Mobile technology appropriation in a distant mirror: baroque infiltration, creolization and cannibalism.

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– DRAFT –

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ABSTRACT:

In recent years, mobile phone penetration has increased dramatically throughout Latin America. Rising penetration numbers tell an important story, but only part of the story. To fully grasp the social, economic and political impact of mobile telephony, we need to understand appropriation: the process through which mobile phone users go beyond mere adoption to make the technology their own and to embed it within their social, economic, and political practices. The appropriation process fundamentally is a negotiation about power and control over the configuration of the technology, its uses, and the distribution of its benefits. Within the Latin American context, today's negotiation surrounding mobile technological appropriation echoes earlier creative tensions about the appropriation of cultural objects, people, and ideas from abroad. This paper reviews existing theoretical approaches to the study of technology appropriation, re-considers them within the Latin American cultural context, and proposes a theoretical framework that can inform an in-depth study of the social, economic, and political impact of mobile phones in Latin America.

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Introduction: the importance of appropriation

The success of a technology is often measured by its penetration throughout a user population. By that criteria, mobile telephony is undeniably successful. In turn, high penetration suggests that a technology has significant social and economic effects. If so many people use it, it must make a difference to their lives. But penetration tells a story about the impact of current technology. For a technology to evolve and become better adapted to its users needs and ever more important to their social and economic development, something more than mere adoption is needed. The long-term, innovative effects occur when users appropriate the technology, when they make it their own and embed it within their lives. The appropriation process is fundamentally political: it is a battle for power over the configuration of a technological system and therefore the definition of who can use it, at what cost, under what conditions, for what purpose, and with what consequences. This confrontation, we argue, is deeply creative and fuels a powerful innovation engine. Users re-invent the technology while they try out its features, tweak devices and applications so they better answer their needs, come up with different ways to use services, and develop new social, economic and political practices around the possibilities open by new technological systems.

While appropriation is important for all kinds of technologies, we believe that it is particularly productive for information and communication technologies (ICTs) because of their flexibility. Like other technologies, their hardware can be hacked and modified, but in addition, ICTs are programmable through the software they use, so that their configuration (i.e. the politics they embody) can also potentially be changed by any actor who has access to the software. As a result, device producers, application designers, content creators, service providers and end users all can engage in the creative process of appropriation. In this paper, we focus our analysis on mobile telephony, though many of the arguments we advance would also apply to other ICTs. In fact, they might actually apply more thoroughly to other technologies, such as open source software or the internet, whose original design intentionally created affordances for extensive user

appropriation. However, we suggest that mobile telephony can be (and has been) appropriated to a greater degree than usually acknowledged, and that much insight into its social, economic and political can be gained through an exploration of its various appropriation modalities. Our argument proceeds as follows.

First, as our starting point, we acknowledge that technology in general, and mobile telephony in particular, is not neutral. The design of its products, applications and services embodies fundamental choices, largely made initially by equipment producers and service providers, about how a mobile phone ought to be used, by whom and for what purpose. As a result, the technology's particular architecture embodies specific power relationships, between equipment makers and service providers, as well as between both of these and users. The resulting power architecture has both social and economic implications (influencing for example what social practices a mobile phone can support, or what interaction patterns are encouraged or discouraged by a particular tariff structure.) Thus, any technological implementation is inherently political.

Second, we believe that users adopt technology because it makes a difference to their lives. If mobile telephony has reached such levels of penetration, it is fundamentally because its use opens up new socio-economic opportunities. Usage in turn progressively reveals the politics embedded within the technology's original configuration, gradually disclosing who really is in control. Soon however, users begin experimenting with their cell phones, exploring how they might adapt them, or adapt their practices around them, so the technology better serves their own interests. They may modify the device, download or program new applications; they might invent new unintended uses for the technology, or invent new practices that leverage its possibilities. We view this experimentation process in large part as an attempt to re-negotiate the power relationships embedded in the technology. This creative re-negotiation process is the core of what we call appropriation, the process through which users take something external (alien, or foreign, something given to them by others), and make it their own.

Third, we observe that appropriation takes many forms. In sorting through these various appropriation modes, we find fascinating parallels (and inspiration) in the history of Latin American cultures, particularly that of mixed race people of the Caribbean and Brazil. These places have a rich historical tradition of appropriating cultural objects, people and ideas from abroad. For their inhabitants, the encounter took place most of the time within an unfavorable, asymmetric power relationship. But from that confrontation, they drew unique creative practices through which the locals appropriated the alien culture and ideas, thus contesting the initial power politics. Among these, we single out Cuba and Mexico's 'baroque infiltration', Martinique's 'creolization' as well as the 'cannibalism' referenced by the Brazilian creators of the tropicalismo movement**.** Each of them references a distinct mode of cultural appropriation of alien elements, where power is negotiated through creative practice.   While we identify them in eth Latin American cultural context, they are universal.

Fourth, we argue that just as the power negotiation that took place with cultural appropriation was uniquely creative, the experimentation that characterizes technological appropriation is uniquely innovative. Thus, as a user-driven re-negotiation of power relations, the technological appropriation process is fundamental to innovation. It challenges the initial power structure embedded in the technology and results in new practices and new technological implementations. Technology providers –device makers and service providers—then face an important choice.   They can choose to suppress the resulting innovation if they find it too antagonistic to their business or political goals. But they can also choose to co-opt it, learn from it, and embed it into successive generations of their technological products and services, thus re-appropriating their users' inventions. As a result, the choices they make will clearly affect the subsequent technological trajectory.

Ultimately therefore, the appropriation process will have substantially more profound socio-economic impacts than mere adoption. The extent and character of these impacts will depend on three fundamental factors. First, the range of possibilities explored will depend on the latitude for experimentation that is afforded by the

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technology, as suppliers initially decide to make it available to users. Second, the intensity with which innovations are explored will reflect the range and depth of innovative practices that users engage in. Third, the extent to which this creativity is harnessed will depend on how the resulting innovation is built within next technology generations or suppressed. Our hypothesis (and our own bias) is that the most successful socio-economic impact will accrue where there is wide scope for user-driven experimentation and appropriation, and where cooperative relationships between users and providers can emerge to learn from it and embed it within further iterations of the technology. Much of the research needed to explore that hypothesis, particularly in the case of mobile technologies, remains to be done.

In making this argument, we have structured this paper in 3 parts. The first part reviews the literature on "appropriation", highlighting elements that are important in the model we build here. The second part examines key creative appropriation traditions in Latin American cultural practices. Drawing on these insights, the third part proposes a new model for understanding technology appropriation, with specific reference to mobile telephony.

1. Theoretical approaches: a review of the literature on technology appropriation

In today's Information Society there is a growing field of research that is focused on how society adopts new information communication technologies, adapts to them and uses them. As noted by Castells (1999, p. 9), "social development today is determined by the ability to establish a synergistic interaction between technological innovation and human values..." This process of social development through technology has, in the past decade, been studied heavily through the lens of appropriation. The appropriation of technology in this context can best be defined as the process of interacting with technology and modifying both the manner in which the technology is used, and the

social framework within which it is used. This definition represents a blending of previous research, which has often utilized divergent definitions of the term. Thus, the following pages present a brief examination of the history of the concept of appropriation of technology and the relevant research that has been conducted regarding the process, grounded first in the diffusion literature, which can be treated in a way as a precursor to the bulk of the current appropriation research.

