Anthropology and the Technology Company

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Technological devices and information structures change the world we live in. This turn of events opens a field of inquiry for anthropologists to study the development of technology and its uses. Anthropologists do so in an iterative fashion engaging both engineers and potential users of technology for technology businesses. They also create and shape new and exciting processes for anthropologic inquiry within engineering practices producing artifacts-of-evidence. These artifacts may include documentation of human thought processes and/or research methods of interaction or the environment people may use a potential new technology within. Understanding how anthropological methods and artifacts fit into an engineering process is changing and iterating through time however, the relationship of technology companies and anthropologists has solidified as evidenced in projects from New York City to Germany that incorporate both innovative engineering practices and anthropologically-based insights for technology products. This article probes both the technology industry's use of anthropological insights and the potential changes to the discipline of anthropology driven by the application of these methods in engineering projects.

INTRODUCTION

In 1962 Douglas C. Engelbart, an early leader in technology innovation and inventor of the computer mouse wrote that he believed there would be a co-evolution of the computer and the human being. This co-evolution through time would become a process of mutual learning in a context of iterative adaptation of computer systems and human systems, one to the other. He proposed that people would learn to map a human symbolic system to computers and computers would limit and change that symbolic system thereby learning to communicate with each other. He called this process "bootstrapping." He believed the bootstrapping process would grow through time and imagined one day the process of building computers would encompass both a deep understanding of engineering and human beings. To Engelbart, the focus in developing these human machines would be neither on product nor on artifact, but on the process of how to build them.

Engelbart's writing took place over 40 years ago, but his research heralded the coming of an era where the need for social scientists in the computing industry would have validity and necessity. Technology may still be thought of as an aid to cognition (memory, storing and calculated action), but it has since moved on to our desks, in to our homes, and can be voice or touch activated. Given this, understanding our world and the activities people perform in our world has become increasingly important to businesses that are building technology they wish to fit into the world. The field that studies this duality (machine/human actions) is called Human Computer Interaction (HCI) or User Research, or User Experience (UX) or User Research studies. Each company calls the specialization something different, but the practice, no matter the title, is rooted in anthropological and design methods, specifically ethnography and interface design. HCI practitioners aim to help make clear what interactions and behaviors take place in context of human interaction with a product or, even before the product is built, by investigating and understanding context and people.

BUILDING TECHNOLOGY FOR PEOPLE IN THE WORLD

Early computer scientists working in artificial intelligence were interested in creating logic machines where the human brain was reflected in computer logic and augmented by the power of a machine. HCI theorists and practitioners saw a needed opportunity to test these logic machines in the real world. What they found when computers were embedded in social environments is that the logic of the machine did not cleanly fit within the everyday life of people. Given this, it became more and more necessary to understand the use of technology in a social context. Paul Dourish's work, *Where the Action Is,* is a good foundation for understanding both the historical underpinnings and current HCI practices. He describes the importance of physical and social phenomena and space as interplay between technology and people (2007). With the advent of machines that we can carry on our person and within context, every day technology is best to be built upon and integrated into the human culture within which the same object will be used, as life does not always emulate logical decision-making. Understanding who will be using an engineered product before building it is important for businesses to keep a competitive edge 'edge' and extend the desirability and usability of their products. Therefore the creation of new artifacts (cell phone, website, databases, etc…) requires that studying the intended culture of use must be part of the design process. As others have written, action based on these principles, "…strengthen(s) businesses and promote(s) communication among international markets, while simultaneously responding to and exhibiting aspects of the target culture" (Tian, Lillis and van Marrewijk 2010). Given this, a symbiotic relationship exists in the technology industry where the culture within which technology is created and used cannot be separated from the artifacts themselves (Pinch and Bijker 1987).

An orientation, acceptance, and understanding of how to incorporate a social science framework into engineering practices brings up questions about technology production. Anthropology is not a specialization many engineers are trained for. Therefore, technology companies may hire an person who is trained in anthropological methods and understands engineering practices for the purpose of studying people in context of their everyday lives and bringing this information back into the engineering framework. The need for specialized anthropological or sociological information to build a product has created 1) the need for anthropological methods and practices in computing; and 2) An agenda on how to focus

perspectives between anthropologists and computer scientists to build products and services that humans understand. With any new endeavor, bumps are seen along the way. Changes to each field results and can be seen in Anthropology, HCI and Engineering conferences where papers are presented that often question: "Where are we headed? And "What methods should be used to best understand human interaction and technology?"

