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Demographics, attitudes, and technology readiness

A cross-cultural analysis and model validation

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Abstract

Purpose – The purpose of this paper is to test the cross-cultural validity of the Technology Readiness Index (TRI) (Parasuraman, 2000) and explore how demographics and attitudinal variables may help to explain adoption and use of technology-based products and services.
Design/methodology/approach – The study is based on surveys conducted with probabilistic samples from two culturally distant countries, the USA and Chile.
Findings – Results support the TRI's cross-cultural validity. They also suggest that demographic variables do matter when explaining people's willingness to adopt new technology, with education being the most consistent predictor. Moreover, some of the findings seem to challenge the attitude-behavior consistency implied by conventional theory – while attitudinal variables are better predictors of pro-technological behavior in the USA, with technology-related insecurity being the most important of four attitudinal dimensions included in the analysis, demographic variables perform as better predictors in Chile, with educational level outperforming age and gender.
Originality/value – This is the first-ever cross-cultural test of the TRI using actual consumer samples from two culturally very different countries.

Keywords Cross-cultural research, Demographics, Technological innovation, Consumer attitudes, Consumer behaviour

Paper type Research paper

Introduction

The market capitalization that has been achieved by companies such as Google, Apple, and Microsoft is one of many clear indicators of the growing importance of technology in people's daily lives (Dutta and Mia, 2010). Technology-based products and services are being introduced at an accelerating pace worldwide (Economist Intelligence Unit, 2010), and at a faster rate in developing than developed countries (e.g. International Telecommunication Union, 2012).

Both following and helping to fuel this trend, many international companies and other organizations have adopted new technologies for their internal operations and market service strategies (Meuter *et al.*, 2005). This is based on the explicit or implicit assumption that consumers will also prefer and adopt the new technologies over traditional service methods (e.g. Westjohn *et al.*, 2009). However, both intuitive insight and existing research (e.g. Lin and Hsieh, 2007) clearly suggest that not everyone may be equally ready to adopt technology-based innovations – and this makes the matter of target market e-readiness one of obviously acute interest to both the developers and users of new technologies. As a result, it is not surprising that several approaches have been put forth for measuring country- or individual-level preparedness to adopt technological innovations – which is commonly and interchangeably referred to as e-readiness or technology readiness (TR).

While such indices and models can be highly useful, they also leave a number of research gaps that need to be addressed. One of these lies at the intersection between the

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industry- and research-oriented indices mentioned above, and provided the motivation for this paper. On the one hand, country indices typically cover many countries but are based exclusively on "hard" data, such as the number of internet connections or cell phones in use, and say nothing of consumer predispositions. This has also been the case with academic studies that have used secondary longitudinal data for the purpose of econometric model development (e.g. Wu and Chu, 2010). On the other hand, mainstream academic research in business examines attitudinal consumer data in depth, but comprises studies that are more often than not limited to developed countries, involve single country instead of comparative research, or examine technology adoption from the perspective of employees instead of consumers (e.g. Meng *et al.*, 2010). Furthermore, in the rush to accommodate the need for new insights in the rapidly evolving information and communication technology sector, most of the extant studies examine e-readiness from one perspective at a time, such as that of consumer attitudes, or demographics, or culture, instead of looking at two or more of these perspectives simultaneously, which might enable a more holistic examination of the issue at hand.

Such observations raise a number of questions with regards to the antecedents of technology adoption in developed vs developing countries, which comprise the focus of this paper. Is e-readiness, as frequently hypothesized, lower in developing countries, and does this pattern holds for all facets of e-readiness and also for the actual adoption of specific technologies? Are differences in TR based on demographic measures, such as age, gender, and education, observed in both types of countries? If so, what role, if any, might demographics play in anticipating TR in each type of country? Would measures of TR work equally well in both developing and developed countries? Can macro national culture help explain micro differences in e-readiness between countries?

This paper aims to address questions such as these in the context of three specific objectives which also reflect the paper's intended contribution: to explore the ability of demographic and attitudinal variables to predict the adoption and use of technology-based services in a developed and developing country context; to test the cross-cultural validity of Parasuraman's (2000) widely used consumer-oriented e-readiness index; and to examine the relative importance of demographics and attitudes in predicting e-readiness in a developed vs developing country under the umbrella of national culture. The study was implemented by applying Parasuraman's (2000) Technology Readiness Index (TRI) in two countries chosen carefully to enable their cultural characteristics to shed light on the empirical results, the USA and Chile, representing, respectively, the developed and developing world. In the four main sections that follow this introduction, the paper briefly reviews the relevant literature and the models used to explain technology adoption, leading to presentation of the research hypotheses; describes the study's methodology; presents the results; and discusses implications of the findings along with limitations of the study and directions for future research.