Technology adoption and diffusion

In Rogers' classic model, diffusion is defined as the process through which an innovation is communicated and spread over time to members of a community. The communication process takes the form of a cumulative "S-shaped" curve starting slowly but accelerating to a take-off phase as more users accumulate, building ultimately to a plateau as the number of potential adopters becomes exhausted (Rogers 1995). Additionally, Rogers predicts that there will be a group of adopters who are more prone to innovation and who are identifiable by key characteristics. Whereas Rogers theorizes that diffusion is a one-stage process through an "S-shaped" flow, appropriation extends diffusion to a more detailed view of the actual use of the adopted technology (Fichman 2000).

Thus insight into the adoption and diffusion of innovation provides a background for understanding the decision to purchase a technology, whereas appropriation seeks to explain the actual use of technology. For example, Sangwan and Pau (2005) provide a comprehensive examination of the diffusion of mobile phones in China and conclude that the acceleration of the mobile marketplace in that country is a direct function of foreign investment in the telecommunication industry, deregulation and reengineering of cellular manufacturing in China and an increase in individual purchasing power. Aoki and Downes (2003) examine the social impacts of cell phone diffusion among young people and find that it has evolved to a necessity of communication and a critical tool for socializing. Roberts and Pick (2004) looked at corporate users of cell phones to predict the factors affecting future adoptions and found that the key factors affecting the decision to adopt are security, reliability and web connectivity of wireless technology. Clearly diffusion theory provides a basis for understanding who will use a technology and how

quickly it will diffuse through a population. Yet the actual manner of use of the technology is largely disregarded in diffusion studies and thus provides only a basis for studies and little in-depth understanding as to the actual appropriation of a technology.

Adaptive Structuration

DeSanctis and Poole (1994) conducted much of the early theoretical work regarding appropriation of new information communication technologies. They propose the use of adaptive structuration theory (AST) as a method for examining process change resulting from the use of advanced information communication technologies (ICTs). AST stipulates that change can be examined by focusing on the structures that are created inherent to the technology and the structures that then result from human interaction with the technology.

Thus, as defined by DeSanctis and Poole, appropriation of technology is an ongoing practice whereby people interact with technology and then actively select structures of use from a larger set of possibilities. They identify four aspects of the appropriation process under this definition: appropriation moves, faithfulness, instrumental uses and attitudes. In this framework, appropriation moves is the process of determining how a structure is used – directly, indirectly, in a modified manner, or negated. Faithfulness is the degree to which a structure is used in accordance with the intent of the technology's designers. By this definition, appropriation occurs at the intersection of technical design and social structures. As a view of appropriation this treats the relationship between production of technology and use in action as a production of sociotechnical systems (Bostrom and Heinen, 1977, Hiltz and Johnson, 1990; Pasmore, 1988).

Appropriation through adaptive structuration theory is illustrated by DeSanctis and Poole in their analysis of a new group decision support system (GDSS) implemented in an office environment. Through an ethnography of the group's use of the GDSS, DeSanctis and Poole observed the creation of new social structures in the workplace. The GDSS, intended originally to increase effectiveness in group decision making processes,

was appropriated by the observed group as a method for determining budget priorities. In the process, the workgroup appropriates the GDSS structure, that is, the method for anonymous decision making, for use in the budget process.

A similar pro-social approach to appropriation is outlined by Jamison and Hard (2003), who stipulate that appropriation of technology from a cultural perspective is the adoption and modification of a technology to fit with the respective cultural environment of a particular group. In line with earlier work by DeSanctis and Poole, appropriation in this context is examined in three settings – the production of structures, systems and artifacts – at three levels – discursive, institutional and practical. Discursive appropriation occurs when new technology influences verbal and written human interaction, such as the use of the verb "to Google" as a synonym for "to research on the Internet." Institutional appropriation is the creation of new systems and governance as a result of systemic changes and practical appropriation then refers to modifications in day-to-day routines and habits. The level of phenomenon – structure, systems and artifacts – then refers to degree to which an instance of appropriation occurs, as outlined in DeSanctis and Poole's vision of structuration.

The adoption of electronic emailing in Africa provides a more practical example of appropriation through the lens of adaptive structuration. As part of a broad study examining difficulties in measuring Internet and email usage in Africa, CheNeau-Loquay (2000) found that due to costs of access postmasters were appropriating the Internet to meet the needs of a developing communication economy. Postmasters in Ghana were found to be purchasing accounts from Africa Online, an Internet service provider, and then charging a rate substantially less than letter post to transmit single handwritten letters via email. The program was an instant success, generating 3000 letters at a single post-office in a two-month period. In this instance, appropriation occurs as a new structure for communication via post is created as well as the creation of a new structure for the use of the postal service. As opposed to the traditional system of mailing a letter, in this instance the classical post-office structure is melded with the new electronic mail structure to create a new system of mail communication.

In another light, cell phone technology in the Caribbean has played a vital role in reshaping the way that communities in that region are able to communicate with one another. Horst (2006) studied the use of cell phones in Jamaican transnational families and found that it facilitated a rapid increase in familiar connectedness, for example, allowing for families to maintain closer contact and more efficiently communicate monetary needs to those working abroad. This increased connectedness, however, can be a burden as well. Horst observed schoolchildren who would forgo lunch during the day in order to afford calling time on call phones. In this manner, technology clearly is appropriated into the fabric of the transnational Jamaican family, yet not all outcomes are positive. Again, the study focused on the clear cultural implications of new communication practices that resulted from the appropriation of existing technology.

Examining consumers and appropriation, Schlosser (2002) noted that technology is assessed according to the individual's needs and becomes a built in component of lifestyle, rather than a task-oriented tool. Looking at individual's use of RIM Inc.'s Blackberry handheld computers, Schlosser observed that users quickly assimilated to using the tool, but also observed that in the process of appropriation the definition of "workday" was restructured due to the increased connectivity to the office that resulted form the use of the Blackberry tool.

A number of youth-orientated appropriation studies have illustrated the creation of new cultural structures as the result of the adoption of new technologies. In his study of the influence of technology on the everyday lives of youth, Tully (2003) explains that there is a particular need to focus on youth because, "Young people are part of a highly dynamic society… [and] technology strongly influences everyday processes in young peoples lives" (Tully 2003, 442). Through surveys and interviews, the study illustrated how technology is appropriated by youth to become an integral part of communication and a key driver of social status. Thus, new processes are created to explain the creation of status in youth culture. A particular youth involved in the study noted that "time" has become a fluid concept:

"If you want to go to a disco or somewhere else on weekends, you no longer fix a time in advance like you used to on the fixed-line network. Attitudes have changed, and young people now say, "we're taking the car" and decide appointments on the cell phone while they're driving." (Tully 2003, 450)

In a series of technology-oriented focus groups consisting of teenagers, Carroll et. al. (2002) explored age and gender issues pertaining to teens and information communication technology. The study found that successful technological appropriation by youth is dependent on six criteria: social management, leisure use, safety and security, information management, lifestyle organization and critical mass. Carroll et. al. (2002b) further explored this model in a subsequent analysis whereby they determined that ultimately appropriation into everyday life occurs at the end of the technology adoption process when a decision has already been made to accept of reject a given technology.

Design for appropriation

The other main school of thought regarding appropriation focuses on the adoption of technology by users as a function of a technology's design and technical specifications. Dourish (2003) places appropriation at the intersection of workplace studies and design. Within the framework of information science Dourish's use of appropriation is directly related to the customization of technology, but also the study of appropriation of technology for purposes other than original intent. As opposed to the definition used by DeSanctis and Poole, this technically-oriented definition ignores the larger cultural implications of the appropriation of new technologies, instead focusing on implications of appropriation for the technical design and use of technology.

