Technological Innovation and Adopter Self-Construal

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Abstract

In this article we theorize that individuals who value independence and distinctiveness identify more with social identities as a result of adopting sustaining technological innovations. Conversely, individuals who value interdependence may become more independent as a result of adopting disruptive technological innovations. We argue that successive adoptions of technological innovation may expand and contract the breadth of adopters' collective identities. We discuss the implications of this conceptual paper and suggest avenues for future research at the nexus of technological innovation and cultural change.

Key Words: Self-Construal; Disruptive Innovation; Sustaining Innovation.

1. Introduction

Along with today's rapid pace of technological advancement comes the potential for significant change to the cultural landscape. Studies of cultural values and the diffusion of innovations have largely served to explain product adoption and the speed of technology transfer between and across firms and nations [Rogers (1983); Kedia and Bhagat (1988); Ziamou (2001)]. For instance, existing studies have noted that users may adapt technological innovations by adjusting certain aspects of their use or by suggesting features for the next generation of products [Pinch and Bijker (1984); Barley (1986); Fulk (1993)]. However, much less consideration has been given to the effect of technology adoption on culture and values.

Some studies have been dismissive, for instance, de Mooij and Hofstede [2002] concluded that "technological innovations are merely enhancements or extensions of ourselves ...They do not change our values." This statement reflects a belief that technology does not alter culture or affect values, or that such change is too slow to be a source of concern for firms. In particular, a firm is not likely to see a given issue as significant or worthy unless a powerful stakeholder group raises some legitimate criticism that begs the firm's attention [Laplume, Sonpar, and Litz (2008); Mitchell *et al*. (1997); Walker and Laplume (2014)]. Possibly, cultural change stemming from technological innovation is an externality outside of anyone's responsibility or control. Alternatively, when seeking competitive advantage, however, firms' leaders may believe they are better off pursuing speed to market as opposed to trying to have an impact on something as intangible as cultural change. Nonetheless, further research seems needed to uncover the potential for technology to alter culture.

Technological innovation often stands in opposition to established culture. For example, over the past few decades, genetic modification of plants and animals, cloning, birth control,

abortion, internet pornography, violence in video games, surveillance cameras, and online-transaction security represent just some of the hot-button societal issues that have driven a great deal of controversy and debate. Using a more theoretical approach, Perrow [1986] warned of the dangers associated with the adoption of technologies that are complex and highly integrated (e.g., where changes to any part may affect many other components). His theory suggests that the cognitive limitations of the adopters of technology may lead to inevitable or 'normal' accidents.

More generally, Ogburn's [1966] theory of cultural lag suggests that technology evolves faster than culture can adapt to it, thus creating a period of time during which there is a misalignment between new technology use and the creation of guidelines for that use. While technological innovations could be socially unsettling [Carlsen *et al*. (2010); Christensen (1997); Christensen and Bower (1996)] they could also facilitate changes for the better [Li (2009); Wang *et al*. (2011)]. Possibly, as Neil Postman [1985] suggests, organizations should pay attention to the effects of technological innovations and act to regulate those that negatively affect their adopters, especially when technological innovations involve qualitative breaks from past thought and past ways of living [Robinson and Smith-Lovin (1992)].

Our broad research question is, "How does technological innovation brings about cultural change in society?" In this article, we argue that technological innovation affects adopter self-construal, that is, an individual's sense of self in relation to others. Two primary types of self-construal are the independent and interdependent selves. We argue that sustaining technological innovation [Christensen and Bower (1996)] may increase interdependent self-construal and decrease independent self-construal, whereas disruptive technological innovations [Christensen (1997)] increase independent self-construal and decrease interdependent self-construal. Sustaining innovations enable collective rituals (i.e., those maintained by incumbents), whereas

disruptive innovations encourage individual detachment (i.e., from incumbent routines). Further, using arguments developed by Marshall McLuhan (1964; 1988), we posit that every disruptive technological innovation eventually "heats up" (improved along existing dimensions of performance), and every technological innovation that becomes overheated eventually cools back down (the amputation of existing performance dimensions). During this process, the identity of adopters vacillates between poles of collective attraction and individual self-reliance.

This article proceeds as follows. First, we selectively discuss the literature on individualism and collectivism, self-construal, cultural change, and technological innovation. We then draw insights from these studies to propose the process through with technological innovations affect adopter self-construal and encourage cultural change, which leads to our theoretical propositions. The article concludes with a discussion of theoretical and managerial implications and suggests paths for future research.

2. Theoretical Background

2.1. The social consequences of technology adoption

There is a need for a better understanding of the social effect of technologies to the extent that their wide adoption may have positive or negative consequences, depending on the particular values of the adopter. For instance, potential adopters of a disruptive technology may work against their own interests if they do not understand the longer term social and institutional consequences of their actions.

The rationale for developing the model came about during a long debate between the authors about the social consequences of technologies and the seeming complete lack of theory explaining it. Given the immense social consequences of some adoptions of new technology, it would seem wise to have some idea of their effects (McLuhan and McLuhan, 1988; Postman,

2011). Such a model, once fully developed may reduce the unintended consequences to adopters by helping to better inform their choices. Finally, this research is especially important for firms adopting technologies that affect how their organizations communicate and interact. For instance, when Marissa Meyer[1] of Yahoo fame forced her telecommuting employees back to the office, we had little theory to predict the impact on the company culture. Should we not, as business scholars, be able to make predictions about these effects?