Background and hypotheses

Overview of the literature

Technology-based innovations are undertaken to reduce costs, increase customer satisfaction and demand, improve service efficiency, and/or develop new delivery channels for existing or new customer segments (Bitner *et al.*, 2002; Liljander *et al.*, 2006). Considering these benefits, it is not surprising that organizations ranging from banks and airlines to retailers, governments, and schools, to cite just a few, are all adding new technological advances to help achieve their goals. Thus technology leads to fundamental changes in the way services are conceived, developed, and delivered (Meuter *et al.*, 2005) and enables firms to become more competitive and achieve higher profits (Jaafar *et al.*, 2007). In turn, the growing interest of both sellers and organizational buyers in the spread of new technologies has helped to spawn a substantive and increasing body of research on e-readiness in the B2B environment in general (e.g. Vize *et al.*, 2013) or from the point of view

of specific processes and sectors, such as supply chains (e.g. Obal and Lancioni, 2013), education (e.g. Cheon *et al.*, 2012; Aldunate and Nussbaum, 2013), and government (e.g. Gilbert *et al.*, 2004; Khalil, 2011).

At the same time, new technologies offer substantial benefits to consumers, including increased convenience, control, and freedom of action (e.g. Westjohn *et al.*, 2009). As a result, they have become an important factor in daily life, thus drawing the interest of researchers to such diverse investigations as the potential effects of religiosity on technology adoption (Ali *et al.*, 2015), or, from an obverse perspective, the behavioral effects of e-readiness (e.g. Ferreira *et al.*, 2014) or of new technologies following adoption (Son and Han, 2011).

Overall, then, technology has brought about major changes for both companies (e.g. Kim and Garrison, 2010; Kurnia *et al.*, 2015) and consumers (Lin and Hsieh, 2007), and one might assume that the interests of both parties, and their preparedness to embrace innovative approaches to marketplace interactions, are aligned. However, a substantial body of research suggests that this is not the case. Some individuals, whether as customers or employees, may not be as psychologically ready as others to adopt technologies in their personal and professional lives. For example, some services have become too technologically sophisticated for consumers (Lin and Hsieh, 2007), and their adoption and use may involve too much effort, time, and/or risk (Bateson, 1985).

Consequently, many consumers are experiencing feelings of anxiety (Meuter *et al.*, 2003), or technophobia (Tsikriktsis, 2004), remain skeptical of the additional benefits, or are resistant to change (Bruner and Kumar, 2007). In turn, this affects their beliefs and behavior toward newer technologies. As well, Yen (2005) provides evidence that consumers do not appreciate the value created by technology to the extent it is advertised by companies. Customer's competence and preferences have also been mentioned as limitations in adopting cutting edge technologies (Zhu *et al.*, 2007). Therefore, whether or not companies may be able to realize the anticipated level of profits from incorporating contemporary technologies is highly contingent on their customers' willingness to embrace and use the new ways and tools of doing business (Meuter *et al.*, 2005).

Generally, despite the wide availability of new technologies, Meuter *et al.* (2003) argue that very little is known about the factors influencing customer usage of technology-based options. Furthermore, most studies of consumers' e-readiness have focused mainly on developed countries, leading Meng *et al.* (2010) to repeat a call that is often heard with regards to research in the current age of globalization: the study of consumer reactions to technology-based products and services needs to go beyond just developed countries and include developing countries as well.

Technology adoption models

Several theoretical models have been proposed to gain more knowledge on how innovation influences consumer intentions and behavior. Those that appear to have attracted the most attention from researchers include the theory of reasoned action (TRA) (Ajzen and Fishbein, 1980); the theory of planned behavior (TPB) (Ajzen and Madden, 1986); the technology acceptance model (TAM), which is rooted in the TRA (Davis, 1989); and more recently the TRI (Parasuraman, 2000). While the first two of these models are generic, the latter two are specific to technology adoption and use.

The TAM was developed to predict employees' acceptance of a new technology at work (Davis, 1989) and posits that this is influenced by their beliefs about its usefulness and ease-of-use. While it has attracted significant attention, the model has been criticized for being device-specific and not examining employees' overall beliefs about technology (Karahanna and Straub, 1999; Meng *et al.*, 2010). More importantly, recent research in marketing has questioned the applicability of TAM in the consumer context because it was developed for employees, whose behavior is largely determined by their company's needs and wishes,

instead of consumers operating freely in the marketplace (Lin *et al.*, 2007). A later extension, the TAM2 (Venkatesh and Davis, 2000), augmented the original model but is subject to some of the same constraints as its predecessor, including, most importantly from the perspective of this paper, that it also focuses on employee behavior at work as opposed to consumers in the market. More recently, Venkatesh and Bala (2008) developed and tested the TAM3, which is an integrated model of the determinants of individual-level (IT) adoption and use; however, this new model has also been focused on employees and not consumers.