Expanding on this technical approach to the process of appropriation, Jones and Twidale (2005) focus on 'appropriation-as-innovation,' examining instances of innovative use of technology beyond the scope of the original design. The focus of appropriation shifts, in this context, away from empowerment of users through technology to users as developers of technology. This follows in the work of Eglash

(2004) and Fischer and Ostwald (2002) in viewing users as active designers and developers of technology.

In his work on a design-oriented approach to appropriation, Dourish examined the use of Placeless Documents at Xerox and the design features incorporated that allowed for the technology's appropriation by Xerox researchers. For instance, the study found the appropriation 'design' must accommodate for multiple uses of an application. At Xerox an example of this is found in the creation of both 'universal' and 'local' properties for a document, allowing users control over who sees what information in a document, and allowing different users to designate a single document to have differentiated meaning.

Carroll et. al. (2001) conducted a similar study, theorizing a technology appropriation model that illustrates appropriation of technology as a process of transformation from the initial vision of the designer to technology-in-use. By this model, technological appropriation fails when a user decides not to explore the capabilities or to evaluate a technology. Failure to appropriate is differentiated from "disappropriation" the descriptor Carroll uses when a user evaluates a technology only to later reject it.

In all, the majority of existing appropriation research falls into these three categories. The main differentiation is that (1) diffusion theory treats technology as given/unchangeable, and conceptualizes appropriation simply as adoption (2) the pro-social aspect used by DeSanctis and Poole advocates appropriation as a process of cultural interaction with technology and the resulting establishment of new structures for using the technology (3) the technical school of Dourish and Twidale examine the physical use of technology and modification of technical design to accommodate it. Overall, there is relatively little emphasis on the implications of appropriation for future technological evolution.

Consider again the Scholsser (2002) study of consumer interaction with handheld computers. In his work appropriation is presented as entirely distinct from design, in that

appropriation is a process that can occur only after a product is developed and thus is completely separate. The diffusion view would look at the spread of handheld computers as a function of its adherence to Roger's S-shaped diffusion curve. The cultural definition would concur largely with this perspective, focusing on use after design and the implications of use. The design view, however, would argue that appropriation and design are interwoven. When technology is designed, future appropriation and accommodation need to be accounted for and built into the design specifications.

Appropriation and Learning (Learning by using / Learning by doing)

Looking at specific application of appropriation theory, there are a number of alternative applications and theoretical extensions worth consideration. In practice, a number of scholars have studied the connections between appropriation and learning. Through the adoption of new work practices and innovative technology, it is inevitable that use in practice will not necessarily concur with the original design. The importance of learning as critical process of economic development and organizational growth has long been established (Arrow, 1962; Rosenberg, 1982). Appropriation then is critical for the development of new solutions and for developing accurate ways to use implement new work procedures (Rosenberg, 1982).

Viewed through the lens of adaptive structuration theory, the notion that new structures of use are created through the use of technology over time was previously explored in the work of DeSanctis and Poole. This concept is further explicated if one considers appropriation as a process of using technology. This notion of learning-by-doing has its roots in the writings of Levi-Strauss (1966) and the notion that knowledge can be developed through a process of bricolage: tinkering and exploring the concepts of a particular knowledge construct to better develop one's own understanding. This notion is also central to the experiential education theories of John Dewey, Jean Piaget, and Paulo Freire. Most accounts of bricolage as relevant to appropriation and learning take place in the work environment: Orr (1990, 1987) found multiple instances of machine repairmen creating their own solutions outside the scope of their employee manuals in order to efficiently solve complicated repair issues.

Brown and Duguid (1991) wrote that appropriation of new work processes and new technologies occurs through the communal sharing of knowledge and experiences. This notion that innovation through the appropriation of existing processes builds on previous community of practice theory by Lave and Wenger's (1991) stipulation that learning in organizations occurs through the collection sharing and development of knowledge pertaining to a common organizational structure. By this line of theorizing, Brown and Duguid explain "the source of innovation lies on the interface between an organization and its environment" (1991: 51). Thus, while previous adaptive learning theorizes that learning through knowledge exchange is a product of discussion, argument and sensemaking (Weick, 1995), Brown and Duguid, and Tyre and von Hippel (1997) add that the organizational setting is a factor in the appropriation process as it enables or prohibits learning through doing. The case of the Xerox machine is used by Brown and Duguid to illustrate this point. Originally seen as a costly and inefficient alternative to carbon paper, organizational resistance initially prevented success of the Xerox machine. Only through the successful introduction of the Xerox machine to select offices, and the sharing of 'success stories,' was the machine able to become a successful product and a staple in offices worldwide.

In another vein of research, Tyre and von Hippel conducted a number of factory studies examining employees ability to adapt to machine breakdowns and the ability of an organization to support learning-by-doing, or bricolage, was directly related to the speed with which employees repaired breakdowns. Thus there is support in previous literature for the concept that appropriation occurs when learning through using is encouraged.

While originally construed as in industrial process, Brown and Duguid's notion of appropriation at the organizational level is alternatively applicable in the context of social practice. A number of studies have examined the appropriation of technology when implemented in developing nations. For example, the Digital Education Enhancement Project (DEEP) examined the impact of technology use by 48 teachers and over 2000 pupils in primary school in Egypt and South Africa. The project was conducted from

January 2002 to March 2003 and evaluated school based development activities using hand held, battery powered computers. While the study was initially intended to enhance teaching in the classroom, researchers observed that as teachers became accustomed to the computers they began to appropriate it into their daily activities, specifically enabling effective organization of activities and storing of teaching materials (Leach, 2004).

Other examples of appropriation include the use of cell phones for the purpose of improved health outcomes in les developed countries. In South Africa, the Cell Life project now uses cell phones to monitor HIV treatment in patients and to collect information to a central database (McConnell et. al., 2006). The success of this program has already spawned a number of similar programs in other regions of the world as the potential use of cellular technology for medical compliance and treatment adherence is becoming clear (Kaplan, 2006). While both studies focused largely on the cultural aspects of health application of cellular technology, both were hampered by limitations of the hardware. Communication of health information via call phones requires greater bandwidth capacity to handle larger flows of data; thus this new appropriation of cell phones implies, from the technical perspective, a future design change to accommodate new applications.

Appropriation and Social Change

In yet another application, Surman and Reilly (2003) define appropriation as the use of networked technologies in a strategically, politically and creatively innovative manner oriented towards uses of technology for the purposes of initiating social change. In this context of advocacy, successful and effective appropriation of networked technology would thus be the strategic use of the Internet for activities such as collaboration, publishing, mobilization and observation (research). By this definition, the delineation between use and appropriation occurs when the technology is turned to specifically reflect an organization's goals and culture.

Camacho (2001) and Surman and Wershler-Henry (2001) illustrate appropriation by civil society organizations as occurring at the pinnacle of a ladder of technology use.

In the middle of this ladder, most traditional organizations focus on adoption of conventional technology. Towards the bottom, organizations with constrained access or slow adoption rates lag behind and seek access to technology. At the pinnacle, however, pioneers and innovators of social activism actively appropriate technology to accelerate their causes, for instance creating "flash mobs" through mass cell-phone text messaging to instantaneously organize large groups of people for the purpose of social protest.

2. Cultural Appropriation in Latin American

Over its history, Latin America has had extended experience and practice with the appropriation of objects, people, and ideas coming from abroad. Most of the time, this appropriation took place in an unfavorably asymmetric situation. And still it continues to produce a culture of its own. Its history has been enriched by a multiplicity of resistance and appropriation strategies. Three of them deserve a particular attention for their symbolic value, and because they might help us organize our understanding of how societies in general, and Latin America in particular, react to the introduction of new technologies and services: cannibalism, baroque, and creolization.