2.2. Individualism and Collectivism

Along with power distance, uncertainty avoidance, masculinity-femininity, long- and short-term orientation, indulgence/restraint--individualism, and collectivism stand as recognized cultural dimensions that differentiate national cultures [Hofstede (1980); Triandis (1995); Fiske *et al*. (1998)]. The dimensions of individualism and collectivism have been adopted to define, explain, and predict differences in attitudes, values, behaviors, cognition, communication, attribution, socialization, and self-concepts [Oyserman *et al*. (2002)]. Scholars have often used individualist traits to characterize people from Western contexts, such as Western Europe, North America, and Australia, whereas Asian, South American, and African personalities are typically described with collectivist characteristics.

Many definitions exist for the complex constructs of individualism and collectivism. Individualism can refer to independence, autonomy, self-reliance, uniqueness, achievement orientation, and competition [Bellah *et al*. (1985); Markus and Kitayama (1001); Kim (1994); Oyserman *et al*. (2002); Sims (2009)]. Individualists stand out as those who accept responsibility for and control over their actions. Collectivists, on the other hand, demonstrate a deep sense of loyalty towards their in-group and are inclined to seek out social harmony. For these reasons,

[1] http://articles.latimes.com/2013/feb/26/business/la-fi-yahoo-telecommuting-20130226

collectivists readily conform to the existing group culture, and their behaviors are dictated by the norms of their in-group (e.g., family, close-knit community).

Cross-cultural scholars articulate that individualism and collectivism exist in all cultures, but one pattern tends to be dominant [Triandis (1995); Gau *et al*. (1996)]. The culture in which individuals are raised influences the way individuals are socialized in terms of individualistic and collectivistic inclinations. Cultural individualism-collectivism (I-C) has a direct effect on interactions among the culture's members because it influences the norms and rules that develop and guide behavior throughout the interaction process in individualistic and collectivistic cultures [Gudykunst *et al*.(1996)].

In individualist cultures, the definition of self remains independent from in-group membership, whereas in collectivist cultures, it is interdependent [Triandis and Gelfand (1998)]. The emphasis in individualist cultures focuses on personal needs, while in collectivist cultures, it focuses on compulsions. Wang, Fussell, and Setlock [2009] argue that communicativeness is considered to be an informative feature for distinguishing cultural communication styles, since collectivists and shy people may be more sensitive to peers' evaluation and may talk less as a result. People in a collectivist culture are rather shy and are more willing to develop long-lasting relationships with others compared to people in individualistic culture [Triandis (1995)]. Definition of self, personal versus communal goals, importance of attitudes and norms as determinants of social behavior, and emphasis on transactional exchange versus relationships – these are all factors that differentiate individual behavior from collective behavior [Triandis (1995)]. Such differences between peoples from individualist and collectivist cultures stem from their different psychological frameworks [Markus and Kitayama (1991)]. It is this psychological framework that we examine in order to understand how technology influences cultural change.

Cultural values are usually insensible, tacit, or taken for granted and can therefore influence people without them being aware of these values [DiMaggio and Powell (1983)]. For example, in Western societies, success is often a measure of an individual's worth, and success is often measured by a person's ability to acquire and allocate resources. Even if we have no inclination that reflects this cultural value our subconscious mind may be affected causing us to feel that it is a preferred value, or that if we have conflicting values to this standard there might be something wrong with us [Briley and Aaker (2006)].

In order to shed any romanticism about collectivist cultures, we point out that an individual's behavior toward their in-group compared to their behavior toward their out-group will vary fundamentally. People in collectivist cultures share and show harmony within in-groups; however, the total society may be characterized by much disharmony and non-sharing, because so many interpersonal relationships are individual out-group relationships [Triandis *et al*. (1988)]. Individuals in these latter kinds of associations care little for the negative consequences their actions may inflict on out-groups [Priem and Shaffer (2001)], since in-group members may be viewed as an extended family, and thus, might accept antisocial behavior towards out-groups as the norm. Still, individualistic cultural traditions dictate certain rights and standards that apply to all members of their group. For example, U.S. law guarantees all citizens the right to life, liberty, and the pursuit of happiness [Hosmer (1994)], and to that end, members of individualistic societies are expected to remain mindful of their own actions and avoid harming others. Thus, compared to collectivist societies, the members of individualistic societies may make choices that reflect less self-interest.

2.3. Self-Construal

The individual-level construct of self-construal measures individualism and collectivism. As most studies require a micro level measure of the respondent values, group-level measures of culture have been replaced with individual-level equivalents. For this reason, in our discussion of cultural differences, we use the psychological concept of self-construal; that is, the way individuals judge or perceive themselves in accordance with the cultural values they follow [Markus and Kitayama (1991)]. Self-construal can be divided into two types in order to more accurately identify the differences between cultures: the independent self (which corresponds to individualism) and the interdependent self (which corresponds to collectivism) [Singelis (1994)]. Independent self-construal involves a distinct boundary between the self and other, which gives priority to personal goals over group goals. Interdependent self-construal, by contrast, defines itself based on relationships with other, placing a priority on group goals over personal goals.

In Western cultures, the independent self-construal dominates. There is a reliance on the natural separateness of distinct persons, and the normative imperative is to become independent from others and to determine and convey one's unique attributes [Henderson and Clark (1990)]. Achieving the cultural goal of independence requires construing oneself as an individual whose behavior is organized and made meaningful primarily by reference to one's own internal span of thoughts, feelings, and action, rather than by reference to the thoughts, feelings, and actions of others [Markus and Kitayama (1991)]. To illustrate, in North America, children may be encouraged to be unique and self-determining. For instance, infants are often given their own beds and rooms, which may foster autonomy. When American children are asked to describe themselves by listing their characteristics, they tend to focus on attributes and behavior that differentiate them from their classmates [Aaker and Schmitt (2001)].