THE NEED FOR APPLIED ANTHROPOLOGY

The practice of anthropology is uniquely based in qualitative data gathering rather than quantitative analysis. For example a study may report 25% of Y type customers prefer X characteristics. How do you build technology for 25% of people who prefer X? Quantitative information cannot relay how someone does something, or the context in which they do this. To demonstrate: qualitative analysis was a vital component in a recent study for in the financial sector conducted among Latinos in Virginia. Before designing a survey to understand how this group makes financial decisions, field research was performed including participant observation and ethnographic interviews to aid in the construction of relevant questions (Rojas 2010). Likewise in the technology industry product teams need qualitative data to envision and create products that meet existing human needs across various groups? Sampling human behavior can provide essential information that cannot be found in quantitative information because quantitative information cannot relay actions or intended actions of people, which is what technology is designed to aid an individual with. As an example, while working for a medical company I have performed multiple ethnographic studies in ICU trauma centers in order to inform decision-making on technology requirements for a medical device. Through ethnographic research, a clearer understanding of contextual workflows can be brought into the engineering requirements gathering process.

> *Scenario: Sarah, a nurse in a busy hospital reads from a glucose paper protocol the procedure and regulations for measuring glucose levels on her patient. While she is reading this protocol, 5 alarms for other monitors begin to alarm. Sarah knows she needs to measure the glucose level every hour, but taking 5 minutes to read through the protocol, then using a calculator in her pocket to measure the amount of dextrose or insulin she must administer is extremely difficult. She makes an intuitive guess of glucose levels and then begins to prioritize which monitor alarm is giving her the most important information. She decides that it is the O2 level that is most concerning to her and calls the charge nurse.* (Forsman, 2010)

From this scenario, gathered through anthropological means, engineering teams and strategic thinkers in a technology business would be able to understand: 1) Identify the real-life problem; 2) Understand what parts of that problem could be solved by creating new technology for the nurse's workflow process; and 3) Build a product that fits into the context or lived experience (alarms going off from other machines, pressure with caring for a critically ill patient, paper and calculators, etc…). This qualitative information indicated *actions* and *intended use* to help teams envision requirements of a technological solution. It helps to answer: what human needs should a technology fulfill and in what context.

ENVISIONING THE APPLIED ANTHROPOLOGIST

When we think of anthropologists, there is a classic archetype of Margaret Mead traveling to an island to study the private lives of indigenous people while living in a hut, documenting thoroughly her experiences in an ethnographic framework and then publishing her writing in a monograph *Coming of Age in Samoa* (1928). Not nearly as exotic, but similarly dedicated, techniques such as ethnography are used in the technology industry requiring research of different peoples, documenting their surroundings, their relationships and actions and what they do *in context*. Often the field site is not one location; rather it may exist as a social environment among a group studied in many different locations. For example, anthropologist Genevieve Bell inspired a design variation for cell phones in Indonesia when she discovered that people used them as a directional tool to locate Mecca at prayer time (Tian 2010). Over the course of an applied anthropologist's career, there may be very little consistency in the types of subject matter or context around which one is employed. Technology companies employ anthropologists to work for manufacturing companies, internet companies, medical device manufacturers, and any company wishing to understand a cultural or mental model for information structures. This diversity may be exactly what defines practicing anthropology in a business sector that is in constant and rapid flux. Studies may be varied and challenging, requiring multifaceted approaches such as participant observation, interviews, surveys and environmental research pertaining to the selected topic. For both private contractors and employees of larger corporations, the duties of the discipline require conscientious ethical consideration of human subjects and culture. Anthropologists are charged with "presenting material unencumbered by the desires and interests of those who contract our services" (Rojas, Turner 2011). This dedication helps corporations to maintain realistic perspectives and develop approaches to problems that accurately and appropriately solve investigated problems.