At one extreme, we find cannibalism, a radical physical reaction later transformed in a cultural program. Cannibalism is appropriation trough dismembering, absorption, and chemical transformation. It appears as a reference in a Brazil's Ministry of Culture program conceived to encourage multimedia creativity and open source tweaking. At the opposite end, baroque is a reaction of the mind. It is the appropriation of spaces through filling and layering, and generally does not imply direct confrontation. An infiltration strategy, it begins by occupying the edges, continuing to fill-in the available spaces until it makes the center marginal. In-between, creolization is appropriation through miscegenation, and détour (roundabout), through unpredictable mixing. A process, more than a condition, it does not need to be confrontational but generally leads to new power arrangements. To be sure, these three modes represent ideal types, seldom encountered in pure form. While inspired by Latin America's cultural history, we argue that these three modes usefully apply in other cultural, geographical, and historical settings.

Cannibalism

Bishop Pedro Fernandes Sardinha was the highest representative of the immensely powerful Catholic Church in Brazil when he was shipwrecked north of Salvador de Bahía in 1556. He was keenly aware of the importance of his mission. And the natives understood this as well, so much so that they decided to seize his power not from him but, literally, with him. They ate him. This was a religious act performed under precise rituals. As in most known cases, the natives of the coast where the Bishop landed practiced cannibalism to absorb the power of those they ate. With Sardinha, they could not have chosen better.

This symbolic act was revendicated (in symbolic terms) in 1928 by Oswald de Andrade, a poet. In his "Manifesto Antropófago", de Andrade (1928) proposed cannibalism as a symbolic strategy to confront influences coming from abroad, "Against antagonistic sublimations brought over in sailing ships." His was a religious, social and very grounded strategy, as we can see in these three excerpts:

> Antropofagia. Absorção do inimigo sacro. Para transformá-lo em totem. A humana aventura. A terrena finalidade.

> [...]Só a Antropofagia nos une. Socialmente. Economicamente. Filosoficamente.

> [...]Somos concretistas. As idéias tomam conta, reagem, queimam gente nas praças públicas. Suprimarnos as idéias e as outras paralisias. Pelos roteiros. Acreditar nos sinais, acreditar nos instrumentos e nas estrelas.

The last sentence of the Manifesto says it all:

> Em Piratininga Ano 374 da Deglutição do Bispo Sardinha. [In Piratininga, Year 374 of of Bishop Sardine's swallowing.]

Rather than the arrival of the first people from the north, rather than the alleged discovery by the Portuguese, de Andrade claimed that the founding act of Brazil should took place on the day when a Portuguese Catholic bishop was swallowed by a Caetés tribe eager to acquire his power.

De Andrade calls for a real revolution: "Queremos a revolução Caraíba." "Caraíba" the term is very precise for those who remember that this Arawak word (which means courageous) refered to some of the fiercest tribes of the Caribbean (whose influenced was felt in northern Brazil). They not only gave one of its names to the region. They inspired Shakespeare's Caliban and gave us, throught the magic of words' creolization, the term "cannibal".

More than thirty years later, the Manifesto Antropófago was re-appropriated by a new cultural movement under the name "tropicalismo". Its main figures were singers Caetano Veloso, and Gilberto Gil. More than a sound, though, as Julian Dibbell (2004) explains so well, tropicalismo was an attitude. It was defined in 2004 by Gil, who by then had become Brazil's Minister of Culture as "no longer a mere submission to the forces of economic imperialism, but a cannibalistic response of swallowing what they gave us, processing it, and making it something new and different. We saw the cultivating of new habits and manners from the outside as a way of nourishing ourselves, not just intoxicating ourselves." (Dibbell, 2004)

Put into such a perspective, the creation of Pontos de Cultura (telecenters) by Gil's ministry throughout Brazil, and the support to Open Source and Free Software do not appear accidental or whimsical. The official pamphlet quotes, both in English and Portuguese, the Cannibal Manifesto.[1] In such light, technology appropriation claims deep roots to (symbolic) cannibalism as a cultural tradition that can be traced to the founding of Brazil, and the Americas.

Baroque

Cannibalism in real time was insufficient to protect native spaces from the conquistadores. For those who were born a century or so after Bishop Sardinha's swallowing, real anthropophagy was not a very practical solution, and even its symbolic practice was still hard to imagine. First, native people had been massacred or wiped out

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[1] - Cultura viva, Programa Nacional de Cultura, Educação e Cidadanía
http://www.cultura.gov.br/sys/skins/cultura_viva_capa/img/cartilha_cultura_viva_pt-br.pdf

by strange epidemics. Survivors were turned into pariahs or slaves as they were joined by others brought from Africa. Both tried to preserve some of their world within the interstices left by powerful conquerors. After a while, the conquerors themselves came to realize they were living in a different world. They too had to invent a new world far from the original center.

Appropriation strategies had to evolve. Direct confrontation was seldom successful. Infiltration, by contrast, could be practiced at small levels in everyday life, in every aspect of cultural production. Always, power was at stake. A long and defining Latin American cultural tradition the Baroque is seen by the improbable Cuban writer and Poet José Lezama Lima (1993) as a tool for "contraconquista". An idea adopted as well by the Mexican Carlos Fuentes and by many others to express their feelings, much like Oswald de Andrade used cannibalism to inspire his 'contemporaries'.

Baroque appropriation is a more complex story than cannibalism. The practice originated in Europe where it was not only tolerated but even encouraged by Rome within a Counter-Reform strategy in which movement, dance, and space were lavishly used to overwhelm protestant rigor. In the Americas, though, it took on a new life that started in the spaces allowed by the Iberian conquerors. An opportunity for slaves of all races to state their presence, infiltrate their messages, suggest their cosmovisions. Our heroes here are often mestizoes who found ways to express themselves in the blank spaces left by the official catholic imagery. Lezama Lima's sees the origin of this movement in a handful of unrelated figures of colonial artists, in particular Aleijadinho, a Brazilian mulato whose grotesque sculpture are still celebrated today, and José Kondori, a rebellious Quechua architect.

Following the same intellectual path, Carlos Fuentes illustrates the point with the work of Kondori, an autodidact who built "the magnificent churches of Potosí, undoubtedly the most brilliant illustration of the meaning of the baroque in Latin America".

> Pues entre los ángeles y las viñas de la fachada de San Lorenzo,
> aparece una princesa incásica, con todos los símbolos de su cultura
> derrotada animados por una nueva promesa de vida. La media luna
> indígena agota la tradicional serenidad de la viña corintia, el follaje de
> la selva americana y el trébol mediterráneo se entrelazan. Las sirenas
> de Ulises tocan la guitarra peruana. Y la flora, la fauna, la música e
> incluso el sol del antiguo mundo indígena, se reafirman con fuerza. No
> habría cultura europea en el Nuevo Mundo a menos que éstos,
> nuestros símbolos nativos, sean admitidos en pie de igualdad. Más allá
> del mundo del imperio, el oro y el poder; más allá de las guerras entre
> religiones y dinastías, un valiente mundo nuevo se estaba formando en
> las Américas, con manos y voces americanas. (282) El Espejo
> enterrado.