By contrast, the TRI (Parasuraman, 2000) is an attitudinal scale that is "individual specific" (Lin *et al.*, 2007). It has been developed to measure "people's propensity to embrace and use new technologies for accomplishing goals at home and at work" (Parasuraman, 2000, p. 308). The index is a multi-dimensional construct, consisting of four distinct dimensions:

(1) optimism: a positive view of technology and a belief that it offers people increased control, flexibility, and efficiency in their lives;

(2) innovativeness: a tendency to be a technology pioneer and thought leader;

(3) discomfort: a perceived lack of control over technology and a feeling of being overwhelmed by it; and

(4) insecurity: distrust of technology and skepticism about its ability to work properly.

The first two dimensions are "contributors" to TR, while the last two are "inhibitors." In other words, high levels of the former will boost a person's overall TRI score whereas high levels of the latter will suppress it. As a result, each individual can be located on a technology beliefs continuum ranging from resistant to receptive on technology.

More recently, Lin *et al.* (2007) incorporated the TRI into the TAM model to propose an integrated technology readiness and acceptance model (TRAM) in the context of adoption of e-service systems. They argue that by integrating individual factors (the TRI approach) with system characteristics of usefulness and ease-of-use (TAM) it may be possible to broaden the applicability of the two models by helping to explain, for example, why the higher the TRI and the lower the TAM score is, the more likely it may be that consumers would adopt new technologies – and vice versa. While the TRAM potentially represents a step in the right direction, it has several limitations including that it was a one-country study, the sample comprised very sophisticated consumers and professionals (participants in online investment forums), and it stopped short of measuring actual behavior, using, instead, intention as the dependent variable.

On consideration, the TRI has a number of characteristics recommending it for this study, including that it focuses on consumers instead of corporate employees; it uses actual adoption of selected technologies instead of intention to adopt; and it has been applied in various countries but almost exclusively in single-country research, which calls for a comparative perspective through the same study. Even though the TRI has been used by over 140 scholars in more than 30 countries for peer-reviewed research, policy studies, and dissertations (Rockbridge, 2016), a few studies have reported low Cronbach's α scores for discomfort and overall TRI (Jaafar *et al.*, 2007), others found that some items loaded on several factors and/or the items' loading scores were poor (Tsikriktsis, 2004).

Formulation of hypotheses

Several studies have suggested that various demographic characteristics, including gender (e.g. Tsikriktsis, 2004), age (e.g. Hertzog and Hultsch, 2000), and education (e.g. Porter and Donthu, 2006), may help to explain behavior specifically in the context of technology adoption. On the other hand, and unlike commonly held beliefs among researchers, the role of these variables is far from being universally confirmed. Meuter *et al.* (2003) posit that

demographics have not consistently explained consumers' technology adoption, and this is supported by Rogers' (1995) meta-analysis of research on the adoption of innovations in general, where only one-half of 228 studies reviewed showed a significant relationship between age and adoption behavior.

The use of demographics in the present study was dictated by three main factors: the overall need to examine their role, since the verdict on their influence is not unanimous; the need to consider whether demographic variations on technology adoption are similar or different between the developed and developing countries in the sample; and, importantly, the need to lay the foundation for the intended multi-faceted examination of technology adoption, which, as outlined in the introduction, includes an examination of the comparative impact of demographics vs attitude on behavior – as well as potential differences of this impact between the developed and developing countries in the study. Therefore, the three demographic variables that are most commonly used in e-readiness research were included in the study.

Gender. Gutek and Bikson (1985) posit that men are more technology-savvy than women. Similarly, there is evidence suggesting that males are more likely than women to have advanced computer skills (Harrison and Rainer, 1992), and that they have also been shown to feel less apprehensive about computer usage than females (Gilroy and Desai, 1986). More recently, Tsikriktsis (2004) reports that males are more eager than females to adopt new technological devices, and Elliot and Hall (2005) posit that men exhibit higher levels of self-confidence than women in using new technology. On the contrary, there is also evidence in recent research that gender has not been significant in explaining information technology adoption and use (Rainer *et al.*, 2003), in the adoption of online activities (Shaw and Gant, 2002), in the adoption of mobile commerce (Li *et al.*, 2008), and in shopping patterns (Fram and Grady, 1997). Conflicting results have been found not only across but also within several studies, as in the research by Meuter *et al.* (2003) on the adoption of self-service technologies. This variability in results in extant research buttresses the need to re-examine gender differences, especially in the context of a comparative study such as the present one. In this light, we propose:

H1. Males are expected to be more technology-ready than females in both the USA and Chile; specifically, in the TRI males are expected to score higher on the contributor dimensions of optimism and innovativeness, and lower on the inhibitor dimensions of discomfort and insecurity, in both of the countries studied.