A day-in-the-life of an applied anthropologist depends entirely upon the project. It may mean sitting with stockbrokers for days performing participant observation on the stock exchange and recording observations. This could be used for executives and related engineering teams to map technology requirements for consumer trading online. A recent article in *Anthropology News* "Riding the Tourism Train?" by Lena Mortensen demonstrates how the travel service industry and government offices have made use of anthropologists' work to understand how to effectively serve tourists while maintaining cultural authenticity in destination communities (2010). Sometimes it is necessary for an anthropologist to spend extended periods living and working within the subject's environment. For instance, one of the authors performed ethnographic research in New Orleans after Hurricane Katrina, documenting the lives of survivors for a year. She performed a longitudinal study in shelters and with people in their homes as they rebuilt in order to gather requirements for a better disaster logistical system for the Red Cross (Forsman 2006). Another author's research associated with providing financial service for Latinos demonstrate the potential use of ethnography for product and service development. Here a Spanish-speaking respondent shares his experience attempting to make a transaction at a local bank:

> *"I felt that it was kind of impossible to really get some information from the bank because I couldn't communicate with the people in Spanish…I started getting more and more uncomfortable…If I had asked about opening a bank account or getting a credit card, I would not have been able to do that"* (Rojas 2010)

Ethnographic work coupled with market potential data and economic forecasting is currently assisting industry leaders to create solutions for the Spanish speaking clientele of area banks in Virginia. These are examples of tangible business problems that corporations seek to solve. To an anthropologist, the variety that is shown in these examples is about field sites, tools, analysis, context, and people. A common ground is found when the discipline of anthropology provides the resources necessary for interested corporations to create solutions to problems.

The value of anthropology in the technology industry has been richly documented, though it is relatively new. In the 1970s Lucy Suchman (1987), an anthropologist working at Xerox Parc, wrote about her findings related to copy machines. Bonnie A. Nardi (1990) also published her fieldwork on group behavior and how it influences the design and use of spreadsheet programs. More recently she has written about group behavior and individual concepts of play and aesthetics as investigated in the video game World of Warcraft (Nardi 2010).

ANTHROPOLOGY, ARTIFICIAL INTELLIGENCE AND COPY MACHINES

In the 1970s Lucy Suchman set out to study how people at Xerox Parc used copy machines. She shadowed users and observed behaviors. She was interested in how people organized, interacted and exchanged information about making copies; and separately how a business organizes and controls copier use through technological artifacts. What she uncovered was that copying with the existing machines was difficult, human interruptions caused problems for the initiator and copy plans were slowed dramatically or terminated when an individual did not know how to operate the machine. Based on observations, Suchman suggested at a design level that a large green button could be placed on the copy machine so that it was easy for people to accomplish their task. Seperately and more importantly than the design, or usability suggestion, her research also changed the way engineers think about building algorithms and logic (Suchman 1987).

At the time of Suchman's research, the dominant field in engineering was artificial intelligence. As a practice and study the field of artificial intelligence embraced the idea that human logic and decision-making could be programmed into machines. What Lucy Suchman's research showed is that people do not always perform tasks based upon logical tasks from start to finish. Programming a machine to emulate such strict logic led to misunderstanding, misuse, and lack of usability cues. For example, if someone did not understand how to use a copying machine, they very well may simply walk away or reassign the task to someone else and not follow a "planned" task engineers assumed would take place.

For Xerox Parc, what grounded the findings was the improvement of the use of the artifact (copy machine) and the way in which the business could use Sachman's research to improve their copiers. Likewise in the financial industry work associated with banking services for non-native English speakers offers insight to the banking community to provide financial services necessary to this particular demographic in an effort to adequately serve an emerging market demand. These examples show how the usability/sales/use of a product can be positively impacted by understanding and observing culture.

SAMPLING CULTURE AND FRAMEWORKS

It is often difficult to define and be comfortable with what is meant by interdisciplinary studies and the boundaries that this approach creates. For the purpose of this work it is described

as: practicing anthropological techniques in a technology business or amid engineering efforts. This practice demands understanding of engineering processes and likewise of ethnographic fieldwork methods, but more importantly it demands an understanding of framework(s).

