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Ethics of Seamless infrastructures: Resources and Future Directions

Abstract:

The argument of this paper is that the rhetoric of “seamlessness” and its embodiment within certain information infrastructures may be ethically problematic due to the way it articulates a particular kind of passivity and lack of engagement between people and their actions and between people and their social and material environment. The paper describes “seamlessness” as a socio-technical value, details its use in context, and outlines three areas of scholarship that can provide necessary perspectives and methods for research on “seamlessness” and other tropes of ubiquitous computing.¹

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As the call for this special issue notes, there is an increasing potential for novel ubiquitous and embedded computational technologies to be invisible and to construct passive subjects. The call also notes that due to the emergent quality of ubiquitous computing, it is difficult to evaluate and discuss its ethical qualities or to begin to hypothesize whether not the above potential will be realized. This being said, more and more aspects of what might eventually be a ubiquitous computing infrastructure are coming online. This means that while we may be unable to fully evaluate the ethics of ubiquitous computing currently, we certainly can debate some of its more important aspects. One of these, the focus of this paper, is the notion of "seamless infrastructure" that currently dominates many discussions about online infrastructures.

While the notion of "seamless infrastructures" may be taken in different ways, the aspect addressed in the paper is the way seamlessness emphasizes the deliberate "making invisible" of the variety of technical systems, artifacts, individuals and organizations that make up an information infrastructure. This work actively disguises the moments of transition and boundary crossing between these various parts in order to present a solid and seemingly coherent interface to users.

There are often good technical and usability reasons for seamlessness and it may be more or less appropriate, depending on the purposes to which the infrastructure is put. However, I want to argue for increased theoretical and design-oriented thinking on this issue, in order to overcome the ethical problematics this paper will detail. Therefore, my goal is to relate existing positions on information infrastructures and extend them in two ways; first, by pointing to the ethics involved in articulating seamlessness as a value; and second, to begin to describe a clearer idea of the kind of agential relationship that seamlessness works to create. This latter extension requires attention to new thinking on notions of interactivity and agency, and I will conclude by pointing to some resources in this area.

Finally, I should note that while the call for this special issue focuses on the role and usefulness of using applied media ethics to critique and examine ubiquitous computing, I rely instead on similar scholarship in science and technology studies and the philosophy of technology. What unites this work to the concerns of media ethics is two similarities; first an emphasis on pragmatic application as well as theoretical exploration (an empirical philosophical approach,) and second, attention to the issues of

visibility, transparency, and accessibility to the moments and institutions of production, that engender the possibility of substantive critique and resistance to bias.

Seamlessness

It is important to differentiate "seamlessness" as a design goal from the notion of "end-to-end" that is another descriptive term used in relation to technical infrastructures. (Gillespie, 2006) While the latter aims to link separate systems "end-to-end" in order to create a total infrastructure solution, the former emphasizes the erasure of the marks and boundaries between separate systems thereby creating an infrastructure whose individual parts blend transparently – without seams. The quotes below demonstrate the pervasiveness of this notion.

"While self-sufficiency and satisfaction are important to learning and to structuring library services that support learning, the importance of seamlessness is crucial, and possibly the dominant trend for the future of libraries. According to the OCLC report, in today's society: "The traditional separation of academic, leisure and work time is fusing into a seamless world aided and supported by nomadic computing and information appliances that support multiple activities." (Martin, 2004)

"Wouldn't it be nice to have one device - better yet supported by one seamless infrastructure - that could do it all, everywhere, at the fastest speed possible, for a reasonable initial investment and monthly cost, that didn't require a rocket science degree to learn how to use, and that didn't become obsolete in less than a year? Enter a research group at UCSD affiliated with Calit² doing its part to address the "seamless infrastructure" part of this problem. Their project is called "Always Best Connected." (Calit², 2003)

