Taking Culture Seriously:
Educating and Inspiring the Technological Imagination

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Introduction:
On the Relationship of Technology and Culture

Ignorance costs.

Cultural ignorance -- of language, of history, and of geo-political contexts -- costs real money.

Microsoft learned this lesson the hard way. A map of India included in the Windows 95 OS represented a small territory in a different shade of green from the rest of the country. The territory is, in fact, strongly disputed between the Kashmiri people and the Indian government; but Microsoft designers inadvertently settled the dispute in favor of one side. Assigning the territory (roughly 8 pixels in size on the digital map) a different shade of green signified that the territory was definitely not part of India. The product was immediately banned in India and Microsoft had no choice but to recall 200,000 copies. Through a release of another version of its famous operating system, Microsoft again learned the cost of cultural ignorance. A Spanish-language version of Windows XP OS marketed to Latin American consumers presented users with three options to identify gender: "non-specified," "male," or "bitch." In a different part of the world, with yet a different product, Microsoft again was forced to recall several thousand units. In this case the recall became necessary when the Saudi Arabian government took offence at the use of a Koran chant as a soundtrack element in a Microsoft video game. The reported estimate of lost revenue from these blunders was in the millions of dollars.[1]

These examples illustrate the very real ways in which cultural ignorance costs money and good will in the big business of technological innovation. In this case, several seemingly insignificant details incorporated into state-of-the-art digital applications not only resulted in the recall of several widely distributed products and damage to a global brand,

1. "How eight pixels cost Microsoft millions," Jo Best, c|net News.com. http://news.com.com/How+eight+pixels+cost+Microsoft+millions/2100-1014_3-5316664.html.

but also demonstrated a grand failure of multicultural intelligence within the ranks of a multinational corporation.

Although it is tempting to deploy these examples as a contribution to the popular pastime of Microsoft bashing, that response is neither creative nor particularly insightful. Rather, I use the examples of the costliness of a multinational corporation's cultural blunders to assert that the process of technological innovation must take culture seriously. Moreover, I argue that the process of technological innovation is not solely about the design and development of new products or services, but rather is the very process that creates the cultures that we inhabit around the globe.

Technology is not an epiphenomenon of contemporary culture, but rather is deeply intertwined with the conditions of human existence across the globe. Although we are now more than a century past the dawn of the industrial age, the global distribution of the benefits of industrialism, i.e., basic health and subsistence-level resources, remains disturbingly uneven. In considering the significant loss of life due to recent hurricanes in the southern U.S. it is clear that the demarcation between rich and poor does not map simply onto the division between the global North and South. The tragedy revealed a wide-scale ignorance of the reality of the technological situation of people living in those regions. Evacuation orders were not only late in coming, they only addressed those who were already technologically endowed with the means to flee to safer ground, i.e., the automobile, or to those who had access to other technological resources, such as planes, trains, or buses. When lives are at stake, which is often the case with the deployment of large-scale or new technologies, it is ethically imperative that the technological imagination must explicitly consider cultural, social, and human consequences. This imagination must be trained to imagine the unimaginable—that is, to actively imagine unintended consequences.

When developing new technologies, culture needs to be taken into consideration at even a more basic level: as the foundation upon which the technological imagination is formed in the first place. I define the technological imagination as a character of mind and creative practice of those who use, analyze, design and develop technologies.[2] It is a quality of mind that grasps the doubled-nature of technology: as determining and determined, as both autonomous of and subservient to human goals. This imagination embraces the possibility of multiple and contradictory effects. This is the quality of mind that enables people to think <u>with</u> technology, to transform what is known into what is possible, and to evaluate the consequences of such creation from multiple perspectives.

The Interdisciplinary Education of the Technological Imagination

2. The resonance with C.W. Mills' notion of the "Sociological Imagination" is intentional here. C. Wright Mills, *The Sociological Imagination* (London: Oxford UP, 1959). See also: Michel Benamou, 1980. "Notes on the Technological Imagination," in Teresa De Lauretis, Andreas Huyssen, and Kathleen Woodward, eds. *The Technological Imagination: Theories and Fictions*. (Madison, WI: Coda Press, pp: 65-75).

