi), information systems embody not only content (information) but also ways of interacting with and being in the world. Extrapolating from this observation, information systems could be designed intentionally to help support social structure and processes that may be at-risk. Consider, for example, the implication of the widespread infection of HIV/AIDS in some regions of Africa on the social fabric of those communities. Many of these communities have experienced a large loss of life among 20 – 50 year olds, leaving a gap in the social structure between the youth and elders. Moreover, during the next 10 – 20 years, many of these elders will die of old age, leaving a population primarily comprised of individuals under 40 years of age. With loss of life following this trajectory, many of the support roles, social networks, interdependencies, knowledge, extended family structure, care-taking, and other aspects of social life will be diminished and in some cases disappear entirely. The question arises: what can be done now while some segments of those populations are still alive to help identify and, where appropriate, create surrogate social structures to meet some of these needs? How to proceed is an open question. However, work on community building, technology to create and sustain social networks, urban simulation, systems to facilitate sharing resources of materials, time, and knowledge may be of some value here.

Remembering and Forgetting

There is certain wisdom to the adage "forgive and forget." The human mind appears to have a built in mechanism to aid healing: through time, harms become less salient as we begin to forget and perhaps begin to forgive, to heal, and to rebuild human relationships. A tension exists between this mechanism for healing and the increasingly widespread practice of recording human communication and activity. While no straightforward solution exists for how to balance these two activities of "forgetting" and "remembering" we can surface at least three relevant dimensions in information design: what communications and activities are recorded, how easily those are accessed and by whom, and the saliency of those recordings. Consider these dimensions in light of the documents from criminal tribunals and more informal courts for genocide, such as those for the genocides in Rwanda [7] and the former Yugoslavia [8].

On the one hand, those societies need to heal and move forward. Neighbors need to find a way to live peaceably with neighbors. On the other hand, there is a desire to know and remember what occurred, in part to ensure that such atrocities do not occur again and to protect against revisionist histories. Given those societal goals, should such documents be placed on the web for widespread easy access and search? Alternatively, should they be recorded now but made available later, say 20 or 30 years from now, allowing for a certain amount of healing to have occurred? How visible should these records be in the societies at large – stored in somewhat obscure locations or salient on the home pages of government web sites? Such questions defy easy answers. But they need to be engaged, not only by the designers and technologists who will enable the solutions but also by policy makers and the various constituents who have a large stake in the outcomes.

Trust, Security, and Privacy

The balance among trust, security, and privacy may be amenable to a longer-term design approach. According to Baier, we trust when we are vulnerable to harm from others, yet believe those others would not harm us even though they could [1]. Moreover, once breeched, trust takes time to be re-established. When we no longer trust others not to harm us, we often fall back on security as a means to protect ourselves from harm. In the current information climate, system design runs from security breech, to patch, to security breech, to patch again in what appears at times to be an unending cycle. Often the thing that we are seeking to protect is our privacy: who has access to our information, under what circumstances, and to do what with. Design for the short-term tends to focus on preventing harms with tools such as firewalls and encryption, what we might call a security worldview. A shift to the multi-lifespan perspective brings time into the design space so that trust can be established, built upon and strengthened incrementally, and maintained. Design with this goal in mind, may create opportunities for a qualitatively different balance among trust, security, and privacy.

Inclusivity and Access

In information system design, we typically seek solutions to issues of inclusivity and access within the constraints imposed by existing infrastructure and common practices. How might a multi-lifespan perspective position us to envision more satisfying solutions? In the physical world, the progress made on wheelchair accessible buildings and sidewalks points the way. One dimension includes the possibility of envisioning an information infrastructure that more readily supports access; a second dimension includes social policy to ensure implementation of that infrastructure (a kin to the laws in some countries which require handicap access to buildings). Granted the difficult questions of variation among human capabilities remains.

THREE CHALLENGES FOR MULTI-LIFESPAN INFORMATION SYSTEM DESIGN

We turn now to discuss briefly three challenges that would likely cut across most multi-lifespan design efforts.

