Discerning Rejection of Technology

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Abstract

Technology is innate to modern society and primarily embodies human intellect. It greatly influences development, societal functioning, and sociotechnical transitions. Rapid technological advancements, made possible with advancement in science, human ingenuity, and competitive markets, provide human society with affordable and unlimited choice. A society can be viewed, with an individual as the fundamental unit, or as a community, or state/nation. In one view, sustainability can be viewed through a matrix of societal, economic, and environmental configurations associated with the three societal levels. Technological advancement and complexity can either remain simple and amenable to the user or, as emerging in recent years, may daunt the user to keep away. While the phenomenon of technology adoption (acceptance) in society has been well appreciated, the increasingly characteristic phenomenon of technology rejection is yet to be understood and studied. Technology rejection is not merely a negation of its acceptance, and hence requires to be discerned carefully. Rejection also does not imply in its totality, but varies in terms of its kind and/or intensiveness. While rejection is discernable at all these three levels of society, this study remains focused at the level of the user (individual). It attempts to discern rejection of technology and discusses its distinctness from technology acceptance through an exhaustive literature study. The article initially discusses the technology–society nexus and provides a preliminary technology–user interface model leading to a detailed discussion into the determinants of technology rejection.

Introduction (Technology–Society Nexus)

Technology fundamentally serves to expand and enhance human capabilities and conveniences, while sociology studies society. An understanding of the way in which a technology is embedded in its social context helps appreciate the interaction between that technology and that society (Cerezo & Verdadero, 2003). Society and technology intertwine and coevolve—culture and social structures shape the design and use of technology, and technology in turn influences cultural and social experience. The user's endeavor of engaging with a technology can have effects on the social quality of the individual—in terms of socioeconomic security, social inclusion, social cohesion, and empowerment (Berman & Phillips, 2001; O'Neil, 2002), increasing a sense of community, trust, and interaction with other individuals (Selwyn, 2003). Technology enables individuals to participate in society, and being without it might constitute a barrier to that end, for example, in the case of information and communication technologies (Haddon, 2000). In the process of incorporating a technology into one's daily routines, the individual gives the technology a physical, symbolic, and social place (Silverstone, Hirsch, & Morley, 1992), negotiating a "proper placement" for that technology in agreement with the already existing set of rules, routines, and ways of doing things

(Selwyn, 2003). Therefore, an understanding of the complex relationship between user and technology is important, both from sociology and technology points of view. Within this branch of research is the investigation into rejection of technology. Certain technologies are accepted (to varying degrees) while many, though not apparent, are rejected. Although the acceptance of technology by society is well researched, particularly in the scenario of competitive markets, its rejection, though increasingly pronounced in the recent decade, has not been explicitly investigated. Technology is innate to society and not only supports material existence (conveniences) but also facilitates social existence (MacKenzie & Wajcman, 1999). This article deals with rejection, as in certain members of society (individuals, or groups, or nations), choosing to refrain from a technology in its kind and/or intensiveness. The objective of this study is to explore the phenomenon of technology rejection occurring within the relationship between society and technology. The article explores the causes of technology rejection and also

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suggests future directions of inquiry. The technologies being dealt with are those that are common, easily procurable, and usually accessed on a daily basis by individuals.

The section on "Technology Rejection Research Thus Far" presents the debate on technology adoption and rejection, and structures the levels at which technology rejection occurs in society. The "Individual Users Rejecting Technology" section articulates the need for investigating the individual user as a rejecter of technology and presents an understanding of the individual's experience with technology. The section "Determinants of Technology Rejection" discerns factors critical to technology rejection at the level of the individual user.

Technology Rejection Research Thus Far

Technology: Acceptance Versus Rejection

A fundamental question is whether the field of technology rejection requires investigation at all, considering the wealth of research available in technology adoption. Are they distinct phenomena? Or is knowledge on technology rejection merely a by-product and subset of knowledge on technology adoption? The debate is yet to be resolved. Although technology rejection has not been extensively researched in itself, there is however considerable research literature asserting that technology rejection is distinct from technology adoption. However, by attempting to explore technology rejection, a comparison of the two may be undertaken. It would then perhaps be possible to ascertain whether they are distinct or whether they are a negation of each other.