Every discipline within the contemporary university has been transformed by the development of new technologies, whether technology now becomes an "object" of study, as in the humanities and legal studies; a tool of knowledge production, as in the social and medical sciences; or a domain of new disciplinary knowledge, as in the engineering sciences, cinema, and communication studies. This means that every discipline within the university has something important to contribute to the development of new technologies.

Universities need to actively educate and inspire researchers, teachers and students to develop a robust technological imagination. This is an educated "quality of mind" that is by nature thoroughly interdisciplinary. To understand technology deeply one needs to apprehend it from multiple perspectives: the historical, the social, the cultural, as well as the technical, instrumental and the material. We must develop interdisciplinary research and educational programs that enact and teach skills of *creative synthesis* of the important insights from a range of disciplines in the service of producing *incisive critique* of what has already been done. From this critique emerges the understanding of what *is to be done*. In this formulation, the traditional role of criticism is expanded. No longer an end in itself, criticism of what has already been done is a step in the process of determining what needs to be done differently in the future. Our educational programs need to teach skills of critical thinking that lead to creative proposals for doing things differently. Then we need to teach students how to do things differently with technologies: how technologies are built, how they are implemented, how they are reproduced and how they affect cultural arrangements. This is the foundation of innovative research and new knowledge production. This is the work of the university-educated technological imagination.

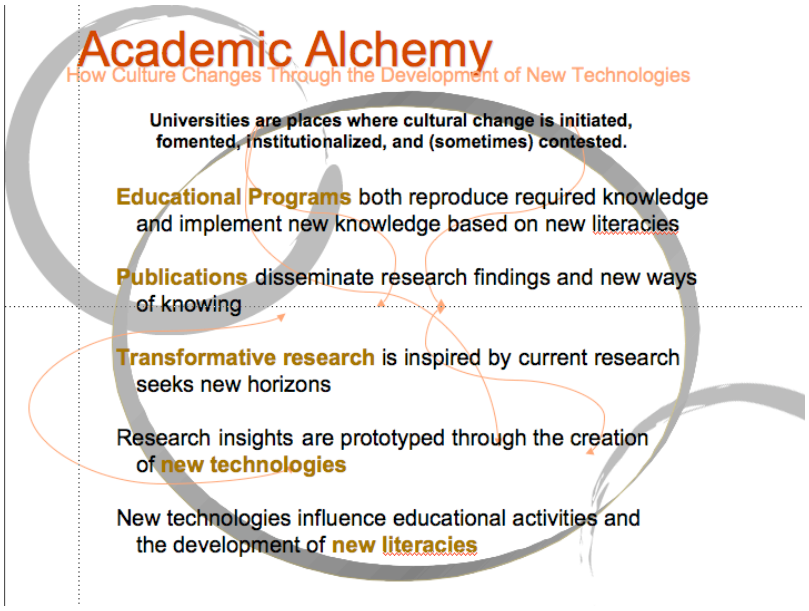

Figure 1: How the university contributes to significant cultural change through the development of new technologies

Educational programs that seek to develop a robust technological imagination must include training in 1) the history of technology, 2) critical frameworks for assessing technology and identifying effects, 3) creative and methodological use of technological tools, 4) pedagogical activities and exercises that create new technological applications, devices, and services, 5) architectural and virtual spaces for social exchange and creative production, and 6) international studies and policy analysis that provide appropriate cultural and institutional contexts of assessment of effects. This is the necessary multidisciplinary foundation for the development of new technologies.