These two quotes, one from information service (e.g. librarianship) context, and one from a information development context (e.g. computer science), point to the ubiquity of the rhetoric of seamlessness in current discourse around information infrastructures. While the author of the first quote notes that other aspects of the user experience are important, he describes seamlessness as the crucial need for library systems today. He also references a report by the Online Computer Library Center, a nonprofit organization dedicated to helping libraries provide access to information through the development and

implementation of technology resources. This quote emphasizes that it is not just that information infrastructures should be seamless to the user, but that the world itself is becoming increasingly seamless. This is mirrored in the second quote, this one from a technical group at the California Institute for Telecommunications and Information Technology, (Calit2), a team whose very name focuses on the ways in which information technology can help with the convergence of the world – Always Best Connected.

It would be easy to dismiss these quotations as mere rhetoric in arenas of technical work that have, for many years, focused on issues of information convergence, usability, and the reduction of complexity. Seamlessness seems to fit easily into this context alongside other claims of interface transparency and the “backgrounding” and invisibility of information devices and resources (e.g. Norman, 1998). However, it is important to note that seamlessness is no longer a technical dream, but has begun to move into the network, insubstantiated in many of the infrastructures that are part of a Web 2.0 internet. Probably the clearest example of this (and its greatest success,) is the development by Apple Corporation of the iTunes/iPod media infrastructure.

Services and seamlessness

The most famous example of the success of a “seamless” approach to design is the iPod and iTunes system developed by Apple. In an oft-quoted presentation (since published online) Peter Merholz of Adaptive Path, a US-based product design company, has made the product/system link explicit:

“The iPod is a product, but it succeeds only because of how it works within a system...The iTunes software is the key to the success of the system. It allows the iPod to be a successful product, because it offloads the bulk of functionality to the PC, which is better suited to handle it...But it doesn't stop there. Apple truly cinched the deal when it opened the iTunes Music Store. Now you could fill your iPod with all manner of media, listening or watching it wherever you wanted to. The iPod device isn't a product in and of itself so much as it is an interface to this larger system.” (Merholz, 2006)

It is important to note how successful this infrastructure has been. By conjoining purchase, distribu-

tion, and consumption of media, Apple has revolutionized access to media and created increasingly high revenue streams for itself. However, it is important to note the other necessary parts of the infrastructure that are often ignored when the iTunes/iPod service design is described. This service is not just made up of media servers, personal computers, and consumer electronics, but also includes the Digital Rights Management (DRM) software and protocols that allow Apple to extend control to the media files themselves, and the legal regimes (such as the Digital Millennium Copyright Act in the United States) that provide the means for Apple to discipline those that break their controls. What makes the infrastructure function is a conflation of social, technical, and legal regimes, that, in addition to the technical objects themselves, work to create and maintain a coherent and seamless experience for users.

Creating such experiences is not entirely new. In his overview of service design, Merholz describes Kodak's development of the box camera in the late 19th century as another example. Instead of the 15-20 steps previously required to take photographs, the box camera, the roll film it was designed to take advantage of, and an increasing network of photographic equipment distributors and developers, simplified the process of taking pictures. Here, the technical knowledge required to print photographs (before requiring technical knowledge, chemical supplies, and one's own darkroom,) was replaced by the seamless integration of film and camera manufacturing, retail, and, eventually, the mail delivery system, making photography available to the masses.

It is certainly obvious, if not from the iTunes/iPod successes, then from the example of Kodak, that the development of infrastructures that connect and blend multiple social and technical systems can be both economically and socially productive. It is equally obvious that while there is value in such infrastructures (for example in providing increased access to information resources and practices,) there are also problematic aspects. In order to call attention to these, I turn now to three areas of research that are useful for carrying out information infrastructure critiques.