There is an extensive body of knowledge dedicated to the acceptance of technology, especially in the modern field of Information Technology (IT; Davis, Bagozzi, & Warshaw, 1989). Numerous iterative models (Technology Acceptance Models 1, 2, and 3) have evolved over time to explore how users have accepted IT (Venkatesh & Davis, 2000; Venkatesh, Morris, Davis, & Davis, 2003). These theories focus on factors that support acceptance of technology and innovation (Aversano, 2005). There has even been extensive exploration of both rationalist approaches and cultural sociological approaches regarding technology acquisition (Pollock & Williams, 2007). There are also theories such as Diffusion of Innovations (Rogers, 1983) on how innovations are adopted by individuals and communities. These theories of *Technology Acceptance, Diffusion of Innovation* and its extension, and *Crossing the Chasm* are acceptance-centric models. However, there is a paucity of both theory (Aversano, 2005) and literature (Goode, 2005) on rejection of technology, particularly from the viewpoint of the individual (in society).

In the opinion of Gatignon and Robertson (1989), technology rejection is a distinct phenomenon and not merely a negation of its acceptance. There is also a lacuna in comprehending social realities associated with rejection. The authors concur that, although there are numerous factors common between acceptance and rejection of technology, a study of technology acceptance does not imply an inherent understanding of technology rejection. This article attempts to identify and characterize rejection-centric factors for technologies at the individual (user) level, including factors beyond the usual economic and material barriers in accessing technologies. Such barriers may be important factors resulting in nonuse, but here, the attempt is to identify factors causing deliberate rejection.

"Rejection of technology" may be expressed as a phenomenon wherein a society, ranging from individual users, community groups, through states (nations), capable of availing the service of a particular technology, deliberately chooses to refrain from its use, in full or part. Consequently, some technologies get increasingly used while the use of others tends to ebb. Conventionally, the debate surrounding the divide between technological "haves" and "have nots" has simply quarantined the latter as individual deficits (Selwyn, 2003), typically of a financial nature. However, a consensus is recently emerging within the arena of sociology of technology that conceptualizing nonusers of technology as purely technology "have nots" is too crude an analysis (Selwyn, 2003). As Bauer (1995) highlights, nonuse or resistance to technology has largely been treated with a negative connotation, placing the nonusers at fault. Bruland (1995) states that such resistance to technology is by no means irrational or conservative. Rejecters must thus be dealt with as *deliberate* rational nonusers. Bauer poses the questions, "Who are the people that resist a particular technology or new technology in general; how do they differ from other social groups; how large is this group, and where are they located within the structures of society?" (p. 21). Selwyn (2003) recognizes that these important questions have remained on the periphery of academic work between technology and society. Focusing on the social and technological nonplacement of technologies into people's lives, and studying individual motivations and consequences of not using a technology, can be an important direction of research into technology–society intertwinement (Selwyn, 2003). Technology rejection is an important yet underexplored frontier tying sociology and technology. As few technologies get adopted and others rejected, both to varying degrees, a "continuum" between these two ends may be visualized. Along this *usage-frequency continuum*, a pertinent query that arises is whether technologies that are rarely used face fewer problems in adoption, while technologies that are frequently used carry a greater degree of concern in light of possible rejection.

The configurability and scalability of technologies, coupled with the diversity of societies, result in technologies being designed and marketed to local appeal and cultural trends. Sociotechnical systems comprise technology, regulation, user practices and markets, cultural meaning and dictums, infrastructure, maintenance networks, and supply

Table 1. Matrix Indicating Technology Rejection at Three Tiers of Societal Scale Versus the Three Pillars of Sustainability Serving as Salient Examples of Concerns Causing Technology Rejection.

		Three pillars of sustainability (concerns)		
		Society	Economy	Environment
Societal scale	Individual	Burma blogging	CFLs (in rural Asia)	Mercury-based batteries
		GPS tracking in mobile phones	Photovoltaics	Synthetic dyes
		Internet		Plastic paper
		Synthetic garments		
	Community	Prenatal gender detection	Healthcare diagnostics	Plastic paper
		Nuclear energy (Germany)	(MRI)	Refrigerants
		Full-body scanners	Photovoltaics (domestic)	Lead-free fuel
	State/nation	Endosulfan	Concord (supersonic commercial flights)	DDT/Endosulfan
		Mobile phones (North Korea)		Seabed trawling
		Nuclear energy (Germany)		

Note: CFL = compact fluorescent lamp; MRI = magnetic resonance imaging; DDT = dichlorodiphenyltrichloroethane. The column influences the row. The societal actor is mentioned on the row, and the reason for rejection is mentioned at the head of the column. For example, the cell entry full-body scanners means that communities may reject that technology for societal reasons (because they feel that privacy is being infringed).

networks (Geels, 2005). Numerous countries, especially in the developing world, are in the midst of major transitions (Rock & Angel, 2005), bringing about transformations in the way a society operates, functions, and performs both technologically and socially. Societies in the developing world are rapidly getting introduced to advanced technologies from around the world and are, as a result, undergoing sociotechnical transitions. Society shapes the values and norms that define consumer preferences (Kotler, Keller, Koshy, & Jha, 2009) and affinity for, or against, a technology. The sociocultural diversity of such societies could influence the users' affinity toward a technology. The same technology used even in technically similar environments may have differences in adoption in different cultures (Straub, Keil, & Brenner, 1997).