People are motivated to find a way to fit in with relevance to others, to fulfill and create obligation. An interdependent self-construal gives dominance to collectivist notions of self and is more common in non-Western societies [Markus and Kitayama (1991)]. Individuals with interdependent self-construal see the self as more flexible and intertwined with the social environment, and they value preserving group harmony and the act of fitting in [Singelis (1994)]. Such individuals have a self-concept that largely depends on their capacity to establish and maintain a connection to a broader social entity, and they tend to inflate the extent to which they feel that they mirror the norms and inclinations of other individuals in their social environment [Stapel and Koomen (2001)].

Self-construal not only affects performance on specific activities, but it may also influence aesthetic preferences. When individuals adopt an interdependent self-construal, they become more likely to prefer rounded rather than angular shapes [Zhang *et al*. (2006)]. Conceivably, the rounded shapes represent harmony rather than conflict, aligning with the core values and goals of individuals in an interdependent nation. Furthermore, because an interdependent self-construal evokes the need to maintain harmony, individuals in this state become less inclined to challenge social norms. Hence, their suggestions for cultural change are more likely to align themselves with prevailing conventions.

2.4. Cultural Change

Changes in cultural values have attracted considerable attention from politicians and policymakers, from neoclassical economists to socialists, and from psychologists to practitioners, with economic development serving as a focal point for many studies on cultural change. Ng *et al*. [1982] found that cultural values in nine East Asian and Pacific Island nations were

intertwined with economic development. Changes in cultural values correlate with economic progress [Hofstede (1980); Hofstede and Bond (1988); Sowell (1994); Schwartz (2004)].

Researchers who accept that cultural values and economic progress are connected do, however, disagree on the causal relationship. Some maintain that economic development changes cultural values or, in other words, economic determinism, whereas others assert that cultural values foster economic development or, in other words, cultural determinism [Weber (1930)]. A third group advocates a middle ground between the two positions [Inglehart (1997)]. All these studies indicate that cultural values are subject to changes and that these changes can arise due to a variety of factors. Schwartz [[1994], p.21] defines these values as "desirable trans-situational goals, which vary in importance and which serve as guiding principles in the life of a person or any social entity". Thus, culture is not a rigid, fixed, or static entity. Rather, it is dynamic and fluctuates across individuals within cultural groups [Matsumoto *et al*. (1996)].

As an example, U.S. culture is typically viewed as individualistic, and Americans tend to view themselves as autonomous, independent people who are fundamentally separate from others. However, some cultural scholars suggest that individualism in the U.S. is being mitigated with a reinforcement of collective values [Bellah *et al*. (1985)]. Matsumoto *et al*. [1996] suggest that cultural shifts in North America increase because of the role of women in society and their generally more collectivistic nature; for example, women may be more inclined to care about others and place more value on harmony and cohesion. Changes may also be caused by an increasing diversity of the population that brings more collectivist values into the mainland of individualism. At the other extreme, East Asians (e.g., China, Japan) have typically been viewed as collectivistic. Yet, anecdotal evidence suggests that the younger generation in Japan embodies

a different set of cultural values from the older one. In fact, Hakuhodo [1988] reported that the members of Japan's younger generation are becoming more individualistic.

Customs, rituals, values, attitudes, and way of life do change, owing to corresponding changes in wealth, material resources required to live, and increased contact with people from other cultures [Matsumoto *et al*. (1996)]. These changes take place over time, but they may also occur rapidly as a consequence of powerful forces, such as wars and natural calamities. Together, these insights suggest that cultural values can and do change. Next, we discuss the role of technological innovation in terms of its effects on the lives of its adopters.

2.5. Technological Innovation

Management researchers have argued many different views of innovation, e.g., incremental, modular, architectural, and radical [Henderson and Clark (1990)]. However, this perspective usually defines technological innovation according to how it affects firms. For example, incremental innovations are unlikely to affect organizational structures, while radical innovation may require new structures. In a further example, Tushman and Anderson [1986] discuss competence-enhancing versus competence-destroying innovation. From this perspective, innovation can increase or decrease the value of skills, knowledge, and resources embodied in incumbent organization. However, approaching innovation simply from the viewpoint of how it affects firms does not capture the full cultural effect of new technology. What is also required is a view of how innovation changes the adopters' lives as well.

To that end, Christensen and Bower [1996] differentiated between disruptive and sustaining innovations. Their perspective adds another layer to the definition of innovation, one that takes into account the dimensions of the innovations themselves, this time from the perspective of the users. Compared to sustaining innovations, disruptive innovations cost less

and/or offer lower performance along the traditional dimensions of rival technologies, although they do compensate for the latter with increased *speed, convenience, simplicity*, and/or *customizability*. For instance, YouTube has lower picture and sound quality compared to TV, but it is much more customizable (i.e., asynchronous, user-generated content). From an amateur content-provider's perspective, posting a video to YouTube is also a lot cheaper, simpler, and speedier than obtaining air time on TV. By contrast, sustaining innovations usually cost more and offer higher performance along traditional performance dimensions. For instance, HDTV and 3D movies constitute sustaining innovations. Unlike disruptive innovations, sustaining innovations are usually brought to market successfully by incumbents [Christensen and Bower (1996)], e.g., the networks and big film-production houses. In summary, the over-arching goal of this research stream is to explain how firms succeed and fail and suggests that new entrants succeed by bringing disruptive innovations to market.