Arrived as a framework imposed by the heirs of the conquistadores, the Latin American baroque emerged when native people and those brought from Africa, whose expression it was supposed to control, reversed it. Its success might be explained by the fact that it ended expressing something all of them had in common: the rejection of the domineering center, a deep hatred for the void that was fought by filling it, layering elements of an exuberant diversity. Alejo Carpentier (1987) explains this perfectly:

> ¿Y por qué es América latina la tierra de elección del barroco? Porque
> toda simbiosis, todo mestizaje, engendra un barroquismo. El
> barroquismo americano se acrece con la criolledad, con el sentido del
> criollo, con la conciencia que cobra el hombre americano, sea hijo de
> blanco venido de Europa, sea hijo de negro africano, sea hijo de indio
> nacido en el continente –y eso lo ha visto admirablemente Simón
> Rodríguez- la conciencia de ser otra cosa, de ser una cosa nueva, de
> ser una simbiosis, de ser un criollo; y el espíritu criollo de por sí es un
> espíritu barroco. (Carpentier 1987: 112)

Natives, Africans, and *criollos* (Europeans born in the Americas) created a baroque within the baroque, and by so doing they appropriated it. That's exactly what Lezama and Fuentes had in mind when they defined it as the art of the *contraconquista*. The error would be to think that it ended sometime between the seventeenth and eighteenth century. For Severo Sarduy (cite?) the Baroque is much more than a specific moment in the history of culture it is a general attitude and a formal quality of the objects that express it. Finding inspiration in Sarduy's work, Omar Calabrese (1994) proposes the term "neo-baroque" to define a dominant taste of our times:

> El «neobarroco» es simplemente un «aire de tiempo» que invade
> muchos fenómenos culturales de hoy en todos los campos del saber,
> haciéndolos familiares los unos con los otros y que, al mismo tiempo,

los diferencia de todos los otros fenómenos culturales de un pasado más o menos reciente. Siguiendo este principio me permito asociar ciertas teorías científicas de hoy(...) con ciertas formas de arte, de literatura, de filosofía y hasta de consumo cultural.

Profoundly Latin American, the baroque appears then as an art form that challenges established power relationships. Started as an appropriation of interstices by those who had nothing, it ended up revendicated as an "art of the *contraconquista*" expressed through exuberant fillings and layering in de-centered spaces.   Thus, seen by Cabrera Infante (1967) as an "arte del prestamo digno" baroque is a very different appropriation strategy than cannibalism. It does not require direct confrontation. Instead of being swallowed, people and objects are surrounded by exuberant forms, richly adorned with them, until they eventually seem to become something totally different, or simply disappear.

Creolization

In-between cannibalistic confrontation and baroque infiltration, Latin Americans often resort to a practice at which they excel: mixing, and re-mixing in what we will call "creolization". The Americas is for ever the continent of *mestisaje* and hybridization, a constant reference in the work of all the authors quoted here. Creolization goes to the heart of what they feel, of what they suggest, of what they propose. A reality that implies a process, hybridization can become an identity, the required basis for any appropriation strategy. Our guide here is, again, a poet (like de Andrade, and Lezama), a mulato from Martinique, Édouard Glissant.

Mestisaje, though, in particular when it involves black slaves, makes it harder to put a name on the artist. Hybridization and the culture to which it gave birth arose from a generic place of mythic dimensions: the Plantation which is the focus of our Caribbean writer after many others (Benitez Rojo, etc.) Mulattoes find their identity in "a Relation to the other" a significant change if we think of identity as traditionally based in roots, and filiations.

Nous "savons" que l'Autre est en nous, qui non seulement retentit sur notre devenir mais aussi sur le gros de nos conceptions et sur le

mouvement de notre sensibilité. Le "Je est un autre" de Rimbaud est historiquement littéral. P.39

Glissant (1996), nevertheless, does not seem to consider that miscigenation is by itself a sufficient concept. That's why he advances "créolisation" which is much more than the "meeting and synthesis of two differences" and seems to be "a limitless métissage, its elements diffracted and its consequences unforeseeable." Elsewhere, Glissant answers the obvious question: "why creolisation and not métissage?"

> Parce que la créolisation est imprévisible alors que l'on pourrait calculer les effets d'un métissage. [...] la créolisation, c'est le métissage avec une valeur ajoutée qui est l'imprévisibilité. (p. 18-19)

More important, still, creolization is, and should be seen as a process – a difficult and frightening one, because it obliges to see oneself in perpetual change. Started in the Plantation, creolization expands and can be found in many other places, in the continent and elsewhere, in particular in today's mega cities:

> Si je prends le terme de créolisation, ce n'est pas par référence à mon clocher ou aux Antilles ou à la Caraïbe, etc. C'est parce que rien ne donne mieux l'image de ce qui se passe dans le monde que cette réalisation imprévisible à partir d'éléments hétérogènes. [...]Quand je dis "créolisation", ce n'est pas du tout par référence à la langue créole, c'est par référence au phénomène qui a structuré les langues créoles, ce qui n'est pas la même chose. (p.29)

The acceptance of the other as part of one's own identity, combined with the never-ending process that results from this new "being in the world" can be seen as the basis of an appropriation strategy often deployed through music:

> On comprend que c'est là un univers où tout cri fait évènement. La nuit des cases a enfanté cet autre énorme silence d'où la musique, incontournable, d'abord chuchotée, enfin éclate en ce long cri. Cette musique est spiritualité retenue, où le corps s'exprime soudain. D'un bord à l'autre de ce monde, la mélopée, syncopée, hachée par les interdits, libérée par toute la poussée des corps produit son langage. Ces musiques nées du silence, negro spirituals et blues, continuées dans les bourgs et les villes grandissantes, jazz, biguines, et calypsos, éclatées dans les barrios et les favelas, salsas et reggaes, rassemblent en une parole diversifiée cela qui était crûment direct, douloureusement ravalé, patiemment différé. Elles sont le cri de la Plantation, tranfiguré en parole du monde.(p.88)

Métissage and baroque are a very powerful mix. Thanks to the former the later "naturalizes" itself.

> Il n'est plus réaction, mais la résultante de toutes les esthétiques, de toutes les philosophies. Alors, il n'affirme pas seulement un art ou un style, mais plus outre, provoque un être-dans-le-monde. (Poétique, p.92)

The language itself gives us the device that is needed to implement the strategy the "détour" or roundabout of what comes from the dominant powers through miscegenation. For Glissant, Creole is "a permanent exercise in the bending of transcendence implied it, that which comes from the French source." The key to its success, the characteristic that makes it unique is that creole is a language which "in its structure as in its poetics, completely assumes the "dérisoire" (pathetic, triffling, inadequate) of its genesis".

Creolization too can be an attitude (as cannibalism, and baroque). Born in the Plantation, in the Hacienda, the Latifundio and the Mine it is now "scattered in those sheet plate and concrete mazes where our common becoming is adventuring itself, in favellas and mega-cities" (Glissant, 1996: 87). It is alive and well, and can be found in the places where most Latin American live, in the spaces in which they are most easily exposed to new technologies and devices. Made of avoidance (like IP packets that find a route around obstacles) and mixing (like mashups and aggregation), creolization appears naturally fit for the realm of information and communication technologies, and might prove a very efficient appropriation strategy.

Reading all the text mentioned here, one can only be impressed by how well these historical proven strategies seem to apply to technology appropriation. They seldom appear in pure form and most cases, most discourses, most actual strategies imply some element of each. For analytic purposes they could be ordered from the less confrontational baroque to the more radical cannibalism with creolization as a process somewhere "in-between" (Santiago, 2001) – not an unusual place for mestizoes.

We presented them in a different order because cannibalism – as strange as it may appear – was suggested to us by an official text directly related to technology appropriation, and thus constituted our initial inspiration to engage the Latin American literature on cultural appropriation. Another advantage is that it helped us start with a clear view that adoption and penetration are not everything. Power is at stake, and confrontation may be violent, radical. Appropriation is the name of the game, and people, following their long history of relationship with the Other, are fighting for it.