Many individual, organizational, and technological factors determine the acceptance (or rejection) of a technological innovation (Tornatzky & Klein, 1982). While the influence of science in shaping technology is well accepted, technology's relationship with society is more pertinent to this article. Technology primarily originates as a human need/desire and fundamentally involves the human intellect (innovation). Technology is intricately woven to economics, politics, and culture (MacKenzie & Wajcman, 1999), and is innate to society. MacKenzie and Wajcman (1999) state "technology and society are mutually constructive." Furthermore, technologies often are themselves influenced by the process of adoption—Adoption of a technology tends to improve its performance over time. In this article, rejection of technology or "society rejects technology" does not imply mutual severance between technology and society, but that certain members of society (individuals, or groups, or nations) may choose to refrain from a technology in its kind and/or intensiveness. The rejection of a technology is not in its universality or entirety but instead in that the

configuration is not amenable to the societal preference/choice of those participants. To reiterate, the focus of this article is to understand technology rejection from the users' arena where technology is accessed/adopted/experienced.

Not all technology rejection is the same. As suggested earlier, this article proposes the exploration of technology rejection at three tiers of a societal scale, namely, individual user, community of users, and a state (nation). These represent the different units of analysis or decision making. The rejection of a technology may happen within a community or in a domestic (personal) setting. Even within communities, choice of one technology over another is seen to reside not in the objective properties of the artifact through a formal technical or economic assessment but in many cases is driven by the micropolitics of the community (or organization), the commitments of the various actors, prevalent rhetorics, and fads (Grint & Woolgar, 1997; Neyland & Woolgar, 2002; Pollock & Williams, 2007). However, this article focuses on the latter setting—one in which users are embracing a technology in a daily personal setting, even in one's occupation. While this study looks at the rejection of technology at the users' scale, it is important to note that technology rejection, though eventually discernable at the individual (user) scale, can be effected or imposed by the state. It may appear intuitive that the rejection of a particular technology by a state has different factors governing that decision when compared against an individual's rejection of a technology. Motivations and considerations in deciding upon a technology would be different at different societal scales. To illustrate if there truly are three tiers to rejection by society, examples of rejected technologies have been presented in Table 1.

Extensive exploration of societal systems may be found in the field of sustainability. Sustainability is most effectively understood through the "three pillars of sustainability," namely, society, economy, and environment. These three
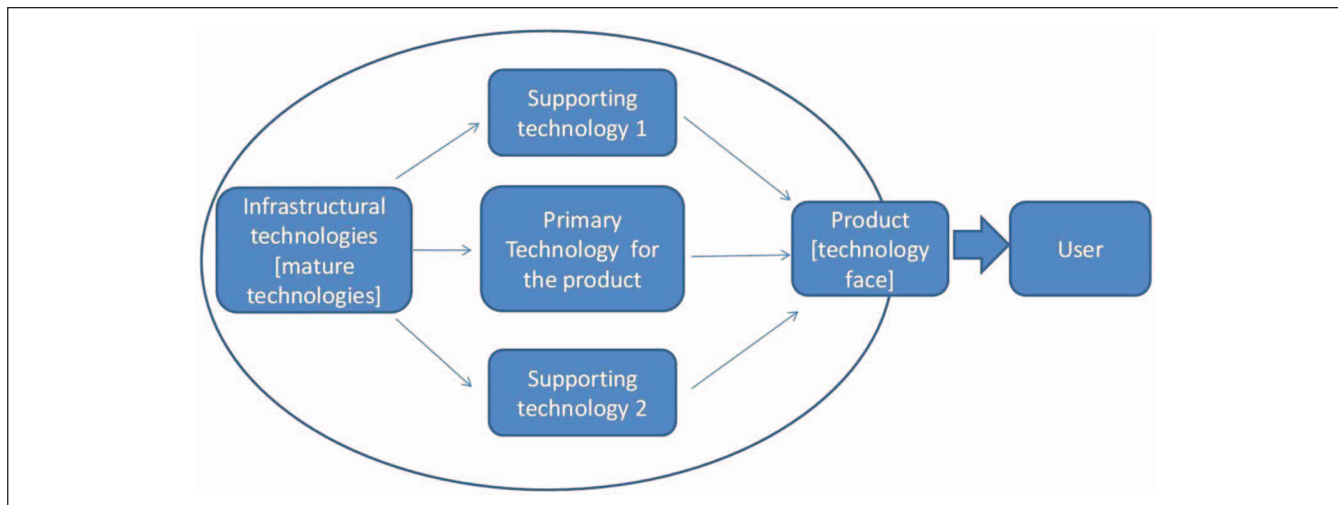
Figure 1. Technology–user interface model.