In contrast to firm-oriented theories, critics and historians of technology have described the dimensions of technological innovation from a bio-cognitive perspective, viewing technologies as extensions of human faculties, especially the senses [McLuhan (1964); Feenberg (1999)]. Without the senses (e.g., seeing and hearing), new content cannot enter the brain, and consciousness becomes nothing more than a rehash of memories since a closed system is not influenced by the outside. The human sensorium is the layer of organs that connect cognition to outside stimuli. The sensorium translates vibrations from the outside into meaningful images and messages. Signals from different senses can, however, send conflicting information to the brain. For instance, a visual signal may suggest that all is well, while an audio signal alerts to possible danger. Since cognition is limited, controlled processing cannot pay attention to all senses

simultaneously if they are all offering conflicting signals. To avoid confusion, controlled processing must concentrate on just a few sensory signals at a time.

Sense ratios or scales are alignments between combinations of senses that have developed maps in cognition, and there are different scales for every type of human activity and for every specific skill. People develop mastery on some scales and not others. For instance, reading rapidly can put the reader in a trance that is specific to reading (e.g., 50% visual and 50% audio performance, at least when first learned). Similarly, running can induce a flow that is specific to running (e.g., 90% movement and 10% visual direction). Activities that are sufficiently similar in their use of scales may yield cross-benefits. For instance, a skater may make a good skier, and an accurate batter may be a good shot with a hockey stick. Scales may start off separate and then merge together as experience reveals their similarities. Novices may find their groove performance at a particular task by becoming aware of the overlap with other previously developed skills. The memories and abilities specific to a scale may transfer to others through a process of accommodation. As we begin to recognize certain commonalities between tasks that require, for example, the use of hand-eye coordination, the transference of skill becomes possible.

Consciousness moves between scales, depending on the demands of the environment. Scales may be switched quickly or slowly, depending on the situation. Multi-tasking may require one to oscillate between scales. Due to their occupations or other life conditions, some individuals may become experts with some scales and not with others. This situation may form the basis for experiences of flow or the feeling of 'being in the zone' that is often encountered by athletes and skilled professionals when they are immersed in their work [Csíkszentmihályi (1997)]. Some individuals may never have the experience of a particular scale that they do not

have occasion to encounter, or they may get glimpses of scales for which they find no use. Some societies may have cultures that privilege some scales over others. Certain scales are more passive, while others are more active. Passive scales require only attention, while active scales require intention. For instance, watching a movie is more passive than driving a car, which is more passive than riding a bike. Passive scales are associated with social and psychological pathologies, including depression and obesity, while active scales are associated with wellness and vitality [Csíkszentmihályi (1997)]. Passive activities tend toward hypnosis where consciousness is captured by a set of senses and can do little but try to keep up with incoming stimulus. For instance, the act of watching a 3D movie leaves little room for much of anything else. The image is so dense with information that cognition gets in the way of understanding. To be enjoyed, the experience calls for automatic processing. By contrast, a comic strip leaves many holes for controlled processing to fill in. It is rather more like hallucination than hypnosis [McLuhan (1964)]. It is active.

In addition to sensual dimensions such as sight and sound, technologies (like bikes and cars) can increase our mobility, and others (like phones and computers) can make us socialize more or less. Media-richness approaches suggest that different types of communication technologies are better suited for and preferred for different types of situations. For instance, context-rich, face-to-face communication is suitable for conveying subtlety, while context-poor technologies like e-mail are suitable for conveying explicit exchanges of information [Daft and Lengel (1986)]. Individualists tend to prefer context-poor media, while collectivists tend to prefer context-rich modes of communication [Schwartz and Ruber (2005)].

Technologies mediate between our physical senses and the external environment. They allow us to see, hear, and touch farther and closer, they give us new ways to perceive, while at

the same time amputating the older modes of perception [McLuhan (1964)]. Human technology allows for patterns of dominance and acquiescence. A technology can favor some senses over others, extending one sense while amputating other faculties. A new technology may not tilt the ratio at all, being essentially redundant with substitutes. To be innovative, then, a new technology must directly modify human perceptions by altering the pre-existing ratio among the senses. The message of any new medium or technology is the change of scale or pace or pattern that it introduces into human affair [McLuhan (1964)]. The human sensorium is a complex set of many different sense combinations, and there are entire categories of products that appeal to each combination of the senses.

3. Proposition Development

In this section we develop some original propositions based on the interaction of technological innovation and self-construal.

3.1. Technological Innovation and Cultural Change

No one can deny that technology has changed rapidly and dramatically in recent years. People crave better lifestyles and are constantly looking for new ways of coping with their physical environment. They also look for new technologies to subjugate their surrounding environments. Such needs have led, for example, to the use of robots in organizations. Similarly, the need for power and control led to the invention of sophisticated weapons. The invention of electricity has changed people's sleeping habits, and the need for faster and more convenient transportation saw the advent of vehicles and airplanes into the market, combined with a population shift from rural to urban residential settings. Such developments have led to changes in the demography of these areas. Newcomers into the cities may be forced to adopt urban values. People need technology, and the greater their need, the more they become attached to technology. New technologies place

new demands on people and create new values and norms. Changes in our values start initially from changes in people.

Cultural change occurs when old cultural patterns are replaced by new ones. Few people today know how to care for a horse or camel, whereas a century ago, this task was common knowledge. Motorized vehicles have replaced horses as a primary means of transportation and, hence, knowledge of horse care has lost its importance in our society [Van Tonder (2004)]. Thus, technological innovation drives adopters to unconsciously change their cultural values. A typical example is that of how technology aided communication and innovations have shaped the social-cultural patterns of Saudi women [Al Lily (2011)].