The need for an interdisciplinary practice of anthropology is prevalent in the Human-Computer interaction field. One of the hallmarks of exemplary HCI work is how it attempts to bridge the gap between the social sciences and the computer science field i.e., the human and the machine. The argument is not that one should leave behind one's particular disciplinary concepts and methods—indeed, it is important work is concretely anchored within a well-defined framework. If ethnographic work is to be of value for technology companies it must, at minimum, attempt to address software design issues. Likewise, the computer science field should be informed by anthropology work, and may demonstrate how technology supports features of work culture. (Bannon 1993)

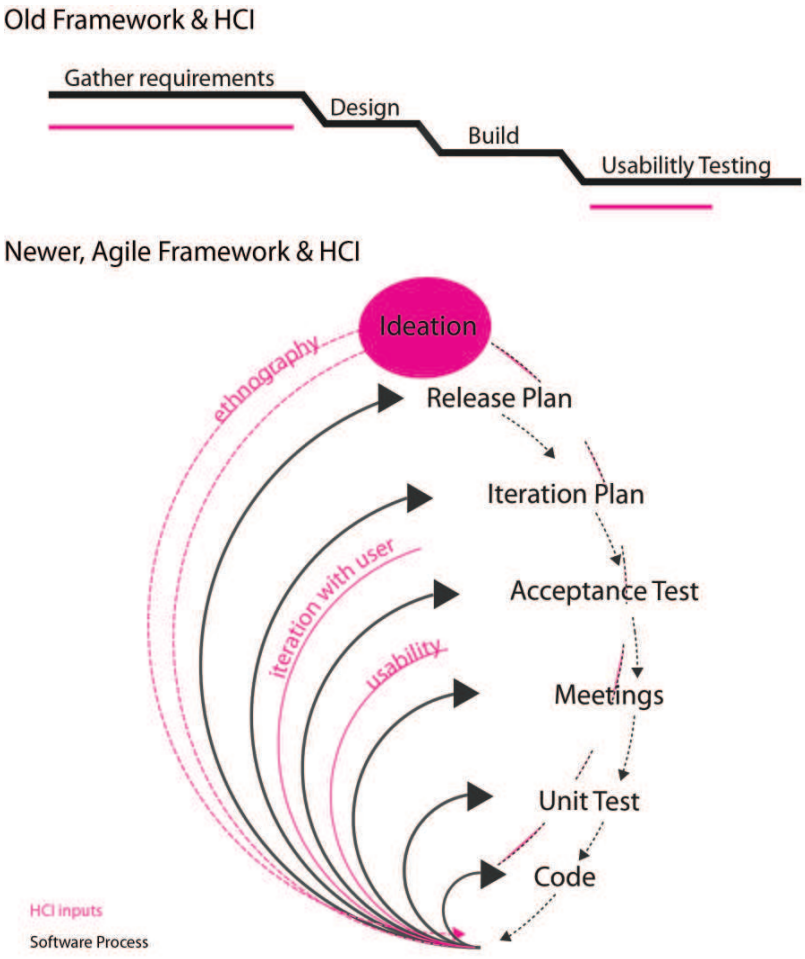
The Pace of Technology Companies, Projects and Insight

The nature of technology businesses is fast-paced and rapidly changing. Technology companies can only afford a certain amount of time for development of a product, and ethnography or user studies must fit into that rapid timeframe. In addition, ironically, the need for better and more usable machinery within a shorter time has created an opening for a broader understanding of what "time" may mean in American applied anthropology. For example, few technology companies could afford an ethnographic study on one aspect of practice for a year or longer. A need for a framework has developed centering on questions like: How thorough is the understanding gained from research collected through sampling rather than through full immersion? What is the standard for 'thorough' and 'rigorous' in this new environment? In addition to anthropological application, these questions pertain to methods and practice in the context of design in both engineering and anthropological research.

From the late 60s to the early 90s usability tests influenced what problems users might have with a product once the produce was built (Hewett, et al 1996). During this era, HCI practitioners participated in the investigation of "use." The practice of cognitive psychology was better suited for this model (as demonstrated in Figure 1, most of the "human" or "social science" touch points are performed at the end of the engineering). The purpose was to verify that a product was "usable" after it was designed. Reengineering the product to include different requirements at that late stage is extremely costly.

Usability testing could not feed the requirements gathering processes. Given this, in the 1970s the use of ethnographic techniques to understand human behavior *before* engineering took place was both a move to broaden the strategic power of ethnographic work and find a way to influence product requirements. Equally, engineering methodologies began to change as an iterative, agile engineering framework became highly desirable. However, moving a social science process into an engineering process is fraught with difficulties and misunderstandings.