Age. Age can also be expected to play an important role in technology adoption. Meuter *et al.* (2003), notwithstanding the findings of Rogers (1995) as well as their own doubts on the role of demographics in technology adoption, posit that age is the most consistent demographic predictor of usage of self-service technologies by consumers. According to Hertzog and Hultsch (2000) older people tend to perceive a reduction in their own cognitive capabilities to learn, which could be a barrier for them to embrace and use new technological developments. Previous studies have reported that age is negatively related to technology adoption. For instance, Harrison and Rainer (1992) and Nickell and Pinto (1986) have reported a negative relationship between age and attitudes toward computers; Porter and Donthu (2006) found a negative relationship between age and the perceived ease-of-use of the internet; and Tsikriktsis (2004) supports the suggestion that younger people are more likely than older people to be "explorers" of new technology. Nonetheless, there is also some evidence that challenges this conclusion – not that age might work in the reverse direction (i.e. not that older people might be more e-ready than younger ones), but that it may not play a role one way or another in explaining technology adoption. For instance, previous studies found no differences in

computer usage (Dickinson and Gregor, 2006) or adoption of self-service technologies (Weijters *et al.*, 2007) among different age groups. Similarly, Meuter *et al.* (2003) report that even though age is the most consistent demographic predictor of self-service technologies, that is not the norm for all clusters identified in their study. As with gender, this inconsistency in the findings of past research supports the intent of this study to include age for examination. Therefore:

H2. Younger people are expected to be more technology-ready than their older counterparts in both the USA and Chile; specifically, in the TRI younger consumers are expected to score higher on the contributor dimensions of optimism and innovativeness, and lower in the inhibitor dimensions of discomfort and insecurity, in both of the countries studied.

Education. The level of educational attainment has also been reported as a significant predictor of consumers' technology adoption. Less educated people have been found to have less sophisticated cognitive structures that restrict their ability to learn in new environments (Hilgard and Bower, 1975). Igbaria and Parasuraman (1989) have suggested that education is negatively related to computer anxiety, and Porter and Donthu (2006) found a positive relationship between educational level and the perceived ease-of-use of the internet. In the study by Meuter *et al.* (2003), education produced conflicting results when explaining the adoption of self-service technologies. Dupagne and Salwen (2005) have also found that lower levels of education among black and Hispanic respondents in the USA (as opposed to whites) did not predict adoption of communication technologies. This is similar to the findings discussed above with regards to age, which was found to not be a predictor of e-readiness in some studies, and argued for the necessity of additional testing of the education variable especially in the context of the present comparative study. Therefore, we propose the following:

H3. More educated people are expected to be more technology-ready than their less educated counterparts in both the USA and Chile; specifically, in the TRI more educated people are expected to score higher on the contributor dimensions of optimism and innovativeness, and lower on the inhibitor dimensions of discomfort and insecurity, in both of the countries studied.

Country differences

Probably the first variable one may think of in attempting to explain any difference in TR between developed and developing countries is their different levels of wealth, and therefore of their respective consumers' ability to even entertain the adoption and use of new technologies. However, although this might be true in the general sense, the evidence shows that as incomes rise beyond a certain level, culture replaces wealth as a predictor variable of behavior (De Mooij, 2011). Srite and Karahanna (2006) performed a study that identifies Hofstede's (2001) national cultural values of low masculinity and high uncertainty avoidance (UA) as an important set of individual difference moderators in technology acceptance. De Mooij (2011) also posits that people in feminine cultures are less interested in technology than those in masculine cultures, and Lynn and Gelb (1996) reported significant correlations between ownership of several technological devices and individualism. Developing countries typically have higher levels of UA, with 77 percent of them scoring in the upper half of Hofstede's (2001) UA index compared to only 50 percent of developed countries, and this leads to a need for explanations and a greater interest in the process for using the new technology; by contrast, low UA societies are more interested in the results to be achieved from that use. Buying brand-new products or services, especially the more costly and sophisticated ones, may constitute a matter of

anxiety for individuals in high UA countries, who tend to adopt innovations at a lower speed than those in low UA cultures (De Mooij, 2011). Overall, it may be hypothesized that the cultural environment in countries scoring high in UA, like Chile, is much less conducive to the adoption of new technologies than are cultural environments with lower levels of UA, such as the USA. Given this, we hypothesize that:

H4. Consumers in developed countries are expected to be more technology-ready than their counterparts in developing countries; specifically, consumers in developed countries are expected to score higher in the contributor dimensions of optimism and innovativeness, and lower in the inhibitor dimensions of discomfort and insecurity, of the TRI.