On the one hand, culture has an impact on the adoption of technological innovations, and those individuals who exercise interdependent or collective self-construal are more inclined to choose objects or activities that value safety over personal achievement or enhancement [Hamilton and Biehal (2005)]. Thus, individuals who exercise independent or personal self-construal are more likely to value objects or activities that will enhance their own personal position [Hamilton and Biehal (2005)]. Collective self-construal pushes individuals to fulfill their responsibilities in a way that minimizes problems, and hence, they behave with caution and conservatism. Conversely, personal self-construal pushes individuals to focus more on potential gains instead of on losses or problems. Such individuals therefore behave with a lesser degree of caution; they are risk-takers.

On the other hand, technological innovations may alter cultural values. Within a particular cultural context, technology changes regularly in response to the needs and constraints of its users. The sharing of technologies between cultures can therefore cause subtle changes in those groups. New technologies are invented, refined, and shared, in turn demanding a degree of

adjustment from the adopters, who must absorb this technological change into their cultural base (Ogburn 1966). Triandis [1995] suggests four attributes that can be used to assess individual versus collective behavior: definition of self, personal versus communal goals, importance of attitudes and norms as determinants of social behavior, and emphasis on transactional exchange versus relationships. Adopting technological innovations may alter each of these factors, at least within the context of use of the displaced technological forms.

Next, we develop specific propositions about the effect of technological innovation on adopter self-construal. First we distinguish the expected effects of sustaining and disruptive technological innovation, on independent and interdependent self-construal. In Figure 1, we summarize our propositions.

Please insert Figure 1 about here

3.2. Disruptive Innovation

Disruptive technologies can cause people to socialize less. As people become increasingly preoccupied with technology in their daily lives, their social focus shifts and they become less able to communicate effectively with others on a face-to-face basis [Takao (2009)]. We build on disruptive innovation theory by examining how they might allow individuals to complete activities that previously could not be done without socialization with others, through companionship, service relationships, and any other type of contact, even with advertisers. We argue that disruptive technological innovations promote individuality and facilitate feelings of uniqueness and exclusivity. For instance, any device that individualizes a previously collective activity would qualify. Even a household washing machine (i.e., it disrupted the human washer) can be said to promote individuality in that no group interaction is required in order to use it. The group norms, values, rules, and other formal and informal structuring institutions that coalesced

and developed around the previously collective activity (e.g., “you wash, I’ll dry”) are left behind when a disruptive technological innovation is adopted, and the institutions that once formed around the old technologies disappear as well (no time for small talk). The social psychology of a cultural group can be altered by the introduction of disruptive technological innovations that empower individuals over their collectives.

Through their elimination of the need to physically gather and communicate by traditional means, technological innovations can have the effect of reducing the power and relevance of group identities [Turner (1982); Tajfel and Turner (1986)]. For example, with over two million mobile phone subscribers in the United States, more Americans own a mobile phone than have an Internet connection. Mobile phones are ubiquitous in many parts of the world today, with an estimated two billion subscribers worldwide. Most of the research on mobile telephony has explored the effects of mobile phone calls and texts on maintaining pre-existing social connections [Jin and Chul (2008)]. Some have argued, however, that mobile phones may lead to atomization and privatization among users by discouraging face-to-face communication in urban environments [Zhang and Alstyne (2004)].

In a further example, by getting rid of its bricks-and-mortar locations, Dell amputated the visual, tactile, and acoustic dimensions of buying a computer. The elimination of the retail store in favor of the web store made the look of the box and the salesperson’s banter much less important than the specs listed on the site. Hence, the process of personal computer shopping on the web became detached from the physical sales experience because there was no opportunity to test and feel the product before buying it. Dell compensated—to some extent—for a lack of physical presence in the retail market with a well-designed website and a fast and efficient service force. To corporate buyers purchasing in bulk, Dell’s web format was ideal since,

without the cost of keeping up its physical retail locations, Dell could afford to sell its products at prices that were lower than those of its competitors. Cutting out the old experience of computer-buying represents a useful example of a disruptive innovation.

Please insert Figure 2 about here

Adopters of disruptive innovations become isolated when they abandon their original social group in favor of new technologies (see Figure 2). As well, this situation has the additional effect of freeing up the individual's time, which was previously spent with their group. The innovation satisfies the adopter's need for uniqueness over their need for conformity, and thus, it pulls the adopter away from the social relationships of their group and the related identities that were developed within it. The collective identity weakens in the face of the individual's heightened sense of personal self-construal, pushing the interdependent self to the background. As a result of adopting disruptive technological innovations, individuals who previously valued interdependence and conformity may instead begin to value independence. More formally, these insights suggest that:

> *Proposition 1a: Disruptive technological innovations increase independent self-construal.*
>
> *Proposition 1b: Disruptive technological innovations decrease interdependent self-construal.*

3.3. Sustaining Innovation

Sustaining technological innovation facilitates social connections and works as mechanism to increase social relationships. Further, sustaining technological innovations allow people to create, develop, and strengthen social ties, helping users to build valuable networks through which to share information and resources. Sustaining technological innovations allow existing

collectives to flourish by taking an activity that was previously restricted to individuals and turning it into a group activity (e.g., Harley Davidson groups) [Fazel, Laplume, and Muralidharan, (2014)]. As a result, sustaining technological innovations become occasions for the development of group norms, mores, folkways, values, rules, and other formal and informal structuring institutions. Wang *et al*. [2011] indicate that such innovations help in creating and maintaining human relationships. Sustaining innovations create occasions for co-creation and a dialectic tension between conflict and cohesion [Van de Ven and Poole (1995)]. Sustaining innovations promote cohesion, while disruptive technological innovations reduce the need for previous forms of collaborations and joint effort.