pillars are helpful in the context of this article—they provide three distinct perspectives for identifying diverse factors that influence society's technology rejection. Following this lead, the possible technology rejection scenarios may be mapped (see Table 1) by meshing technology users (individual, community, and state) with the three pillars of sustainability (society, economy, and environment). Examples of technology rejection at the individual/community/state level influenced by the societal, economic, and environmental considerations have been presented in Table 1. From these examples, it is evident that not all cases of technology rejection are the same. Also, the three tiers have distinct examples highlighting concerns relevant to that scale of society. This article deals with technology rejection at the individual-user scale (The first row in Table 1). Despite the examples provided in the table, the authors of the article concur that technology rejection happens not due to exclusively economic factors or societal factors or environmental concerns—it happens due to a combination of reasons from all three pillars. These factors are interlinked between the three pillars. In the later sections of the article, when factors are identified, the authors agree that it is not directly possible to classify factors as belonging exclusively to one pillar of sustainability and not the other two. What is also evident from this exercise is that deeper understanding of the individual's experience of a technology is required to identify the factors causing technology rejection at the individual-user level. This exploration beyond the three pillars is the objective of the subsequent section.

Individual Users Rejecting Technology

An exploration of all the three tiers is required to determine where technology rejection research adds most value in a unique way to our understanding of the relationship of technology and society. However, in this article, only the first tier—the individual user—is discussed. While technology rejection is discernable at different societal levels, this study discerns the same at the level of the individual, the fundamental unit of any social structure. Individuals rejecting a technology can influence sociotechnical transitions and this may manifest on a large scale too. Selwyn (2003) acknowledges that it is the individual's perspective which is of great importance when it comes to any realistic notion of effective technology access for practice. Thus, the reasons why these individual users may reject a technology must also be part of the discourse on sociology of technology. Some underlying factors may be within the capacity of the individual to change and other underlying social and economic forces may fall beyond the intent of the individual (Powell, 1987). A structured understanding of why they reject technologies will enhance sensitivity to their concerns.

Technology–User Interface Model

To understand an individual's experience of a technology, a schematic representation of this interaction has been developed. This experience is important as it may cause the user to reject that technology. A technology characterized as a product (assembly) usually integrates numerous technologies responsible for the various components (subassemblies) of the product. However, all the technologies on which a product is based are not of equal importance to that product (and its functioning). To the general user, the product is the (inter) face of the technology (as a whole) and not the physical embodiment of its components. A proposed model to discern the role of technology (manifest in a product) and its acceptance or rejection at the user level is illustrated in Figure 1.

Infrastructural technologies are those that have already reached their maturity levels and now serve as a standard platform upon which newer technologies take-off, (Carr, 2003), for example, FM radio, MP3, and human-interface

devices such as keyboard and mouse. *Primary technology* refers to the core technology that is either adopted or rejected by the users, for example, mobile communication technology in smart phones. *Supporting technologies* are those that are also evolving in conjunction and usually facilitate the manufacture of the core product, for example, micromotors, thermoplastics, and capacitive screens. The technology behind a product is judged based on its interaction (face) with the user, and it is the nature of this interaction that critically determines the rejection or acceptance of technology. For example, while televisions have evolved from cathode ray tubes to plasma to LED-LCD TVs, the interface has essentially remained similar. In industry's pursuit for cost-effectiveness, ease of manufacturability, serviceability, and so on, the various technologies behind a product are always evolving, for example, computer processors, RAM, and so on. Many research findings also concur that the product face determines successful (or unsuccessful) transitions. Barriers for technology adoption have usually comprised skill- and dexterity-related issues (Goode, 2005). The schematic representation shows that the product—as the face of the technology—plays an important role in acceptance or rejection of the technology as a whole.