Baroque, a less confrontational practice, acts through filling and layering. Often a matter of style, it helps us understand that even the more conciliatory attitudes include a dose of appropriation, that we have to research in order to understand the phenomenon in all its magnitude. Finally, creolization seems to be a second nature for most Latin Americans. We find it everywhere at varying degrees. As a result, the place given to unpredictability – one of its main virtues – presents an elegant opening towards the innovation capabilities of Latin Americans in their multiple strategies to appropriate information and communication technologies.

3. Toward a new understanding of appropriation

In this section, we draw theoretical insights from the literature on appropriation, combine them with the analogies we draw from our exploration of cultural appropriation in Latin America, and propose a new framework that can inform the study of the socio-economic impact of mobile technology in Latin America.

The framework we propose comprises two essential components. First, it views the overall process of technology evolution as a three-step cyclical process, successively proceeding through phases of adoption, appropriation and re-configuration . During that cycle, control over the technology's evolution oscillates between providers and users, and learning of different kinds alternatively accrues to each. Smooth progression through the cycle is critical to the overall technology trajectory (and presumably to socio-economic impact) through the integration of learning-by-using and learning-by-doing.

Second, our framework highlights the second stage of that process: appropriation is the key place where users can engage in experimentation, thus putting their imprimatur on the innovation process. We identify 3 appropriation modes, by analogy with our earlier discussion of cultural appropriation: baroque layering, creolization, and cannibalization. They represent increasing degrees of power contestation by users (and growing challenges to the established structure), as well as increasing engagement with 'doing' technology (rather than simply 'using' it.)

The technology evolution cycle

The evolution of an information technology such as mobile telephony can usefully be conceptualized as a cyclical process composed of three principal stages. The cycle first begins when users decide to *adopt* a new technology and employ it to support their social or business activities. A second occurs soon after adoption, when users start to *appropriate* the technology: they experiment, test it out, try out its possibilities, modify its features to better adapt the tool to their needs and desires. At some point however, their experimentation inevitably runs into limits imposed either by the architecture of technology itself or by its providers. To move on, a substantial transformation of the technology platform will then be needed, sparking a third stage of *re-configuration*, during which a different technology platform is produced. A new cycle then begins as users adopt this new technology, then experiment with it, ultimately prompting further re-configuration, and so on (Bar, 1990.)

These cycles can be observed at various levels of the evolution of a technological system. They can refer to long technology cycles, describing for example the transition through mobile technology 'generations' as in the current transition between 2G and 3G, or to smaller-scale improvements of devices or services within one technology generation. Similarly, they can also span an entire technological system (as in all the terminal, network and software components of the second generation mobile system), or serve to describe the evolution of individual components of that system (one particular device or application.)

Regardless of the particular time scale or scope, this cyclical model is particularly useful to a study of technology appropriation for three reasons. First, it isolates the appropriation mechanism within the broader technology evolution process, thus allowing us to better identify and analyze its properties and explore how it relates to the other stages. Second, this cyclical model highlights the fluctuations of the power relationship between providers and users. At first, providers are largely in control and users simply get to decide whether to adopt the technology or not. The appropriation phase marks the attempts by users to acquire greater control over the shape and use of the technology , characterized by the negotiation of the creative tension between these two parties. Finally, the re-organization phase brings some measure of resolution through re-configuration of the technology around the lessons learned through experimentation during the appropriation phase. Third, this cyclical view opens up a richly detailed description and analysis of the innovation process, and of the attached co-evolution of technology and practice. In this section, we begin by describing each of the three steps, then elaborate on some of these implications

Adoption represents the first stage of the technology evolution cycle. When a technology becomes available, adoption is the process by which users acquire it and apply it to their existing practices. In the initial stage, their practices do not change fundamentally. Users make calls on a mobile phone instead of a wired phone or a public phone, but they essentially carry out the same conversations, with the same people. The tool has changed, but the practice hasn't. They *do old things in new ways*. In the process, the technology allows existing practices to become more efficient – cheaper, faster, less place-bound, but not fundamentally different. In doing so, they simply follow the usage script presented to them by the technology provider, and behave according to that provider's business plan and interests. Of course, practices cannot remain unchanged for long once new technology is used, and very soon the practice itself will be transformed by the use of the new tool. But that will be the beginning of appropriation, our next phase. The dynamics at work during the adoption phase are perhaps best described by diffusion theory.

In the second stage, users experiment. They *do new things in new ways*. They explore all aspects and possibilities of the technology, even those which may not have been part of their initial motivation for adopting it. They personalize the device and applications to better integrate them within their lives. Some users will take devices apart and re-build them in ways that reflect their personalities (for examples with new faceplates), or load up their own music as ringtones. Others will unlock their phone so they can switch providers, or even modify the software that came with their phone to adapt it to their needs. Some will even hack their device to transform them deeply. Users will also experiment with different ways to use their phone, again exploring those intended by the provider (SMS, conference calls, saving caller information in their address book, etc.) and pushing the envelop to invent uses that may not have been anticipated by the providers (swap SIM cards to use competitor networks, flashing or beeping to avoid paying connection charges, etc.) Finally, social practices will be transformed: teen-agers will make plans on-the-fly (and change them constantly, because they can), and demonstrators will evolve elaborate swarming strategies coordinated through their cell phones. As a whole, these multiple experimentation practices (which will be examined in more detail in the next section) represent various forms of technology appropriation: during the adoption phase, users simply used the technology as it was given to them; now they modify it to make it their own and invent new practices around its possibilities. In doing so, they re-negotiate the power relationship tying them to the technology provider: by claiming the technology as their own, they strive for greater control, which may or may not be congruent with the provider's interest.

At some point, a substantial re-design of the technology platform will be called for, bringing about a third stage of re-configuration. It may be that experimentation has run into the limits of an existing technology, or that the technology providers decide to take back control and deploy a new generation network (e.g. 3G rollout), or to develop substantially new services (e.g. to introduce internet access on cell phones). With mobile telephony, re-configuration typically constitutes a deep re-design of the technological system that requires provider involvement, the kind that users alone could not achieve.

At this stage the providers regain control: they have to be directly involved. But they can decide to learn as well from the user experimentation of the previous stage: the new technologies users have introduced and the new practices they have evolved both can provide inspiration for the development of new technology platforms and services. We might argue that the manner in which providers navigate this transition (i.e. how they handle the power shift) matters a lot to the future success of the technology, and to the likelihood that users will be able (and willing) to further experiment.

Then, after this re-configuration, a new technological platform is in place, upon which new rounds of adoption, experimentation, and re-configuration can take place. A new cycle begins.

The emergence of mobile banking (m-banking) in Africa provides an excellent illustration of this evolutionary cycle (InfoDev, 2006). In the beginning, phone companies introduced pre-paid mobile telephony in these countries much like they did in the developed world, and local customers adopted it much like everyone else, to conduct phone conversations and send short text messages. Over time however, African users recombined two elements of the service, pre-paid recharges and SMS, through a new practice that allowed them to send money using their mobile phone. The practice, called *sente* in Swahili, works as follow: a user buys a pre-paid recharge card, but instead of entering its code into the phone, sends it via SMS to someone to whom he wants to transfer money. If the payee doesn't have a mobile phone, the code is sent to a public phone operator in her neighborhood, who will use it to recharge his own phone and give her the equivalent cash (minus a commission) (Chipchase, 2006?).