While collectivism, by its nature, stems from the socialization processes of a given cultural group, it can also be enhanced through technological innovations. By socializing those activities that were previously individualized the adopters create an underlying institutional groundwork that replaces the previously individual routines of the adopting group.

Please insert Figure 3 about here

As the social groups that form around the new, sustaining technologies become reinforced, the adopter becomes progressively more socialized (see Figure-3), and an increasingly larger part of the culture grows up around the technological innovation, and users immerse themselves completely within it. This degree of immersion serves to increase the adopter's perception of interdependence, and the group identity becomes more powerful than that of the individual alone. As a result of adopting technological innovations, individuals who previously cared only about maintaining a distinct and independent identity may begin to place more value on the collective identity of the group. More formally, we expect that:

Proposition 2a: Sustaining technological innovations increase interdependent self-construal.

Proposition 2b: Sustaining technological innovations decrease independent self-construal.

3.4. Overheating and Reversal.

As a given technology becomes overheated (e.g., they improve along existing dimensions of performance), it eventually causes its own destruction by helping to bring about the disruptive technological innovations that act as its substitute [McLuhan (1964)]. The substitute is then itself subject to sustaining technological innovation, thereby starting the whole process all over again. As Batteau [[2010], p.115] wrote, "Dis-connection and re-connection are the metabolic rhythm of a dynamic culture". Technologies such as satellites produce a global village in which different cultures mix as if in one small village [McLuhan (1964); Chesebro (1995)].

Globalization involves the compression of the world and the intensification of consciousness of the world as a whole [Roberston (1992)]. The restraints that once protected certain knowledge traditions have fragmented. In one way, globalization inevitably leads to the expiration of local cultures and homogenization of world cultures. Accordingly, Western countries are not only perceived to be more economically advanced than non-Western countries, but they are often seen as reference countries in the realm of cultural reorganization. The global culture, which privileges consumerism, individualism, competition, and efficiency, has been characterized in some non-Western countries as new, modern, scientific, and results-oriented [Lam *et al*. (1999); Pilkington and Johnson (2003)].

As seen in Figure 4, there may be a shift from a more local collective to one at a higher order of analysis. Identity may shift first from a more immediate circle to a more regional one,

then to cross-regional, national, and international circles. As technological innovations extend human faculties, they allow us to reach out further to find others with whom to associate.

Please insert Figure 4 about here

Collective identities of higher orders of magnitude or spans come to replace the more local ones, based on family and kinship ties. Technological innovation facilitates this process by continually displacing the center of identity of adopters and replacing it farther and farther away. Hence we propose:

> *Proposition 3a: New identity centers form around new disruptive technological innovations when they start to be heated up again with sustaining technological innovations.*
>
> *Proposition 3b: The new centers form around an expanding span of members, increasing from local to global.*

To the extent that new collectives are mediated by technological innovations, they will be less rich in context [Daft and Lengel (1986)]. Visual and asynchronous technological innovations may be particularly prone to prime the individual self over the collective self because the collective is present on only one channel or sensual dimension at one time. Rather than encompassing all the senses richly, as with face to face interaction, the collective is mostly imagined [Anderson (1983); Batteau (2010)]. Since it is accessed sensually through only one dimension, the rest must be filled in by the imagination of the adopter. Disruptive technology reduces the senses involved in human interaction, increasing the need for involvement and for a cognitive process akin to hallucination [McLuhan (1964)]--the comic book reader fills in the joke. When fewer senses are involved in an activity, the people in it become less salient, as in the case, for example, of the multitasking conference-caller. At the extreme, all direct interaction is completely eliminated, and any semblance of connection is washed away.

By contrast, the richer the interaction, the more "real" a collective becomes because of the increased opportunity to exchange ideas and learn about each other on multiple levels (e.g., rational, emotional, aesthetic). A unidimensional lens lends itself to superficiality, misinterpretation, and a potential for manipulation and exploitation. A multidimensional lens aids in communication, especially of sensitive information [Daft and Lengel (1986)]. Nonetheless, since every disruptive technology eventually heats up on whatever becomes its dominant dimension of performance for adopters, some of the richness of interaction returns, and the possibility of meaningful interaction increases once more (e.g., Reddit "meetups"). Nonetheless, at least at the early stages, the new community that forms around a disruptive technological innovation is likely to be more imagined than real. Hence we expect that:

> *Proposition 4a: As identity centers expand outward, new identities may be increasingly imagined rather than real.*
>
> *Proposition 4b: As innovation heats up the previously disruptive technological innovation, these wider identity centers once again become more real.*

4. Discussion

The ability of external factors to influence cultures is becoming increasingly apparent and important [Hofstede (2001)]. For example, Robbins and Stylianou, [2010] report less diversity in languages used on global web sites, noting a movement towards homogenization. In this paper, we examine the unique question of how technology impacts the cultural values of adopters, revealing that all cultures posses a natural potential for change, even when they resist it. Culture is bound to change over long periods of time, shifting and evolving in ways that are sometimes barely noticeable. It can also change dramatically in relatively short time periods, as demonstrated by society's broad degree of adoption of sustaining (and disruptive) technological innovations in recent years. Rapid and ongoing spread of technological innovations can have the

effect of raising (or lowering) a culture to new levels of collectivism and individualism, all within one short decade, as we have already witnessed in the 21st century.