Determinants of Technology Rejection

The phenomenon of technology rejection is determined by numerous factors attributable to the nature of interaction between society and technology. To answer the question "Why do individuals decline to use a technology?" is the focus of this section. An understanding of the intricacy of how technology presents itself to the individual (represented schematically in Figure 1) serves as a good foundation to the exploration of factors resulting in technology rejection. The approach taken here is to review the diverse research exploring the barriers that individuals experience in their interaction with technology, rather than adapt from the extensive literature on how technology adoption happens (although there are overlaps as shall be seen). With a ground-up approach, a new perspective might reveal rejection-centric factors that might not emerge from negating acceptance-centric factors.

With an understanding of how social, economic, and environmental concerns influence individuals, and a deeper understanding of the technology–user relationship, the following factors discerning technology rejection have been identified.

- Technological complexity
- Technology fatigue
- Level of flexibility
- Altering user-base
- Switching cost and loss aversion

Technological Complexity

Technological complexity is the degree to which a technology is perceived as (relatively) difficult to understand and use (Rogers, 1983). Technological complexity can have a profound influence on users leading to the rejection of a technology. It could be the outcome of either a technology actually being too complex or it only being perceived as too complex for use. Consider the response of underinformed users when introduced to a new technology. These users tend to experience anxiety, apprehension, or even fear, when required to incorporate a new technology into their routines. This aspect may be called *technological anxiety*. Also, the degree to which users believe that they can perform a task effectively using a new technology may be quite low. This may be understood as a low level of *technological efficacy*. The factors of anxiety and efficacy are also of critical importance in specific fields such as IT (Venkatesh & Bala, 2013). Such factors affect the attitude of the individual which in turn influences the behavioral intention of the individual (Davis et al., 1989). In sociology, these factors are largely encompassed in the phenomenon of "technophobia" which is considered by social psychologists to include the fear and apprehension felt by an individual when considering the implications of using a technology (Selwyn, 2003). These factors result partly from technological leapfrogging (i.e., development by skipping inferior, less efficient, more expensive, or more polluting technologies and industries and moving directly to more advanced ones). The concept of technological leapfrogging has numerous advantages in sustainable development (Goldemberg, 1998; Steinmueller, 2001). When communities rightly skip initial and inferior technologies and move directly to advanced technologies, they also lose out on the training and social conditioning required for a smooth transition, with an impending risk of shock attributed to the insurgence and accommodation of an overbearing technological complexity. Technological leapfrogging must be studied by taking into account complementary technologies (Steinmueller, 2001).

Apprehensiveness with a technology may arise not only from underinformation but also from overinformation. Both these extremes of what could be termed a *technology-familiarity spectrum* are seen to exhibit technology rejection. An example comes from the world of blogging. Some users may not want to adopt this niche because they do not understand its mechanism, while other users may reject it because they *do* understand the vulnerabilities of the medium, the pervasiveness of the Internet, information theft, and the traceability within cyberspace. Another example is from social-networking websites. Many do not use these sites because they are unfamiliar with this forum, while at the other end of the spectrum, users conversant with the intricacies of social networks refrain from its adoption. Internet banking also faced this problem initially (until encryption

technology was dramatically improved to address the concerns originally raised at Amazon and eBay).

The shape of the learning curve may also be responsible for the rejection of a technology. If the technology requires a steep initial learning, then it may get rejected. Psychological literature highlights that there is a range of individual factors centering around the cognitive and intellectual ability to use technology which is an important set of enabling or disabling (unable to use) factors (Selwyn, 2003). While a steep initial-learning curve can cause technology rejection, a learning curve that requires users to learn along the way to attain confidence over the technology would be different as it generates a dedicated user-base usually comprising a strong network of loyal actors (e.g., the Linux developer community). Linux may be a good example because of the importance of learning involved in becoming a user, bug-fixer, and finally a developer (Ye & Kishida, 2003). Learning itself is a motivation that intrinsically drives people to get involved in a technology and better it. This is true of technology developers wherein users tend to start off from the *outside* following a "learning by doing" approach before choosing to proceed further and go *inwards* to become developers.