The Challenge of Shifting Conditions

In the multi-lifespan landscape, it is unrealistic to think that the social and environmental conditions under which a solution is first conceived will remain unchanged throughout the course of implementing that solution [9]. Thus, in addition to an initial solution path, effective multi-lifespan solutions will need to embed within themselves processes for adaptation along with core commitments (e.g., to societal healing). The core commitments serve as a check to steer the adaptive process toward the long-term goals.

The Challenge of Passing the Baton Across Generations

By definition multi-lifespan solutions will be carried out across more than one generation of individuals. Thus, representations and mechanisms are needed to pass along the vision, commitments, and adaptive processes from one generation to the next. This challenge shares some structural similarity with design teams in which composition of the team changes over time; the strategies that work in those contexts may be able to be leveraged in multi-lifespan situations [6].

The Challenge of Morale

On the one hand, it can be life affirming to work on multi-lifespan problems as this perspective opens up new possibilities for solutions. On the other hand, at times such work can be demoralizing given the magnitude and longevity of the problems under discussion. Progress may be slow and, depending upon when an individual joins a multi-lifespan problem-solving endeavor, the solutions in their entirety likely will not be realized within the individual's lifespan. Thus, it becomes meaningful to ask in what ways the interaction design could help to convey a sense of progress and support morale. While clearly an open research question how best to do so, recent work on informing through interaction [5] and social responses to computer technology [10] suggest two possible approaches.

LAST THOUGHTS AND OPEN QUESTIONS

This CHI Note's key contribution entails the articulation of a promising new research initiative for the HCI community. The ideas presented here begin to frame a research and design agenda around multi-lifespan processes and solutions. To make progress here, significant real world problems will need to be engaged[1]. The goals would be

[1] This work is inspired by and sympathetic with that of Stewart Brand and others engaged with the Clock of the Long Now [2]. One key difference is that the long now work concerns the development of a clock as a societal icon while this work concerns existing societal problems.

twofold: (1) to contribute meaningful information system designs to the specific real world problems under study; and (2) to generate more general knowledge about the design of multi-lifespan information systems. Preservation of indigenous knowledge and documenting biodiversity (both mentioned above) illustrate the sort of problems one might work on here. As a third example, consider one taken from our own research: with our colleagues, we have begun work on the information legacy of the International Criminal Tribunal for Rwanda; in this project, we are designing information systems and interactions to support Rwandans in their efforts to achieve healing, reconciliation and a lasting peace in the aftermath of the 1994 genocide, now and for the decades ahead [4].

We conclude with several open questions that, in turn, suggest next steps.

Additional Categories of Multi-lifespan Problems. In addition to the three categories of multi-lifespan problems suggested here – limitations of the human psyche, structural limitations within a given society, and slow time frames for some natural processes – are there other problem categories that would benefit from a multi-lifespan design approach?

Adaptive, Not Prescriptive Processes. As discussed above, rigidly prescriptive approaches are likely to fail in the multi-lifespan context as they lack internal mechanisms for responding to changes in conditions over time. What models exist for building in adaptive structures? Here it may be useful to look to exemplars such as some national constitutions or the structure of a nation's courts.

How Long a Timeframe? When taking a multi-lifespan perspective, how long a timeframe would be helpful to think with? Some Native American communities speak of "seven generations;" that is one possibility. Another intuition is to begin with a 100-year time frame – long enough to move beyond a single human lifespan but somewhat within the human ability to imagine.

What If a Near-term Solution Might Work? Yet another question lurks in the background: What of significant societal problems where a shorter-term solution might succeed? In these instances, it may make sense to pursue both short-term and multi-lifespan solutions simultaneously. If the shorter-term solution succeeds, then society will have a solution in hand and, in part, have wasted the resources for the multi-lifespan work (though, hopefully, some of that work might be able to be repurposed). If the shorter-term solution does not succeed or only succeeds in part, then the groundwork for a multi-lifespan solution would be in place and work begun.

In closing, the challenges we face as a society are immense; the importance for the human condition tremendous. It is hoped these ideas will stimulate a new approach within HCI research and design that takes the longer view. From this perspective, perhaps, innovative solutions will flow.

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