Consistency between attitude and behavior may be varying across countries because of income and cultural factors. People from more affluent economies, such as the USA, are on average better prepared to afford the purchase of new technological devices if they wish. By contrast, people from developing countries, such as Chile, may show a favorable attitude but not translate it into a purchase due to lack of resources. Alternatively, even if they have enough resources to obtain new devices, consumers may refrain from purchasing or using new technologies due to resistance to change and/or other factors arising from their home culture, thus leading to attitude-behavior inconsistency. De Mooij (2011) argues that people from collectivist societies, such as Chile, tend to behave based on the situational context, and may therefore report a favorable attitude but not behave accordingly. Thus:

H5. Consumers in developed countries are expected to show a higher degree of adoption of specific technologies when compared to consumers in developing countries.

Technology attitudes vs demographics

According to Rogers (1995), there is a long tradition of focusing on demographic variables and his well-established five characteristics of innovation (relative advantage, compatibility, complexity, trialability, and observability), as primary predictors of innovation adoption behavior. More recently, Bobbitt and Dabholkar (2001), among others, argued that one way to truly understand what drives consumer decisions is to examine underlying consumer attitudes. Davis (1989) reports that attitude is an antecedent to intentions to adopt computer technologies. Similarly, Meuter *et al.* (2003) find that the construct of technology anxiety, defined as the user's state of mind regarding his or her ability and willingness to use technology-related tools, is a better predictor of self-service technology usage than traditional demographic characteristics such as age and gender. Furthermore, Bobbitt and Dabholkar (2001) suggest that there is a need to first understand attitudes toward technology in general rather than attitudes toward specific technologies, because doing so will allow researchers to capture underlying motivations more fully. The line of thinking reflected in these studies is consistent with the broader marketing trend toward ever-more sophisticated approaches to understanding and segmenting markets, such as the use of psychographics instead of demographics in everything from supermarket to fashion shopping. As can be seen, however, the arguments that favor attitude instead of demographics as the principal explanator of behavior often come from studies that have found mixed results on gender, age, and education, as discussed above, rather than from research that found more consistent results on the role of demographics – and it is exactly this divergence in researchers' views that calls for the simultaneous examination of demographics and attitude that was undertaken in the present study. Therefore:

H6. General attitudes toward technology (i.e. TR) are more important than demographic variables in explaining adoption of technological innovations.

Methodology

Study sites

Since the intent was to conduct the first-ever cross-cultural test of the TRI using actual consumer probability samples, it was considered important from the outset to approach the selection of countries for the study systematically and nor randomly or by convenience, as is often the case in international research (e.g. Malhotra *et al.*, 1996). Furthermore, a key premise for the selection of study sites was to maximize, from within the feasible set of countries that could be researched, the cultural distance between the countries to be chosen for the research. With these considerations in mind, Hofstede's (2001) approach to the study of culture, and the Kogut and Singh (1988) index for determining inter-country cultural distance, were selected for the present research, since both are among the most commonly used in international marketing research. Hofstede's (2001) approach examines national culture based on five dimensions, namely, power distance, individualism-collectivism, masculinity-femininity, UA, and long-term orientation.

After careful consideration, two countries that fit the criterion of cultural dis-similarity were selected for this study: the USA and Chile. The cultural environment in countries scoring high in UA, femininity, and collectivism, like Chile, is less conducive to adopting new technologies than the environment of countries like the USA, which is characterized by lower UA and higher masculinity and individualism (De Mooij, 2011; Lynn and Gelb, 1996; Srite and Karahanna, 2006).

Research instrument

The scale items for the TR index used in this study were adopted from Parasuraman (2000). The questionnaire was originally developed in English and then translated into Spanish for the data collection in Chile. To ensure consistency in translation, professional back translation (Brislin, 1970) was also performed. The survey instrument consisted of three main sections. Section 1 asked the respondents to answer 36 five-point Likert-type questions on TR (1 = strongly disagree to 5 = strongly agree). To prevent routinization and response bias, the scale items corresponding to the four dimensions of the TRI were randomly intermixed. Section 2 included questions regarding the current and potential use of a subset of technology-based products and services, selected from the original Parasuraman's (2000) study. The last section included questions about respondent demographics.

Data collection

The questionnaire was administered to random samples consisting of national cross-sections of adult respondents aged 18 or older in the USA and Chile, by telephone survey using a random-dialing process. The sampling procedure sought to ensure that the gender distribution was representative of the populations in both countries. Data cleanup resulted in 499 complete and usable interviews in the USA and 501 in Chile, representing, respectively, response rates of 18 and 34 percent.