Technology Fatigue

There are four factors which may be summarized as causing technology fatigue in well-informed, educated, and capable users.

a. Feature fatigue

Due to technological advancements, products are today capable of performing numerous additional functions with only a nominal increase in product cost. Users tend to exhibit *feature fatigue* (or what has been called "featuritis") when technological products get bloated with features. Rust, Thompson, and Hamilton (2006) explain that typical users "don't use anything close to the full functionality of a highly complex product. For them, more functions translate to lower value in use" (p. 99). This is due to the learning involved and the risk of erroneous use with secondary functionality, particularly in product categories such as mobile phones, cars systems, home appliances, and even hand tools. In multifeature products, where only few features get used, it must be understood not only as a rejection of the rest of the features but also as a *partial rejection* of the vast technological capabilities offered. Product companies such as Acer, LG, and Samsung today attempt to make advanced products that are simple and have fewer features. The iPod is an example of a popular single-purpose device that consciously avoids extra features (Rust et al., 2006). Other examples such as exclusively calls-only cell phones (John's phone) and email-only device (Peek) are emerging on the other extreme. Google's search engine and browser "Chrome" have been successful due to minimalism of design and interface (Muchmore, 2011).

b. Wait-and-watch tendency

When users are unable to determine supremacy among technological choices, they tend to wait for the emergence of a clear "standard" technology or product before investing—as seen in the standards battle between the Blu-ray and HD-DVD (Christ & Slowak, 2009). Complementary advantages to this *wait-and-watch tendency* are hardware stabilization, software bug-fixes, establishment of standard features, price reduction, and product improvement. This tendency is higher when the rate of technology change is more pronounced and during periods of growth and turbulence. The tendency, leading to technology's *momentary rejection* (put away), is evident and pronounced in numerous technologies and products as seen in the launch of multifunction smart mobiles/PDA (personal digital assistant)/tablet PCs. A poll by an electronic-technology magazine *PC Advisor* found that in February 2009, 83.2% of respondents did not wish to adopt e-book readers; this number shrank to 40.7% by November 2010, showing that markets are ready to adopt these devices after initial resistance (*PC Advisor*, February 2011). Another 2011 survey revealed that almost half the respondents did not wish to buy a Tablet PC (*PC Advisor*, January 2011), probably because tablet devices are still experiencing battles on the screen-size (around 7 inch and 10 inch sizes) and the Operating System arenas (tilting toward Android, *PC Pro*, 2011; and Windows Phone 7, *T3*, 2010). Research firm Gartner observed data in 2010 to identify that the smartphone market share was still in flux from Symbian, Linux, and Windows Mobile to the iPhone and Android, indicating a lack of stabilization. In all, 75.4% of respondents to a 2010 survey by *T3* magazine were not keen on buying a Facebook phone but might shift when social-networking phones become common. Consumers of 3DTV are adopting a wait-and-watch tendency according to a 2010 survey by Nielsen Company.

c. Unnecessary technology

Technologies can progress faster than market demand. Companies overshoot their market by giving customers more than they need or ultimately are willing to pay for, thus losing to products based on disruptive technologies, which are cheaper and simpler to use (Christensen, 2003). Technology overestimates the need for itself. Companies routinely overestimate the benefits of their products by up to a factor of 3 (Gourville, 2006). Competition among companies results in the development of excessive technology while users tend to refrain from its overwhelming capabilities and withdraw toward *minimalism* of technology. Many of the products of IT, consumer electronics, and telecom industries "have far overshot the needs of . . . consumers yet failed to help them to get essential jobs done" (Standage, 2005, p. 109). A survey revealed that at least 80.7% of the respondents refused to subscribe to Sky's 3D Channel in the United Kingdom primarily because it was either too expensive or they did not see

the utility for it (*PC Advisor*, November 2010). Gourville (2006) cites the TiVo, a Digital Video Recorder in the United States, as facing rejection because users would have to otherwise put up with the clutter of yet another electronic device. Forrester's State of Consumers and Technology Benchmark report 2010 highlighted that mobile device users beyond the age of 30 do not even use much of text messaging, social networking on mobile devices, or mobile web, bringing the overall adult usage to 57% for text messaging, and 27% and 23% for networking and surfing the web respectively (*PC Today*, 2010). This mobile device usage pattern is not just feature fatigue because the younger generation uses these functions extensively whereas the older generation sees no need for these "excessive" capabilities.

   d.Excessive choice effect

Technological advancement and flexible manufacturing processes have led to increase in product choice. Excessive choice among similar products from a new technology may repel potential users. This *excessive choice effect* occurs due to the cognitive burden on the short-term memory to discern the right choice (where a person has to understand and remember all the options to evaluate them) and the risk of a postpurchase regret (in which buyers fear the likely prospects of choosing a suboptimal option; Iyengar & Lepper, 2000).