Our proposed model is to understand the social consequences of adopting new technology and it informs both theory and practice. From a theoretical perspective it provides a nuanced understanding of cultural change, specifically informed by technology adoption. From a practical perspective it points towards unintended consequences of adopters of new technology in society. It also attempts to explain the mechanisms that lead to changes in organizational culture when firms decide to adopt new technology. Understanding of the mechanisms of the consequences of adopting new technology may help ward off negative consequences in society and in organizations by developing proactive policies and practices. In the next section we outline several implications of our study for various business subfields in the area of management.

4.1. Implications for Management.

In any organization, one of management's most important tasks is to organize workloads in ways that optimize corporate outcomes. To accomplish this challenging goal, stakeholder groups must mobilize collectively, and they are more likely to do so if they can communicate effectively and if they share a common identity [Rowley and Moldoveanu (2003)]. Our study suggests that an organization's choice among competing technological innovations can influence the degree of identification a stakeholder will have with the firm, and for this reason, the adoption of a given technological innovation should match and support the organization's goals. Managers must learn to recognize the potential power of a particular technological innovation to either sustain or disrupt workflows, thus allowing them to optimize their technology-adoption choices on behalf of the firm.

Winning or losing technological races can have the effect of affirming or threatening firms. Firms choose technologies they believe will satisfy their goals for strategic gain, and strategic leaders must envision the ensuing outcomes, either mentally or by modeling intuition into probable scenarios. Understanding the differing effects of individual and collective technologies on culture may be useful for strategic leaders, who must predict and react to technological trends and effects as part of their regular strategy-planning activities. The concepts of sustaining and disruptive innovations may require different adoption processes and may result in consequences that fall within different cultural contexts. Adoption rate and span may therefore depend on whether a technology is sustaining or disruptive and what the culture longs for in the space or sense ratio it has created. This information may provide windows of opportunity for new research and may aid firms by exposing some of the pitfalls in going to market with new products that are ahead of their time.

Self-construal has been studied in consumer behavior, where it has been shown to influence brand meaning [Escalas and Bettman (2005)], the persuasiveness of advertising appeals [Agarwal and Maheswaran (2005)], brand extension evaluations [Ng and Houston (2006)], and impulse buying [Zhang and Shrum (2009)]. Technological innovation influences consumer experiences and helps to construct their identities through adoption, which is an observation of this study that may help marketing managers to understand the underlying mechanism of adoption preferences. The specific role of individualist and collectivist values in converting sustaining or disruptive technological innovation, as well as how these technologies are evaluated, could represent another promising direction for future research that should help us further understand the impact of culture values on the process of forming and generating technology.

As firms grow across national borders to form cross-cultural strategic alliances with foreign partners, they must develop effective ways to interact with individuals and companies from a broad variety of cultural environments. This circumstance requires an understanding of the dynamics that explain the conflicts and commonalities among people from different cultures [Elsayed-Ekhoulym and Buda (1996)]. In the global initiatives of multinational enterprises, a detailed understanding of the self-construal construct makes up a necessary part of a firm's ability to effectively harness the support of its multicultural workforce [Cross *et al*. (2011)]. The extant research has examined the cultural constraints faced by organizations that transfer technology across national borders, as per Hofstede's dimensions of culture [Bhagat *et al*. (2002], but as yet, no research exists concerning the link between technological innovation and cultural change. Depending on the context, technological innovations can either protect or threaten cultural identities. Some cultures even go so far as to view technology as the evil work of man, largely because these groups resent the impact that technology has had on their lives [Sclove (1995)]. In order to understand and work around such attitudes, businesses operating in countries with large differences in individual-collective orientations should look into the role of regional cultural traditions and unique aspects of social life. Firms' capacity for innovation (i.e., knowledge creation, inventiveness, knowledge sharing) and their ability to employ new technologies may sometimes be constrained by the regional cultures in which they operate. New research should seek to uncover the sources of such culturally embedded forms of resistance with a view to finding ways to break down the barriers that interfere with successful adoption.

4.2. Limitations and Future Research

Technology has become a welcome addition to our world, delivering ongoing developments that, for the most part, facilitate and improve our daily lives. The other side of this story, however, is

that technological innovations sometimes cause us to focus on the short term and overlook the long term, which is more difficult to predict [Ehlich (2000)]. The difficulty stems from the potential for technology to lead to some dysfunctional cultural changes that can have long-term effects. Thus, we need to examine the ways technology affects our daily lives and be aware of how it can influence our cultural values and norms. A formal examination of cultural values (e.g., power distance, uncertainty avoidance, masculinity, short-term versus long-term orientation) constitutes another useful avenue for future research, in terms of the power that innovations have to sustain or disrupt progress. In addition to individual and cultural effects, future research could examine certain other dimensions of technological innovation, such as those that extend or impede human senses and cognitive processes.

Various dimensions of technological innovation can influence cultural values beyond individualism and collectivism. For example, simplicity can be disruptive [Christensen and Bower (1996)] since it reduces cognitively demanding processes and reduces them to "vanilla" solutions that make a given piece of technology available to a broader range of users. Touchscreens, for example, provide an ease of use to young children and the elderly, who might not otherwise be able to adopt a given technological tool, but the downside of this move toward simplicity is that by eliminating a product's cognitive dimensions, we severely reduce the user's controlled cognitive processing skills. Cognitive energy can then move instead to the content of the medium rather than having to focus on the medium itself. A smooth transition from novice to expert is a necessary feature for any new technology, except those that are pursued as games in themselves. Killing cognition is a reliable way to improve any product, if not for the current generation of super-users (who have found tricks and ways to make do with the current form), then for the new generations of potential adopters who have no such baggage. How might killing

cognition or lighting it up affect uncertainty avoidance? How might visual innovations power distance?