Moreover, there is a category of technology—what might be labeled technologies of literacy—that serve as the stage for the elaboration, reproduction, performance, and dissemination of culture across the globe. Technologies of literacy include the development of pedagogical methods for educating literate citizens who not only understand the technologies already available, but who will be equipped with the intellectual foundation and habits of mind to respond and use the new technologies that will become commonplace in the future. This is a crucial dimension of the education of life-long learners. Thus these educational programs must experiment and develop innovative pedagogies that engage multiple intelligences: the social, cultural, and emotional, as well as the cognitive and the technical. Furthermore these pedagogies must utilize the full range of new technologies that enable multiple-modes of expression in the production of educational materials and educational output: visual, textual, aural, corporeal, and spatial. In this way these programs both draw on new technological literacies and engage faculty and students in the creation of the literacies of the future.

In a research context, the manifestation of this imagination comes through the collaboration of faculty and researchers from different disciplines working together on projects of social and cultural significance to create human-centric technologies. The output of their research may take several forms: innovative technological devices, applications, research monographs, presentations, demonstrations, performances, and installations. The guiding strategy for all these research projects is that they "take culture seriously;" culture serves as both the context for the formulation of the research problem in the first place, and as the domain within which significant technological developments will unfold. In this way, this kind of technology-based research understands its ethical dimensions and acknowledges its ethical responsibilities.

To do this right, we need to ground these interdisciplinary efforts in new ways of thinking about technology. We need a new educational philosophy that can guide our efforts to create "original synners"—students who can synthesize information from multiple perspectives.[3] We need to develop new institutional structures for research and new pedagogies that support the development of the technological imagination and inspire its practical application. We need new analytical frameworks that enable us to imagine the

3. This is an explicit reference to Pat Cadigan's novel, *Synners* (New York: HarperCollins, 1991). For a more complete discussion of the education of original synners: "Engineering Cultural Studies: The Postdisciplinary Adventures of Mindplayers, Fools, and Others" *Science + Culture: Doing cultural studies of science, technology and medicine,* eds. Sharon Traweek and Roddey Reid (New York: Routledge, 2000: 259-274).

multiple consequences of the deployment of new technologies. I also argue that we need to specify the ways in which all of us within the university are accountable for the future of technological development. Designers and engineers need to address their cultural responsibilities. Humanists and social scientists must contribute creative direction as well as critical analyses. In an effort to suggest a starting point for new multidisciplinary collaborative applied technology-based research projects that take culture seriously, I offer the following three broad questions:

What are the most pressing cultural issues within the US and across the world? All technologies rearrange culture. We know that new technologies are especially useful in facilitating interactions among people from different cultures. How is the project of cultural reproduction served by new technologies? How will current as well as traditional cultural memories be preserved over time? How should we choose what to forget? What role does narrative play in the technological reproduction of culture? How is narrative itself a technology of culture? What new narrative devices/applications need to be developed to aid the reproduction of culture? The use of new digital devices for entertainment and pleasure yields contradictory effects. While some people in the developed world enjoy an expanded range of mobility, enabled by the development of mobile communication devices, others become more sedentary and confined within a limited orbit Through the use of global telecommunication networks people can expand their global awareness through virtual visits. What are the cultural possibilities and consequences of virtual mobility? What is the future of embodied play and entertainment? What implication does this have for the design of playgrounds, digitally-augmented performance spaces, and the development of creative toys? What are the implications of virtual tourism for the reproduction of privilege and mobility? What are the cultural possibilities of technologically-augmented reality?

What are the literacies of the 21st century? Literacy is a technological phenomenon. The development of new technologies of communication and of expression not only influence but demand the development of new literacies. These literacies do not compete with traditional print-based literacies, but rather build on and complement them. Current undergraduate students will become the next generation of scholars and researchers who will go on to develop new technologies of literacy, new genres and devices of cultural expression, and new forms of scholarship and research. How will we prepare them for this important cultural work? What technologies can be developed to teach basic literacy? What new kinds of reading devices will be useful in the future? How will our educational materials need to change to address the many kinds of literacy that will be required of future generations: reading, writing, digital, technological, multimedia? What will the textbook of the future look like? What are the possibilities of multi-player distributed gaming for the development of educational experiences?