Level of Flexibility

Flexibility fundamentally implies the dexterity of a technology in being amenable to use. It helps users in accepting and adopting technologies in ways naturally suited or appealing to their personal convenience/habituation/conversance. The open-source software movement is based on this approach (Raymond, 1999). Flexibility has been understood to be of great importance to organizations, which must adapt in short notice to changing needs. This is relevant at the individual level as well, where the lack of flexibility may result in users rejecting the technology. Technology is fabricated with the intention that it should be used in particular ways. But at the user level, the technology is taken up and used in contexts other than, and broadly separate from, the ways intended (Selwyn, 2003; Woolgar, 1996). Learned users or conditioned users want flexibility at the most fundamental operational level of the technology. Here the technology is not expected to render itself as primitive, but the flexibility of use must be in its fundamental operation and adoption. An example of this is in adoption of the top-loading (as against the front-loading) washing machine, which permits one to work with buckets of water as against the prerequisite of a reliable constant head of water for the fully automatic front-loading washing machine. Users in the developing world exhibit a much higher capability to evolve creative and ingenious solutions in response to demands of practical circumstances, such as adopting the top-loading washing machine with an intermittent and unreliable water supply. Technologies not rendering themselves as flexible at the fundamental level of operation tend to get rejected.

Altering User-Base

As a technological niche (at the individual-user level) matures into an organizational sociotechnical regime, it is characterized by a reconfiguration in the technology user-base/adopters (e.g., as in recent cases of the Apple iPhone being preferred to Blackberrys and the Android operating system preferred to Windows). Furthermore, it is also possible that technologies get confined to communities of networked niche users in a landscape of another technology. An example of this may be the Linux or Mac community, which exists as a well-connected network of niches within the large Windows landscape. Geels and Schot (2007) identify that general users (actors) who participate in the landscape regime may have perceptions (and preferences) different from those adhering to niche technologies. Niche users differ from regime users in terms of traits determined by their affinity and/or aversion toward a technology. When a niche innovation attempts to become a regime, it may get rejected if the mass of prospective adopters fails to cross over. Rogers (1983) explores the differences characterizing the adopter categories in terms of their background and the perceived image/incentive in the preference of a technology. The initial *smaller* (in size) adopters tend to be more educated, affluent, and image and fashion conscious, and carry an elite socio-economic stature in comparison with later *larger* adopters. They tend to be part of better informed social networks and aware of societal trends in adopting technologies. Under such circumstances, a technology may get rejected from becoming a regime, with the later adopters being less educated and poorer (and thus more frugal) and carrying a lesser image of flamboyance. User categories fundamentally differ on social and economic grounds, risk perceptions, prior technological exposure, knowledge base, language, and capabilities. The value late adopters associate with new functionalities would be different. A technology may get rejected because its incentives do not appeal uniformly to different adopter categories—what was preferred by one category may not be preferred by another. As an example, in the case of early desktop PCs, early adopters did not recognize problems of feature fatigue because they tended to be more knowledgeable and familiar with that technology (category of products; Rust et al., 2006). Failing to recognize such distinctions among adopter categories could result in technology rejection.

Switching Cost and Loss Aversion

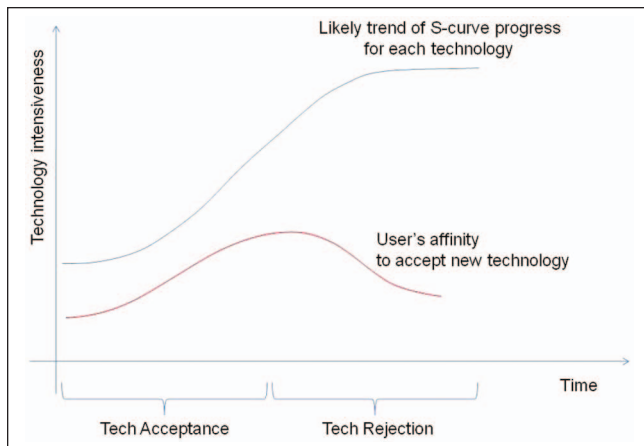Switching cost and loss aversion are also key factors in technology rejection. The change a technology demands of

Figure 2. User response to technological intensiveness.