Results

Assessment of reliability and validity

Overall the samples resemble very well the profile of the two countries' populations, with the distributions by region, gender, and age in both countries, and education in the USA, being very nearly complete matches (Note: the complete demographic data tables are not shown due to lack of space but are available on request).

Confirmatory factor analysis (CFA) was used with both data sets to examine the adequacy of the combined measurement model (i.e. the four dimensions of the TRI and the covariance between contributors and inhibitors) and evaluate the discriminant validity of

the constructs. The results revealed that the estimation process converged properly after deleting some items based on low critical ratios, low standardized coefficients, high standardized errors, and/or high modification indices. The final measurement model for Chile, presented in Table I, shows the following ratios, which fit the data very well and fall within the accepted boundaries (Kline, 1998) thus supporting the soundness of the measurement model for the refined TRI scale: standardized root mean square residual

Constructs and items	Standard coefficient USA	Chile
Optimism		
Technology gives you more freedom of mobility	0.65	0.55
Products and services that use the newest technologies are much more convenient to use	0.48	0.47
You find new technologies to be mentally stimulating	0.59	0.42
You like computer programs that allow you to tailor things to fit your own needs	0.57	0.50
Technology makes you more efficient in your occupation	0.63	0.47
Innovativeness		
You can usually figure out new high-tech products and services without help from others	0.60	0.55
Other people come to you for advice on new technologies	0.75	0.61
You find you have fewer problems than other people in making technology work for you	0.56	0.53
You keep up with the latest technological developments in your areas of interest	0.64	0.53
In general, you are among the first in your circle of friends to acquire new technology when it appears	0.58	0.43
Discomfort		
Sometimes, you think that technology systems are not designed for use by ordinary people	0.43	0.45
It is embarrassing when you have trouble with a high-tech gadget while people are watching	0.38	0.44
Technology always seems to fail at the worst possible time	0.42	0.46
Many new technologies have health or safety risks that are not discovered until after people have used them	0.37	0.42
There is no such thing as a manual for a high-tech product or service that's written in plain language	0.51	0.48
If you buy a high-tech product or service, you prefer to have the basic model over one with a lot of extra features	0.35	0.49
Insecurity		
You do not consider it safe giving out a credit card number over a computer	0.66	0.57
The human touch is very important when doing business with a company	0.38	0.40
You do not consider it safe to do any kind of financial business online	0.73	0.74
You do not feel confident doing business with a place that can only be reached online	0.47	0.57
You worry that information you send over the internet will be seen by other people	0.52	0.41
Path coefficients		
Contributors → Optimism	0.67	0.70
Contributors → Innovativeness	0.99	0.78
Inhibitors → Discomfort	0.98	0.97
Inhibitors → Insecurity	0.71	0.83
Contributors ↔ Inhibitors	−0.35	−0.54
Fit indices		
χ^2	280.70	267.23
GFI	0.95	0.95
AGFI	0.94	0.94
CFI	0.95	0.94
RMSEA	0.03	0.03
SRMR	0.04	0.04

Table I.
Confirmatory factor analysis of the TR measurement model (21 items)

(SRMR) = 0.04, GFI = 0.95, AGFI = 0.94, CFI = 0.94, and RMSEA = 0.03. Likewise, as Table I shows, the fit indices for the measurement model for the USA are also equally strong: SRMR = 0.04, GFI = 0.95, AGFI = 0.94, CFI = 0.95, and RMSEA = 0.03.

Table II contains the reliability coefficients (Cronbach's α) for the four factors as well as the pair-wise inter-factor correlations. The reliability coefficients are above the acceptable threshold of 0.6 for satisfactory internal consistency (Malhotra, 2002, p. 268) for the USA sample with only one exception (discomfort). While the reliability coefficients are somewhat lower for the Chilean sample, they all also exceed the 0.6 threshold for the scales used to measure four TR dimensions. The pattern of coefficients in Table II also provides evidence of the scales' discriminant validity, which refers to whether the measure of a given construct is distinctly different from the measures of other related constructs. In addition, following the suggestions of Fornell and Larcker (1981), discriminant validity was assessed by means of comparing the shared variance among optimism, innovativeness, discomfort, and insecurity with the average variance extracted (AVE) by these latent variables. Discriminant validity is achieved when latent variables accounts for more variance in the observed variables associated with them than the other constructs within the conceptual framework. In our study, the AVE in all cases is greater than its shared variance (squared correlation among them), thus discriminant validity is again supported.