What will scholarship look like in 10-15 years? Interdisciplinary collaborations and research provoke the need to develop new forms of scholarship, publications and other modes of cultural outreach. These new forms in turn offer an opportunity to experiment with modes of expression made possible by the development of new digital technologies. In the process, new forms of knowledge production emerge. New forms of scholarship

will require the development of new authoring and publishing tools. We already know that authoring and designing are merging; what kinds of digital authoring environments are needed to support scholarship across the curriculum? Collaborative scholarship is a global phenomenon: how can social networking applications be used for scholarly and educational purposes? These social networking applications facilitate communication among scholars and lay people, thus offering a stage for the forging of radically new collaborations for the production of knowledge. Traversing the binary distinction between "scholar" and "amateur" promises to transform the educational scene within the university, effectively opening up the university to the world in unprecedented ways. How can the communication of scholarship and new research be enhanced through the development of multilingual digital applications, widely distributed digital archives, and new collaboration platforms? What are the stages for knowledge transfer from the university to the broader public, which now includes so-called "amateurs" who are also actively engaged in new knowledge construction (through the development of folksonomies, for example)?

A trained technological imagination is the critical foundation required by the next generation of technologically and culturally literate scholars, scientists, engineers, humanists, teachers, artists, policy makers, leaders, and global citizens. Creating research programs and new curricula that explicitly address the education of the technological imagination are the ways in which the university will contribute to significant cultural change.

Instead of a Bridge, How about a Collaboratory?

In 1959, when C.P. Snow first described the gulf between the sciences and the humanities as a "two culture" problem, he implored educators to find ways to bridge the divide.[4] He took pains not to blame one side or the other for the failure to communicate because he believed that neither "the scientists" nor the "literary intellectuals" had an adequate framework for addressing significant world problems. In the intervening half-century since the publication of Snow's manifesto there have been several attempts to bridge the "two culture" divide. While some of these attempts resulted in spectacular failures ("The Science Wars" of the 1980s), others represent modest, but on-going interventions (The Society for Literature, Science and the Arts). The development of Science and Technology Studies programs (STS) are noteworthy academic programs that train students to investigate the cultural and social implications of science and technology. Few if any of these programs or institutional experiments have successfully brought humanists, social scientists, scientists, and engineers together—as peers—to collaborate on the production of new applied research that results in the creation of new technologies. Future attempts to *bridge* the two cultures will be of limited success as long as these groups of scholars continue to see themselves as standing on opposite sides of the divide, or if the groups continue to regard each other as hierarchically advantaged or disadvantaged. I believe that the time is right to take up Snow's challenge once again, not to work on building bridges per se, but rather to create a new place for the practice of multidisciplinary, collaborative technology-based research.

4. C.P. Snow, *The Two Cultures: and a Second Look* (New York: Cambridge University Press, 1963).

In 1989, a professor at the University of Virginia coined the term *collaboratory* to describe a new institutional structure for collaborative research. As of Fall 2005, there are dozens of collaboratories around the world, most of which are virtual spaces that utilize digital network technologies to support the collaboration among researchers at distant physical locations. Many of these collaboratories are actually collaborations among *laboratories* located around the world, where the individual laboratories are (presumably) still organized in the typical fashion around a single PI's research or a single topic.

To date the collaboratories that involve humanities scholars focus almost exclusively on humanities computing research, where the projects involve the development and use of a high-end digital infrastructure for digitizing, archiving and searching specialized collections of historic materials, most typically books, manuscripts, and images. While these efforts and others such as the various "digital library" projects are absolutely necessary and valuable, they represent only one vector of research that unites the humanistic with the technological.

In 2002, a group of humanities program directors formed a virtual collaboratory called *HASTAC: The Humanities, Arts, Science and Technology Advanced Collaboratory* designed to promote the development of humane technologies and technological humanism.[5] The programs participating in HASTAC each have attempted to create some sort of institutional space for collaborative research involving humanists and technologists. The efforts include humanities computing programs as well as interdisciplinary humanities institutes that have a particular focus on science and technology.