its adopters and the adopters' perceived risks of uncertain consequences could cause technology rejection. Technology adopters often prefer not to change habits they are accustomed to, as it would demand time, effort, uncertainty, and anxiety (depending on age group). It is important to highlight the fact that technological adoption does not occur in isolation—it could involve a cascading rejection of many other technologies. Technology/products work in conjunction with complementary product families, as present-age products tend to be reliable and designed for long durations of usage. (Indian farmers switched to improved crop varieties, fertilizers and pesticides and mechanization as a self-reinforcing package; Rogers, 1983.) As Sassen (2002) highlights, analysts rarely appreciate the material conditions and practices, place-boundedness, and thick social environments within and through which users articulate technological experience. Adopters would prefer to recover investment in existing technologies (in terms of value or service) before switching to a new technology. They are concerned about the financial investment in the previous products and the mental and financial investment in a new product (Okada, 2001). The rapid introduction of new and improved versions can make a customer regret a previous purchase, delay all new purchases, and agonize over similar purchases in the future, none of which is in the long-term interest of the market (High-Tech Strategies, 2008) or sustainable sociotechnical transition. The requirement of prematurely withdrawing existing in-use products can prevent customers from purchasing an upgrade, and this may even prevail over attractive pricing and quality offered by a new product (Okada, 2001), particularly in frugal societies. This rapid pace of product improvement/replacement may lead to prohibitive switching costs. *Switching costs* refers to the costs and efforts imposed on the end user in shifting from one technology to another (Shapiro & Varian, 2003). Just as the relative advantage of an innovation is related positively to its rate of adoption (Rogers, 1983), so does the switching cost relate negatively to its rate of adoption. The wait-and-watch tendency (list item "Unnecessary

technology" under "Technology Fatigue") is also closely related to this factor of switching costs.

A closely related concept in decision theory is *loss aversion*. Customers evaluate a new product in relation to existing products. If there is a perceived loss of an already proven benefit/incentive, they display loss aversion by not adopting another unproven technology. Users not only compare a new technology against what they already use, but also against a prevailing market-dominant standard. The extent of behavioral change required is an important cause of technology rejection. Research (Aversano, 2006) has shown a tendency among few mobile phone users in the United States to reject that technology as it intrudes into their time engaged in solitary activities. Users rejected this technology because it forced a change in lifestyle or had *effects on the self*. People are also concerned about a technology's *effects on society* as a whole. This relationship of how a new technology organizes its relationship with its users has even been explored as an important analytic issue of sociology (Sassen, 2002). Such concerns may be particularly relevant in Asian rural environments where an adherence to social norms and traditions (Kotler et al., 2009) forbids technology adoption. This insecurity or inertia plays an important role in technology rejection.

Unbridled Technological Intensity

Nearly all technological trends follow the technology life cycle S-curve as illustrated in Figure 2. Consider a technology that is directly offered to individuals for incorporation into daily routines, namely, mobile phones and media players. Initially, users are excited to accept the technology wherein they learn to extract the advantages/services provided by the new technology. Users are willing to learn to use a new technology but this willingness tends to level off depending on the time and effort required to keep pace with evolving/updating technologies. When technologies demand continued learning, beyond a threshold, a lingering need to withdraw manifests—and this withdrawal is significant, as in a rubber band returning from stretch. Eventually, the technology is found to be too complex to keep pace with, resulting in its gradual rejection. This results in the bell-shape trend in user affinity toward a technology, starting with an increasing acceptance to a certain level after which technology rejection starts to manifest (see Figure 2). However, when a technology eventually reaches its maturity and levels off, the user affinity also stabilizes, resulting in its common acceptance, for example, public transport, television, and so on. This bell curve trend can be corroborated by other findings including feature fatigue itself (Thompson, Hamilton, & Rust, 2005).

Conclusion

This article deals with the increasingly pronounced phenomenon of technology rejection and discusses in detail the determinants of technology rejection. Rapid technological

advancements, made affordable through advancement in science, human ingenuity, and competitive markets, can often daunt society to keep it at bay (rejection), in part or in whole. Though technology supports material existence (conveniences) and also facilitates modern social existence, its rejection here implies that certain members of society reject technology in its kind and/or intensiveness for a configuration amenable to their preference/choice. While acceptance of technology is well studied, technology rejection is not a mere negation of its acceptance and hence requires careful examination.

Technology rejection is discernable at various levels of society, namely, individual, community, or state/nation. However, this study investigates this phenomenon at the level of the individual (user), the most fundamental unit of society. A preliminary technology–user interface model has also been discussed to provide an orientation to this topic. Factors determining technology rejection include its complexity, associated fatigue, level of flexibility offered, userbase, and associated switching cost. This article, based on an exhaustive literature review, provides a basis for further research in understanding technology rejection.

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