This "social bricolage" constitutes an appropriation of mobile telephony invented through experimentation by users who had no access to the formal banking system and needed a straightforward way to transfer money to distant friends and relatives. The emergence of these practices, combined with the realization that many poor users could only afford recharges in very small denominations, prompted the phone company to engage in a minor re-configuration of its pre-paid service: it begin offering re-charges for

very small sums, and made it possible to transfer air-time in any amount directly from one phone account to another. These new services were quickly adopted by the users, who further experimented with the services possibilities, for example trading airtime for goods in the marketplace. Eventually, phone companies like Safaricom and Wizzit engaged in more profound re-configuration of the financial transaction aspects of its network, introducing full-fledged m-banking, where the phone functions essentially like a debit card, allowing purchases, bill payments, transfers to other phones, or transfers to regular bank accounts. This re-configuration results in a new technological platform, which is currently being adopted rapidly (Mwakugu, 2007), and will no doubt soon give rise to further rounds of user-driven appropriation.

Several key analytical elements from this cyclical model deserve emphasis. The first relates to the different kinds of learning that take place during different stages of technology evolution. Following Rosenberg (1982), we distinguish 'learning-by-using' and 'learning-by-doing'. The first accrues from emplying a technology as it is given to the user. Learning then essentially focuses on becoming skilled at making use of the technology, as well as developing new practices or simply better understanding existing practices as they become highlighted through technology use. By contrast, when users engage in experimentation with technology, they learn 'by-doing'. They tinker with the hardware, hack the software, invent new usage routines, or construct new social and organizational practices inspired by the newfound possibilities of the technology. Users obviously "learn-by-using" as soon as they adopt a technology, but they only "learn-by-doing" as they appropriate it through active engagement with the experimentation process. Otherwise, only the devices and service providers find themselves in a position to learn 'by-doing' technology. We believe that greater innovation occurs when users can engage both in learning-by-using and learning-by-doing, when the two forms of learning mutually enhance each other, and when the resulting lessons can be embedded into successive rounds of technology re-configuration throughout the evolution cycle.

Second, the possibilities that exist for user experimentation and appropriation will depend on the platform initially made available by the provider. Open platforms allow

greater experimentation and more extensive appropriation than closed ones. This in turn affects how much experimentation and innovation can take place. Over time, the sustainability of user-driven experimentation and innovation also depends on how the providers manage the re-configuration stage: whether they choose to retain the characteristics that allowed appropriation in the previous cycle, or to close them off. It is worth emphasizing that mobiles telephony platforms today afford much less possibilities for user-driven experimentation and tinkering than other, more open ICT platforms such as the internet or the linux open-source operating system. Yet, as we describe in the remainder of this section, we observe a variety of user-driven appropriation practices taking place on this relatively closed mobile telephony platform. A comparison with the internet suggests how much more innovation potential could be unlocked by relaxing the tight grip phone makers and service providers continue to keep on these systems (Wu, 2007.)

Three Appropriation modes

We distinguish three principal modes of technology appropriation. Echoing our earlier exploration of cultural appropriation in Latin America, we label them 'baroque', 'creolization' and 'cannibalism.' Briefly summarized, *baroque layering* is the filling-in of technological spaces that providers intentionally leave blank for users to personalize their devices and applications; *creolization* is bricolage, the recombination of the technology's components to create something new; and *cannibalism* is creative destruction, an innovative act that first requires breaking down the existing to come up with something new. Like the various forms of cultural appropriation, these three modes are ideal types and most real-life appropriation borrows from several of them, or fall somewhere in between.

We present them in this order because they correspond to increasingly confrontational stances the user can take vis-à-vis the technology provider. With baroque, users (at least initially) follow an appropriation script laid out for them by the

provider. With creolization, users invent their own script which may or may not run counter the providers' interest. And with cannibalism, their practice is deliberately hostile to the providers' interests. To some extent, they also correspond to progressively deeper user involvement, which require increasingly sophisticated technical skills. Each of theses three practices represents an alternative way for users to reach for greater control over the technology they use, mold it to fit their lives, and make it their own. All three practices however are uniquely creative.

As we describe the various appropriation modes, we will provide examples of existing practices that illustrate each. Some of these examples are taken from Latin America, but not all. As we pointed out earlier, the urge to appropriate is universal and the cultural patterns identified throughout Latin America's history also unfold in many other places – technology is no different. In fact, many of our examples come from Africa, proving once again that innovation often comes from the edge (Lessig, ??) For each appropriation mode, we seek examples relating to three components of the technological system: (1) the technology itself (hardware and software), (2) the mobile phone usage patterns, and (3) the social, economic or political practices that have emerged around the technology.

Baroque layering

The most basic way in which users can appropriate a technology is for them to use the personalization features that are provided to them with that intent in mind. As technical objects, mobile phones come with many such affordances. These include for example the ability to change the ringtone, screen wallpaper, upload one's phonebook, set up short-cuts for most-often called numbers, download games, and upload one's music, photo, or video collection. Users also personalize their phone by changing them physically: they install decorative faceplates and sleeves, or create their own decorations; they attach "charms" to their phone, which they may buy or make themselves. In doing so, they often go beyond the personalization options offered by their mobile phone maker or service provider and look to third parties for additional options. A thriving sub-

industry offers an ever-growing array of options. A user's appropriation of their mobile through 'baroque layering' does not stop with the device itself and can also involve the service. Recording of a personal voicemail greeting, setting up different music tracks for callers to hear while they wait for their call to be answered, or the marking of a set of numbers as "friends" eligible for free or cheaper phone calls all constitute such examples.

This baroque layering needs not always be done directly by the user, but can also be done for them by third-parties (or services they subscribe to) who provide baroque layering 'for-hire.' Phone customizers exist that will 'pimp' any phone to the customer's desires. Services have emerged (such as the aptly named 'mobilefaker.com') that will automatically send you the latest hip ringtone, or call you in a foreign language (and feed you appropriate lines) to make you look worldly. More substantive examples include the multiple Mobile Virtual Network Operators (MVNOs) that offer to customize the generic service from the main mobile carriers so that it fits particular lifestyles. Examples include MVNOs like TuYo, Movida, targeted at Latino populations in the US, whose services range from Spanish language services and assistance to specially discounted rates for calls to specific countries in Latin America.

Another form of baroque appropriation is the progressive transformation of social practices allowed by the device's functionalities. One example is the way in which teen-agers now coordinate their meetings and outings "just-in-time", and keep changing them until the last minute, because they now can remain in constant contact via their mobile phones (cite?). Another example is the role texting plays in close relationships among Japanese teenagers, what Ito (2005:264) describes as "ambient virtual co-presence" - a "light-weight awareness of connection with others."

These illustrate just some of the myriad ways in which users appropriate mobile technology by personalizing their device and service according to a set of options offered to them by device makers and service providers, or by using their mobile 'as intended'. Their actions do not conflict with the interests of the providers and, in fact, fit well within their business proposition. They generate revenues for the device makers, service

providers, and third parties. They do however go some way beyond mere adoption of the technology and represent active practices of modification of a device or service, which occasionally go beyond what was envisioned by the supplier. Taken together, they add up to a rich layering of modifications using customizable spaces created by the technology supplier, a process strongly reminiscent of 'baroque infiltration'. The resulting objects and services reflect the creativity of their users and as such embody a meaningful degree of innovation.

Creolization

Creolization represents a deeper transformation, a more profound form of appropriation. It refers to practices where the user recombines or reprograms elements of the technology. In this appropriation mode, by contrast with baroque layering, users are more deeply involved in changing the technology. They now explore ways to adapt the technology beyond the options that have been designed by the phone makers and service providers. In doing so, they may come up with modifications that are compatible with the suppliers' business models, or that find themselves in direct conflict. But their goal is not to seek or avoid that conflict. Their goal is to make changes to the technology or to come up with new practices, so that the technical systems better serves their own needs, better fits within their lives. Bricolage is the most apt description: identify the components of the technology that can be isolated, modified or recombined to create something new, better adapted to users needs.