Interestingly, and even though our Cronbach α's are reasonable, our AVE values are below the threshold of 0.50 suggested by Fornell and Larcker (1981). This may be explained by the fact that reliability and AVE have unknown sampling distributions. Ping (2004) supports this by stating that "reliability and AVE are linked, but not always closely. While reliability is always larger than AVE, a highly reliable measure can have an unacceptable AVE" (p. 132). A complementary explanation is that even when AVE values are low this may not necessarily indicate a suggestion to disregard the model. Having good overall fit indices, as is the case here, creates sufficient support for the model because measurement errors have also been taken into account in SEM. Therefore, while recognizing that AVE is a good evaluation criterion for the indicators, this does not necessarily signify that the indicators or a model can or cannot be used. By so doing, one may incur a Type I error, i.e. the incorrect rejection of an acceptable model.

Configural, measurement, and structural invariance

Prior to empirically examining the study hypotheses, we also conducted CFAs to assess configural, measurement, and structural invariance between the USA and Chilean samples as suggested by Byrne (2008). The results are shown in Table III.

Country	Constructs	Mean	SD	INN	OPT	DIS	INS
USA	Innovativeness (INN)	3.01	0.95	*0.74*			
	Optimism (OPT)	3.82	0.84	0.50	*0.72*		
	Discomfort (DIS)	3.53	0.73	−0.21	−0.17	*0.52*	
	Insecurity (INS)	3.84	0.91	−0.17	−0.19	0.50	*0.69*
	Overall TRI	2.90	0.57				
Chile	Innovativeness (INN)	3.13	0.68	*0.67*			
	Optimism (OPT)	4.01	0.47	0.36	*0.60*		
	Discomfort (DIS)	3.60	0.61	−0.26	−0.23	*0.62*	
	Insecurity (INS)	4.14	0.63	−0.21	−0.19	0.53	*0.67*
	Overall TRI	2.85	0.41				

Notes: Diagonal with italicized numbers shows the Cronbach's α coefficients; all mean values are on a five-point scale where 1 = strongly disagree and 5 = strongly agree; the overall TRI score for each respondent was obtained by averaging the scores on the four components (after reverse coding the scores on the discomfort and insecurity components). **Correlations are significant at $p < 0.01$

Table II.
Mean, standard deviation, correlation and cronbach alpha coefficients

Configural invariance is assessed by means of the goodness-of-fit of a baseline model that tests all of the hypothesized relationships in the model presented in Table I, but this time using both the Chilean and the American samples at the same time (i.e. multi-group analysis). The model (model 1 in Table III) produced a χ^2 value of 574.289 (χ^2/df = 1.552), CFI 0.93, GFI 0.95, AGFI 0.94, and RMSEA 0.02. These indices indicate that configural invariance is attained and provide support that the pattern of fixed and non-fixed parameters in the model is comparable for the Chilean and the American samples.

To test for measurement invariance, all the factor coefficients were constrained to be equal between the two samples (Model 2 in Table III). This procedure increases the χ^2 value from 574.289 (Model 1) to 604.625, gaining at the same time 17 degrees of freedom. Since the measurement invariance model is nested within the baseline model, a χ^2 test was performed. Results indicate that the difference is not statistically significant at $\alpha = 0.01$, and therefore measurement invariance is supported.

Structural invariance tests whether the relationships among the latent variables are properly drawn the same way for each group in the analysis. Using the methods discussed in the preceding paragraphs, structural invariance is also confirmed (Model 3 in Table III). Therefore, the refined model is cross-validated between the USA and Chilean samples, thereby supporting the meaningfulness of making direct comparisons and further analyses of the samples.

Testing of hypotheses

To assess the hypothesized links between TR and gender (*H1*), age (*H2*), and education (*H3*), we used *t*-tests, Pearson correlations, and Spearman correlations, respectively. For examining cross-country differences in TR scores (*H4*) and in technology-related behaviors (*H5*) we used *t*-tests and χ^2 tests, respectively. Finally, to ascertain the relative explanatory power of demographic vs attitudinal variables (*H6*) we used hierarchical multiple regression analysis.

Gender. The mean score for each TR dimension was computed and *t*-tests were used to look for significant differences between genders (Table IV). The two samples show consistency, since three out of the four dimensions show differences in gender, and in the predicted direction, with the exception of optimism which was not significant (but also in

Table III.
Fit indices for invariance tests

Test	χ^2	df	χ^2/df	*p*-value	CFI	GFI	AGFI	RMSEA (90% CI)
Chilean sample	267.23	185	1.44	0.001	0.94	0.95	0.94	0.03 (0.02-0.04)
American sample	307.09	186	1.65	0.001	0.93	0.95	0.93	0.04 (0.03-0.04)
Configural invariance (baseline model – Model 1)	574.29	370	1.55	0.001	0.93	0.95	0.94	0.02 (0.02-0.03)
Full measurement invariance (Model 2)	604.63	387	1.56	0.001	0.93	0.95	0.93	0.02 (0.02-0.03)
Full structural invariance (Model 3)	575.84	373	1.54	0.001	0.94	0.95	0.94	0.02 (0.02-0.03)