FIGURE 1
ETHNOGRAPHIC SAMPLING FOR PRODUCT DESIGN



Melding a Social Science and process and an engineering process to each other is an extremely difficult task. We are proposing that an organic "sampling culture" developed through time where engineers, managers, and marketing personnel "sample" ethnographic findings throughout an entire product development lifecycle. Technology businesses move extremely rapidly and adjustments are made quickly based upon relevant information. Information about "users" is valuable to technology companies assisting them to adjust and build to the needs of a user population. Any form of information that is explicit in understanding how a technology is used or built is extremely valuable especially if it can fit into an Agile framework such as is described in Scott Ambler's work *Agile Modeling: Effective Practices for eXtreme Programming and the Unified Process* (2002). The focus is on human experiences and interactions and constant "samplings" of the user population. The agile framework for engineering allows for openings in engineering practices where iterations of a product may take place for specific

features and functionality in parallel. Requirements can shape and form through that iteration and parallel processes (e.g. requirements do not need to be finalized before production can begin). Given this engineering process, the opportunity for human insights of context and activities can also be iterated upon throughout the lifecycle of developing a product. Innovative approaches through the participation of anthropology in the design process have changed not only product development and delivery but also the nature of anthropological application and perspective.

ARTIFACTS AND THE "VISIBILITY" OF ANTHROPOLOGICAL FINDINGS IN THE TECHNOLOGY INDUSTRY

> *"…system designers are less interested in theoretical reasoning than in immediate effects within their structural concepts. Their thinking focuses on what can be successfully applied to make an artifact, such as an information technology system, work. Sociologists, on the other hand, are interested in generating an interpretative framework. A theory (and for some a good case operation, the design ideas focused on improving actors' basis for ongoing negotiation, arguing that one central problem such a project faces it the (in)compatibility of automatic scheduling with cooperative decision-making…"* (Wagner 1993).

Working in an interdisciplinary role within a company the anthropologist is aware that the product or artifact around which research is focused is usually more important than the framework one uses. By focusing on the artifact-of-evidence, does not draw into question the messy and contestable description of framework, definitions or even technique, but immediately applies findings from fieldwork to actionable blueprints for an engineering team or business.

When one thinks of technology for the marketplace like a copy machine, a spreadsheet program, or a social networking site, one sees the outward artifact of a multi-dimensional set of processes and interactions by individuals and groups in specific contexts both in the artifacts use and in misuse. How the anthropologist impacts those included in a study is best illustrated by various and continuous sampling of people, places and context and from there the use and redesign may be based upon fieldwork findings. Because we realize that monographs or the historical anthropological artifacts of analysis do not fit into an iterative and ongoing adaptive engineering lifecycle except as a point of reference. Imagine an engineering team sitting down to read a monograph, reflecting, and waiting 6 months to 5 years to receive this information. Monographs may be replaced by a continuous set of samples that are used in engineering processes in order to fashion new artifacts aptly to fit our living cultures.

It is this understanding of artifacts, anthropological samplings and resulting production of design, that directly helps organizations to define a role and place for anthropological research. It has also shaped and changed what anthropologists produce and how they work. Through applied anthropology practice within the technology and multiple other industries the artifacts that companies have begun to produce with this research and the duration and production of research has changed. Additionally required is the necessity to produce findings that can easily be consumed. Examples of user-generated results include the development of ergonomics, the importance of usability, and research based on experience. Concepts for technology design have been implied as outputs from research even when fieldwork may have no forecasted impacts. This development may speak more to human processes and possibly addresses how

unpredictable it can be to find satisfactory results from ethnographic practice (Dourish, 2007). Although the entry-point or "visibility" of an anthropologist's work in a technology business may be his or her direct influence on the design of the technology product, there is also another process taking place. There are occasions when the work of understanding groups, processes, and ultimately the culture surrounding an artifact has brought about insights that affect not only the businesses within which anthropologists are employed but anthropology practices as a whole. Their work has affected larger concepts including actors, the collaborative process, action, and alternative markets. This is important to understand because it speaks most directly to the dual role of the anthropologist who operates within a particular orientation and skill set and articulates the way humans interact. Our work just may change the way we think about technology as a whole, and that in turn change what companies pursue as future technology endeavors.