Examples of creolization practices include a number of physical device modifications. Some take place by 'unbundling' the phones elements (SIM card, battery, keypad, screen, etc.) and recombining them in different ways. In its simplest form, this may mean swapping SIM cards to gain access to a different network, while a more sophisticated version of that practice would be to modify the phone itself so it can hold two SIM cards (a graphic example of hybridation.) In several African countries, mobile phones have been grafted onto transportation devices – bicycles, boats, etc.- so they can better serve as moveable public phones. Some users have designed external antennas

(sometimes several meters high) that boost their mobile's reception in remote areas. These bricolage practices have strong connections with the presence of highly developed mobile phone repair cultures in these regions. Current attempts (such as openmoko.org) to port open source operating system software onto GSM cellular phones could open up substantially greater potential for creolization practices.

Another category of creolization practice directed at the technology has to do with electrical power supply especially in regions where electricity provision is limited or unreliable. For example, African users have evolved inventive new ways to charge their phones, thus making them better adapted to their daily lives. These can rely on hardware 'bricolage', as in a case we observed in Mozambique, where a solar panel had been 'borrowed' from a TelKom cell tower in neighboring South Africa, was connected to a car battery during the day, so the battery could then be used at night to re-charge the inventive bricoleur's mobile phone. Other practices rely on social arrangements, such as that of a woman in rural Rwanda who made a deal with a local bus driver to plug in her phone in the bus' cigarette lighter and return it to her – fully charged – after completing his morning route.[2]

Other forms of creolization involve the development of inventive new ways to use the phone to avoid charges. One such practice is the so-called 'beeping' or 'flashing': the caller only lets the phone ring briefly, long enough for the caller-ID to register, and quickly hangs up; this constitutes a pre-arranged signal for the receiving party to call back and incur the charge, or to prompt them to take action – customers 'flash' rickshaw drivers in Sri Lanka to let them know it is time to pick them up (de Silva, 2007.) In a very different domain, the transformation of language arising through the use of text messaging is another form of creolization – in this case the literal creation of a creole (Castells et al, 2006).

Finally, a third kind of creolization practices involves the transformation of social, economic or political practices through the appropriation of mobile telephony. The

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[2] Anecdotes gathered during field research in East Africa, dec. 2006

example of the emergence of mobile banking described earlier fits well in this category. Another interesting example comes from the border region of Tijuana. Walking the streets of Tijuana, one cannot help but notice the constant chirping of walkie-talkie *radios* that have become a pervasive feature of the city's soundscape. These are the sounds of people connecting with their friends and relatives using the Push-to-Talk (P2T) feature of their cellular phone. Once aimed at small businesses with mobile workforces – plumbers, contractors, etc. – P2T has now been appropriated by families and groups of friends whose lives straddle the border. Pairs of callers or small groups constantly rely on the *radios* to coordinate the complex logistics of cross-border carpools, shopping lists, doctors' visits, day jobs, kids' pick-up, night-club outings, even participation in political rallies, or simply to stay in touch informally throughout the day. These practices emerged in 2003 when Nextel, the world's leading P2T provider, decided to launch international P2T service in Tijuana.[3] What used to be an expensive international phone call instantly became a very cheap connection, quickly set up at the push of a single button. In so doing, they have invented new ways to manage their complicated lives, born of the cross-pollination of a business phone service, extended family logistics, and their unique situation on the border.

Cannibalism

This third form of appropriation is the most extreme in the sense that it corresponds to practices where the user chooses to engage in direct conflict with the suppliers of the technology (or at least with the power relation as embodied in the technology.) Cannibalism includes modifications of the device that place the user in direct opposition with the providers' business model, destruction of the device. Their goal is to destroy, subvert, defeat the device or service as offered. They represent a direct and explicit confrontation with the provider. We should acknowledge from the start that we found fewer examples for this last appropriation mode than we did for the two previous ones. This was to be expected since these kinds of practices have obviously not

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[3] "'Push to Talk' gets International Hookup," CNET, July 24, 2003.
http://news.com.com/Push+to+talk+gets+international+hookup/2100-1037_3-5054037.html

been encouraged by those in control of the technology. Yet, we do identify a number of examples that fit here.

In a first category are cases where users hack the technology itself in ways that are meant to defeat the provider's control and come in direct conflict with the provider's interests.

Examples include the installation of applications that would deprive the carrier of revenues. On the milder side, an illustration of that kind of cannibalism can be found in the current tussle over the conditions under which end users might be able to install Skype on mobile devices, thus appropriating the hardware for a purpose diametrically antagonistic to the purposes of the carrier (Anderson, 2007). Increasingly more antagonistic cannibalism practices include phone unlocking (to defeat the contractual restrictions associated to device subsidies), and phone cloning (to redirect all charges to another, unsuspecting device). One of the more extreme is the rebuilding of cellphones into detonators that let terrorists trigger explosions from a distance with a simple phone call.

Finally a number of political practices have emerged where mobile technology is used to confront power directly. These include street and guerilla tactics such as swarming and netwar, use of mobile phones by terrorists or smugglers. Use of cell phones by the São Paulo's Primeiro Comando da Capital (PCC) to direct criminal actions from within prison cells would also fit in that category.

Conclusion

In this paper, we lay out a theoretical framework that can help inform future studies exploring the impact of information and communication technologies, with particular application to mobile telephony. We argue that while technology penetration explains much about current impacts, a detailed articulation of appropriation – the process through which users make a technology their own and embed it within their lives – is critical to understanding innovation mechanisms and the technology's long-term

impact. We make a case for understanding appropriation as a user-driven attempt to re-negotiate the power relationship embodied in a technological system. The creative tension at work throughout this process is a fundamental source of innovation.

The model we propose views technology evolution as a three-step cycle, progressing through successive phases of adoption, appropriation, and re-configuration. We focus on the appropriation phase, outlining in turn three distinct appropriation modes. By analogy with the historical process of cultural appropriation in Latin America, we label these three modes "baroque", "creolization" and "cannibalism." To be sure, these represent ideal types. Just like real-life processes of cultural appropriation usually involve some combination of the three, actual technological appropriation practices also reflect combinations. But they open up useful analysis because they represent progressively more assertive attempts by users to assert control over the technological tools they use, in the face of technology suppliers.

This framework gives users the important place they deserve in the innovation process. It naturally leads to an understanding of the evolution of mobile communication technology as an iterative and cumulative process, where the lessons derived from experimentation and appropriation through each cycle become embedded within the technological system, supporting further rounds of innovation. It ultimately argues that the character and magnitude of the technology's social, economic and political impact will depend on how smoothly successive cycles build upon each other. Critical to this process is the articulation of productive relationships between providers and users of the technology. While we draw our inspiration for the definition of these three appropriation modes from Latin American cultural history, the power dynamics are universal and the innovation model we outline has broad application.

This model suggests three important research directions to explore the role of appropriation in technology evolution. The first is an exploration of the conditions that permit and encourage appropriation. Such factors range from technology architecture (e.g. the extent to which a technology is open) to legal and policy regimes that control the

conditions under which users are allowed to modify the technology they adopt or to apply it in ways not intended by producers. A second research direction would further examine appropriation practices. In particular, it will be very fruitful to analyze the multiple ways in which the user/producer power negotiation takes place during the appropriation stage, and study the resulting innovation modalities. A third research direction would investigate how innovations that emerge from the appropriation process are later incorporated (or blocked) by producers through re-configuration of their technology platform. Together, these three axes would provide a detailed articulation of the user/producer dynamics at work through the appropriation process, leading to a better understanding of the innovation process and, in turn, to a richer understanding of the technology's socio-economic impact.

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