Technology and ethics

A standard ethical concern regarding technologies has been the issue of determinism, that technologies and their uses pre-suppose history and social

life by actively working to construct and organize social relationships. This thematic work was most strongly examined in the theories and analyses of bureaucratic technologies in the 1950's and 1960's (e.g. Ellul, 1964), with the most sophisticated versions of this argument found in the work of the Frankfurt School. Marcuse, in particular, addresses how technology in modern culture is constitutive of dominant social relations as well as their reproduction. (Marcuse, 1941; 1964) For Marcuse, technologies are more than merely material devices, instead they create a "mode of organizing and perpetuating (or changing) social relationships" and thus become "an instrument for control and domination." (Marcuse, 1941:414).

Information systems and values

This mode of substantive technological critique has lost favor in recent years, due, in part, to the overwhelming philosophic, historical, and sociological work demonstrating the complex relationships between technology and society. Information systems have been particularly addressed, and work from diverse disciplines and subfields such as Science and Technology Studies, Philosophy of Technology, Computer Supported Collaborative Work, and others have demonstrated the various ways in which individual activity and social organization are co-constructed with scientific choice, technical decisions, and the resultant material information practices.

One thread of this work focuses on how values are embodied through design activity in technical infrastructures and objects. (e.g. MacKenzie and Wajcman 1985; Feenberg, 1991; Latour 1992, Hughes 2004). These authors (among others) also provide an explicit critique of the determinist theories mentioned above, noting in particular, that the instrumental values of functionality, rationality, and hierarchy that were a particular concern of previous scholars, are often choices, rather than naturally-occurring and inherent properties. Equally, many of these scholars note that other types of substantive values may also be embodied in technical systems, including notions of liberty, freedom, autonomy, and trust. Recent work by such scholars as Helen Nissenbaum and Batya Friedman, among others, has emphasized the necessity (and difficulty) in taking values into consideration during the design of technical systems but also in analyzing designs after the fact. (Friedman and Nissenbaum 1996; Friedman and Kahn, 2003; Nissenbaum 1998; 2001; 2004).

The growth of this area of research, often called "value-sensitive design"¹ or "values in design"², tends to focus on issues of human dignity and welfare, inclusivity, and the furthering of individual agency. This scholarship makes visible the ways in which values are embodied within technical systems and how design-oriented approaches constitute, articulate, and often negotiate these values. Such work reveals the contingency of technical values and the possibility of alternative approaches.

Infrastructure Studies

Another useful perspective comes from the study of infrastructure. A cross-cutting set of scholars from information studies, science and technology studies, communication, and other disciplines has been engaged in studying the effects infrastructures have on both individual and social behavior (e.g. Star and Ruhleder 1994; Bowker, 1994; 1996; 1998, Bowker and Star, 1999; Eschenfelder, 2003; Hanseth and Monteiro, 1997; Slaton and Abbate, 2001). This area of research, recently named as "Information Infrastructure Studies" (Bowker, Baker, Millerand, and Ribes, forthcoming), provides a rich critical perspective on many of the trends that are the focus of this paper. Of particular importance is the rich definition of infrastructure that emerges from this context. This definition emphasizes the complexity of infrastructure, defining it as *pervasive enabling resources* (Bowker, Baker, Miller and Ribes, forthcoming). Infrastructure scholarship also provides insight about the interweaving of technical and social systems – wires, tubes, computers, optical cables but also legal and political regimes, organizations, and individuals – that constitute infrastructure. Infrastructures, based on this definition, consist of the connecting of different systems, in order to articulate a coherent whole. Often mundane, they have the tendency to become backgrounded to other aspects of life and therefore require techniques such as "infrastructural inversion" (Bowker, 1994; Mackenzie, 2005) to make their various parts and functionings visible. This area of research is useful in critiquing the "seamlessness" that is the focus of this paper in at least three important ways; first, by broadening the definition of infrastructure beyond the purely technical; second, by defining the "seams" of infrastructures as the boundaries be-

¹ <http://projects.ischool.washington.edu/vsd/>

² <http://www.nyu.edu/projects/valuesindesign/>

tween systems; and third, by articulating a method for revealing infrastructures through analytic work.