TABLE 1
ANTHROPOLOGICAL TOOL OR CONCEPT USE IN TECHNOLOGY BUSINESSES

Visit to fieldwork site for an extended period of time. Cultural immersion and native understanding.	• Multiple fieldwork sites within a company to study product team, marketing, training/usability, outside the company for unrelated groups who may use the technology. • Short periods of exposure to the context and culture the company believes is intended to use the artifact. (Often one will not know if they can return for longitudinal studies due to the pressures of technology businesses and time-to-market). • Shadowing people for a day or a few days may be used rather than immersion.
Ethnographic observation and field notes	• Ethnographic observation and cultural probes are used to sample different cultural aspects throughout the engineering lifecycle, and even after a product has gone to market. • Remote work may be suggested with still or video cameras or and diaries (cultural probes).
Monograph of findings: insights can be used for political or overall consumption for those who wish to know more about the culture.	• Personas and Scenarios are often used to synthesize annotated field notes with coding for insights. • Scenarios are created from fieldwork. • Written reports and presentations are shown in an iterative fashion to correspond with the development timelines. • Insights can directly influence the strategic direction of information, services, or a product. • Insights may guide a company through product development, marketing, and usability. • Insights can illuminate engineering team or company organizational structures for productivity of devices, information services. • Insight can illuminate how the products are used in the culture that has adapted it and help highlight future requirements. • Research conferences of publications if the company does not hold the anthropologist to legal stipulations in publication.

PLACEMENT, PRACTICE AND PERSPECTIVE

Since anthropological practices and roles are different in application than performance in the academic context, early critiques of applied anthropologists' work have revolved around how they are employed and whose interests are served through the research performed (Jordan, Dalil 2006). Occasional unethical research has taken place when corporately employed anthropologists have become part of a colonizing infrastructure in order to understand the colonized (Rojas, Turner 2011). As anthropologists are recruited onto engineering teams and into business environments, we cannot overlook that their role and what they produce has changed in a historical perspective. It is important to examine what that might mean to the anthropological process and the current state of the anthropologist's practice when employed by technology companies. These questions may be asked: How is the anthropological process influenced? Is it constrained by the lens of business and industry infrastructure? The field of Anthropology now recognizes a need for a constant commentary of context, ethics, definitions and methods regarding interdisciplinary approaches to computer science and anthropology. With integration of the discipline, the practices of applied anthropologists are often grounded in a business environment. This situation has made obvious the need for detailed ethnographic studies to focus on and implicate findings for technological design in social settings (Backhurst 1988).

CONCLUSION

While the technology industry changes rapidly, the value of ethnographic methods is in helping companies to understand explicitly, and continuously, the people who will use, buy, interact with, and purchase their technology. Applied anthropologists working for technology companies will encounter demands that may be different that archetypal anthropologists, but the value they bring to companies is their ability to create and demonstrate understanding of context and human behavior that may not be obvious to executives and engineers. So far it has not been there is no simple framework for interdisciplinary practices in the marketplace when it comes to understanding when to do fieldwork, how long to perform research, and how this fits within an engineering lifecycle. However, there have been both tangible and intangible profits made in understanding who a user group is or will be and recognizing the context, actions and interactions of peoples who will use the technology the company produces.

Understanding how ethnography is used as a technique in technology companies is based in materiality (artifacts) such as the product that will go to market, the document outlining user behaviors, or an understanding of the technology itself. The anthropologist's perspective is valuable because these tools and techniques make clear information aiding communication, collaboration and coordination among groups of people. In recognizing value, we must also reflect and reveal adaptive anthropology of practice requires methods of field research and documentation that is creative, hybrid and not well defined at all times. The technology industry's recognition of the need for anthropology within the design process but also its need for speed and adaptability changes dramatically the process of data collection by traditional terms. But examination of human culture must allow for the changing needs of human culture as it interacts with, affects and is affected by its environment. The incorporation of anthropology into technology businesses affects both the industry of technology and our own discipline in profound ways, which in turn shapes not only our roles and actions but through the production of artifacts human culture as well.

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