Inspired by HASTAC discussions and meetings, I assert that there is a critical need to create physical collaboratories that bring humanists, artists, media producers and technologists together to build human-centric technologies. This requires a physical space where researchers from multiple disciplines work together as peers to design, prototype, and actually fabricate new technologies. In combining the critical methods of the humanities and social sciences with innovative engineering/design methods such as rapid prototyping and user-centered design, these collaborators will create innovative methodologies. Thus, the research output includes not simply new technology-based projects and demonstrations, but also insights into the nature of interdisciplinary collaboration and the creation of new methodologies for collaboration. Instead of a single PI, the business of the collaboratory would be coordinated by a representative group of researchers whose interests span the disciplinary spectrum: humanities, social and cognitive sciences, arts, engineering and sciences. As participants in this collaboratory, researchers from various disciplines each bring something important to the collaborations:

Special role of the humanist: Contributes expertise in the assessment and critique of the ethical, social, and practical affordances of new technologies; provides expertise on the

5. http://www.hastac.org

process of meaning-making which is central to the development of successful new technologies; provides appropriate historical contextualization.

Special role of the social and cognitive scientist: Contributes expertise in the assessment of social impact and in the analysis of institutional, policy, and global effects of the development and deployment of new technologies; addresses the cognitive impact of new technologies; provides methods for analyzing social uses.

Special role of the technologist: Contributes expertise in the innovation of new devices and applications; provides analytical skills in the assessment of problem formation and solution design; demonstrates methods of design, creation, and prototyping; recommends specific tools, processes, and materials.

Special role of the scientist: Contributes expertise in the development of new theoretical possibilities; provides methodologies for assessing and evaluating implementation efforts, and for formulating possible (theoretical) outcomes; develops experiments with new materials; contributes understanding about environmental impacts and waste management.

Special role of the artist: Contributes expertise in the performance, expression, and demonstration of technological insights; provides skills in different modes of engagement: the tactile, the visual, the kinesthetic, and the aural.

The goal is to create space for the constitution of a research community that collaborates on technology-based projects that take culture seriously. While it is tempting to offer a list of suggested projects, this would undermine one of the critical components of the collaborative effort. While any participant can suggest a project, the project must be, in effect adopted by the community. This is to say that there needs to be consensus that a project is important to pursue. This, of course, is the basis of all good research; but it is rare that humanists, artists, and social scientists have a voice in this kind of evaluation of technology-based research projects. It is even rarer still that they have peer-status as researchers who will design, build, and fabricate new technologies. This is one of the important innovations of such a collaboratory. The output of these research projects might include typical research monographs, but also possibly public demonstrations, new pedagogical technologies, and new technologies of literacy. All the collaborators will serve as important "technology-translators" who can help make the meaning of new technologies more accessible to a wider public, both within and outside of the academy.

The social engineering of this endeavor is a crucial element of its success. The price of admission to this collaboratory is an individual's commitment to embrace collaborative work. A key requirement of the research participants is that they work against the facile division of labor that would have the humanists doing the "critique," the technologists doing the building, and the artists offering art direction. While there is a special role to be played by each participant, they must all be willing -- indeed, eager-- to learn new skills, new analytical frameworks, new methods, and new practices. A personal commitment to life-long learning is the foundation for these collaborations. Each participant must be

willing to uphold the ethical foundation of multidisciplinary work: *intellectual flexibility, intellectual generosity*, *intellectual confidence*, and *intellectual humility*. Only by doing so will the collaborations result in the kind of work where the sum is greater than the parts, and where the technological imagination can be freely exercised and employed to create futures that are desirable for all people around the world, not just for those already-privileged and technological-empowered.

Excerpted from *Chapter 1: The Technological Imagination Revisited,* *Designing Culture: A Work of the Technological Imagination*, Anne Balsamo, Duke University Press, forthcoming.