“Seamful” design

Finally, an important critique of the notion of “seamlessness” comes from within design and computer science itself. (Chalmers and Galani, 2004) This analysis focuses on how the desire for seamlessness comes about as an attempt to make information tools and resources “...weave themselves into the fabric of everyday life until they are indistinguishable from it” (Wieser, 1991). Relying on the ideas of “ready-to-hand” and “present-at-hand” from Heidegger’s hermeneutic approach to tool use, Chalmers and Galani describe how the former consists of a non-rationalizing and pragmatic form of use, while the latter is a reflexive and abstracting process. They note that while having information tools “ready-to-hand” may be a desirable goal, having access to information tools as “present-at-hand” is essential to the adoption and, if necessary, adaptation of them for differing users and contexts. Without this access, the circular process of interpretation seen by Heidegger and later hermeneutic scholars as necessary for human development and self-expression, fails. Chalmers criticizes the notion of “seamlessness” as reducing the ability to reflect and repurpose information infrastructures, and articulates an alternative strategy:

“We are particularly interested in seamful systems whose underlying infrastructural mechanisms are “literally visible, effectively invisible”, in that everyday interaction does not require attention to these mechanisms’ representations—but one can selectively focus on and reveal them when the task is to understand or even change the infrastructure.” (Chalmers and Galani, 2004: 253)

This seems a valid and important critique of seamlessness due to the way it clearly articulates what is at stake. While Chalmers focuses on the pragmatic aspect of this issues (e.g. whether or not “seamless” infrastructures will function appropriately,) it is not difficult to extend this problem to the ethical realm. Chalmers and Galani’s analysis provides a way for us to understand how seams may work to provide access to a particular mode of engagement with information technology. For them they function as a means for transitioning between reflexive and unreflexive modes of use.

Ethics of seamlessness

Together, the above perspectives clearly articulate some useful definitions and perspectives with which to critique and understand the ethical issues associated with “seamlessness.” As the “values in design” literature demonstrates, values are not necessarily inherent to technologies but are the result of complex negotiations that happen in both design and use. “Seamlessness”, understood as a choice, rather than a purely rational value, should be compared to other types of values (such as inclusion and justice) just as previously happened with values of technical rationality and efficiency. Information Infrastructure Studies provides a clear definition of what infrastructures are and how they work, providing some methods for picking apart the seams and understanding the social, legal, and institutional systems by which they are typically constituted. Finally, Chalmers and Galani’s focus from within computer infrastructure on “seamful” design, and their use of hermeneutic philosophy gives us some additional tools. However, we still remain divided between seamlessness as positive, in that it may (as in the iTunes/iPod and the Kodak box camera cases) open up information access to non-expert users, and as negative in that it may reduce the resources necessary for objection and critique. For this final issue we need to rethink some of the standard ways of conceptualizing agency and technology.

Agency, infrastructure, and seamlessness

It is perhaps obvious that the previous ways of understanding the structuring effects of technology and the ways in which it reduces agency and constructs subjects are not entirely useful in this context. Equally, the separation of modes of engagement with tools between unreflexive and reflexive modes requires some additional attention. Chalmers (2004) puts forth the idea of purposive “coupling” of media forms in the design of “seamful” ubiquitous computing systems, seeing the support of movement between forms as helping bridge the gap between reflection and use. Equally, Cultural Historical Activity Theory, has a rich literature that addresses a similar hermetic circle, using the conjoined relations of “objects” (reflexive) and “tools” (unreflexive) and focusing explicitly on the social resources that make such transitions possible. (e.g. Engestrom and Escalante, 1996; Nardi, 1996.) While these perspectives provide some purchase, we still require a better way of understanding the kinds of engagements that seamlessness may work to create. In this, it may be that the binary relations

between “ready-to-hand/tool” and “present-at-hand/object” that are used (however analytically) to examine information infrastructures, limit our ability to analyze and understand. While a deeper analysis of this issue is beyond the goals (and word limit) of this paper, recent work in Game Studies on the concept of interaction and the relations between structure and agency may prove useful (e.g. Aarseth, 1997; Murray, 1997; Wardrip-Fruin and Harrigan, 2004).