We outlined how local cultural collective understandings, rules, norms, procedures, customs, and conventions are affected by the use of sustaining or disruptive technological innovations. Our approach can be criticized, however, for being deterministic concerning the effect of technology on people and on culture [Fulk (1993)]. A next step will be to test the impact of the technological innovation adoption on self-construal, which will be the first step in examining our proposed model. Some of the potential measures that could be used exist in extant literature. For example, self-construal was originally conceptualized in terms of the two broad dimensions of independence and interdependence [Markus and Kitayama (1991)]. Consistent with this conceptualization, common measures of self-construal were developed in order to measure independence and interdependence. The SCS scale [Singelis, (1994)], for example, was designed to measure self-construal as two distinct dimensions of collectivism (interdependence) and individualism (independent). Recent experiments conducted show preliminary support for self-enhancing innovation decreasing interdependent self-construal and group-enhancing innovation decreasing independent self-construal [Fazel *et al*. (2014)]. Future study should analyze the change over time. It seems necessary to use research designs that are able to describe individual changes within and beyond single life spans. Therefore, longitudinal studies may be needed due to the fact that values change over time, which leaves less control over allocation of study treatments and less control of the other factors being studied. Quasi-experimental longitudinal designs with repeated measures may provide valid observational estimates of the counterfactual outcomes by comparing extrapolated pre-adoption effect trends with the observed post-adoption effects [Cook and Campbell (1979)].

5. Conclusion

Technological innovation changes the environment in order to make it compatible with human needs, while culture represents our compatibility with the environment around us and the relation we develop with it. A direct relationship exists between technology and culture, and each has a direct effect on the other in a sequential manner. We argued here that technological innovations change cultural values by changing adopter self-construal. Individuals who value independence and distinctiveness may care more about the collective as a result of adopting sustaining technological innovations. Conversely, individuals who value interdependence and conformity may become more independent as a result of adopting disruptive technological innovations. Because technological innovations continually extend our reach, new collectives cover progressively wider spans. Thus, technological innovation is instrumental in the breaking down of cultural characteristics, but it can also support, sustain, and expand cultural identity.

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Figure 1: A model and technological innovation and cultural change

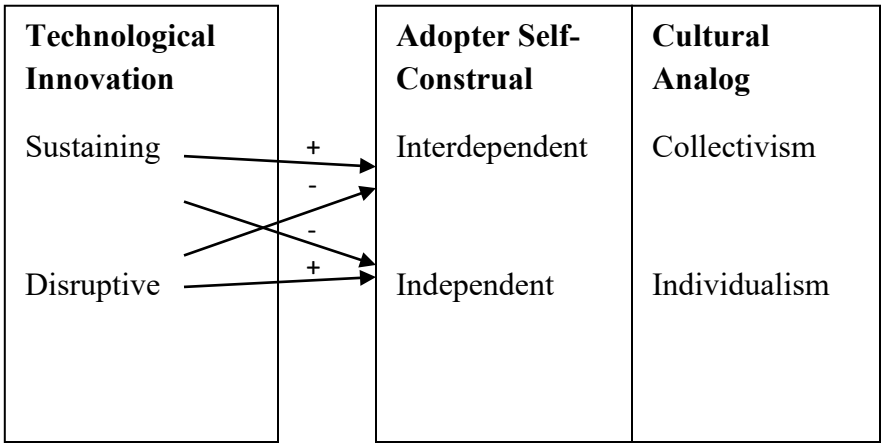


Figure 2: The effect of disruptive innovation on individuals and collectives.

Figure 3: The effect of sustaining innovation on individuals and collectives

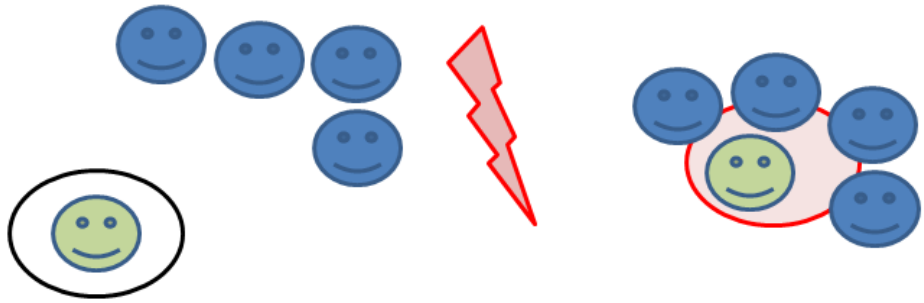
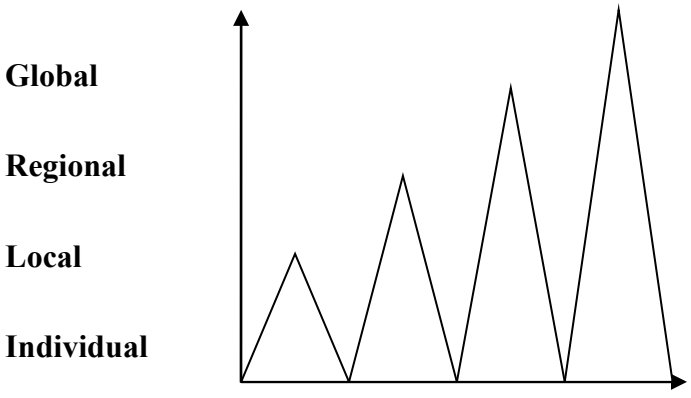


Figure 4: Re-centering of collectives after repeated cycles of technological innovation



Cycles of sustaining and disruptive innovation