Recent scholarship in Feminist Science Studies and Epistemology is also directly applicable to these issues, in particular the work of Thompson on “ontological choreography” (Thompson, 2005) and Barad on “agential realism.” (Barad, 1999; 2007). While directed towards ontological and epistemological questions about discourse and realism, such perspectives provide a novel way of understanding how agency is negotiated beyond the binaries articulated above. Thompson (particularly in Ch.6) demonstrates the way the agency of women IVR patients includes the (necessary) ability to transition themselves between an object and a subject position in relation to the medical techniques they were experiencing. Equally, Barad posits the notion of “intra activity” to describe the “within” rather than the “between” of the constitution of subject/object relations. For her, agency is constituted in negotiations within subjects and objects, rather than something that is exchanged between them.

Such perspectives require much more attention in order to help us differentiate and understand the kinds of agencies constructed by infrastructures. Still, one thing is clear, while most information infrastructures are “interactive” in the sense that they allow us action, many are not “intra active” in the sense that we are allowed to negotiate when and how we take control. Ultimately, this may be the true ethical issue with seamlessness – by hiding the seams between systems, we are not allowed the ability to decide when and how we engage with them.

Conclusion

One important ethical question that faces ubiquitous computing in general is not just what kinds of subjects do these infrastructures construct and maintain, but also what possibilities are left for individuals and non-normative social groups to resist these enfoldings and characterizations in order to allow for difference? Here it is important to note, as Paul Dourish and Genevieve Bell have recently

remarked, that ubiquitous computing, in the ways in which it predicts the future, also has much to say about current normative social relationships. (Bell and Dourish, 2007.) In other words, it is not just individual identities that are constructed within ubiquitous infrastructures but also the ways individuals organize to form social wholes. It is not just that individual identity is “torqued”, to borrow a term from Bowker and Star’s sophisticated analysis of infrastructure, but that social life itself may be twisted to fit the standards and categories of embedded technical systems.

What might we then say about the problematic of seamlessness? While there may be other strategies, it appears that the seams between systems provide the most opportunity for extending, troubling, and repurposing infrastructures. Without self-knowledge of these seams and if the infrastructures themselves hide these seams from view, we are left with little recourse to the kinds of actions, behaviors, and identities infrastructures presuppose. Moreover, and more importantly, without knowledge of the boundaries, users may be left with little ability to negotiate the moments of switching between active and passive roles. Yes, seamless infrastructures may remain “interactive” but it is an interactivity on their own terms. By removing our knowledge of the glue that holds the systems that make up the infrastructure together, it becomes much more difficult, if not impossible, to begin to understand how we are constructed as subjects, what types of systems are brought into place (legal, technical, social, etc.) and where the possibilities for transformation exist.

Seamlessness as a value for current and future information infrastructures, including the ubiquitous computing infrastructures that are the focus of this issue, may be ethically problematic for the reasons noted above. This is not to say that resources for critiquing and pragmatically informing alternative values do not exist. Some of the resources have been noted above, in particular the social analysis of information technologies as including embodied values, and the methods for articulating and making infrastructures visible. However, the questions of agency and transparency raised by information infrastructures, seamlessness, ubiquitous computing and similar visions such as pervasive and ambient intelligence, remain a concern. Again, the difficulty here is in linking conceptual work on action and agency to the empirical and material contexts of information infrastructure development.

More optimistically, we might also note that despite the best efforts of many developers, seamless and

ubiquitous computing remain, as Bell and Dourish illustrate, "...characterized by improvisation and appropriation" and by "...flex, slop and play." (Bell and Dourish, 2006: 11). Still, if nothing else, we can critique the clean, orderly, and homogenous future that is at the heart of these modernist visions of ubiquity and use these critiques to better understand the ethical dimensions of our increasingly socio-technical world.

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