Table IV.
Gender and TR dimensions (mean scores and *t*-values)

TRI Dimensions	USA Males	USA Females	USA *t*-statistics	Chile Males	Chile Females	Chile *t*-statistics
Innovativeness	3.25	2.79	5.469	3.34	2.93	6.986
Optimism	3.86	3.77	1.111	4.04	3.98	1.472
Discomfort	3.45	3.61	−2.216	3.49	3.71	−4.163
Insecurity	3.71	3.97	−3.176	4.05	4.23	−3.082

Note: All *t*-statistics are significant at $p < 0.05$ except for optimism (not significant in either country)

the predicted direction) in both samples. Males score higher than females on innovativeness and lower on discomfort and insecurity. Therefore, *H1* is supported. This result goes beyond mere affirmation of gender differences in overall views of technology, since it speaks specifically to the critical dimensions of the TRI and also shows similar male-to-female differences within each country as well as differences for each gender across the two countries.

Age. As Table V shows, age is significantly related to the four TR dimensions in both countries. As implied by the signs of the correlation coefficients, younger respondents scored higher on innovativeness and optimism, and lower on discomfort and insecurity than their older counterparts. Thus, *H2* is supported, and again, this result does not simply affirm the importance of age in technology views but also highlights the similarities between the two countries.

Education. Similar analyses were performed to examine the relationship between the four TR dimensions and education (see Table V). For both countries this relationship is significant and positive in the case of innovativeness and optimism, and negative for discomfort and insecurity. Thus, more educated individuals are more prone than are less educated ones to adopt new technological developments. Therefore, *H3* is also strongly supported, invoking a similar comment to those made above for gender and age: further to its face value, this finding is also interesting since it points to similar influences of similar demographic variables across highly dissimilar countries.

Country differences. Table VI shows the results of analyses undertaken to examine differences between the samples with regard to attitudinal and behavioral variables. A review of the mean attitude scores in the table reveals that the rank order of importance among the dimensions is the same for both USA and Chilean respondents: insecurity (3.84 and 4.14, respectively), followed by optimism (3.82 and 4.01), discomfort (3.53 and 3.60), and innovativeness (3.01 and 3.13). The overall index is slightly higher in the USA (2.90) than in Chile (2.85), but this difference is not statistically significant.

However, when considering the two countries at the level of each attitudinal dimension individually, the mean scores show that Chileans score significantly higher than Americans on three of the four dimensions, with the fourth (discomfort) indicating a difference that is not significant but is in the predicted direction. This is especially so for insecurity, with a score of 4.14 for Chile vs 3.84 for the USA, which is statistically significant at the 0.01 level. In other words, when compared to Americans, the scores achieved by Chileans on the technology adoption inhibitors tend to confirm *H4* – but their scores on the contributors do not.

Turning to *H5*, the bottom part of Table VI shows the results concerning actual behavior (adoption and usage) of five selected technologies. The table shows that Americans have a significantly higher level of adoption than Chileans, thus strongly confirming this hypothesis.

Variable	USA		Chile
Age		*Pearson correlation*	
Innovativeness	−0.271		−0.201
Optimism	−0.264		−0.162
Discomfort	0.263		0.250
Insecurity	0.235		0.258
Education		*Spearman correlation*	
Innovativeness	0.115		0.232
Optimism	0.196		0.249
Discomfort	−0.186		−0.357
Insecurity	−0.163		−0.203

Note: All correlation coefficients are significant at $p < 0.05$

Table V.
Correlation coefficients for age and education

Attitudinal variables	Country means USA	Chile	Difference[a]
Contributor dimensions			
Innovation	3.01	3.13	−0.12
Optimism	3.82	4.01	−0.19
Inhibitor dimensions			
Discomfort	3.53	3.60	−0.07
Insecurity	3.84	4.14	−0.30
Overall TRI	2.90	2.85	0.05

	Respondents					
	USA		Chile		Difference[b]	
Behavioral variables	No.	%	No.	%	No.	%
Booked travel arrangements online	149	30	53	11	96	19
Bought or sold stock or securities online	37	7	15	3	22	4
Purchased an item costing less than $10 online	76	15	43	9	33	7
Purchased an item costing between $10 and $100 online	190	38	88	18	102	20
Purchased an item costing over $100 online	123	25	36	7	87	17

Table VI.
Testing differences in attitude (*t*-test) and behavior (χ^2 test)

Notes: [a]All differences are significant at $p < 0.05$ except for discomfort and the overall TRI; [b]all differences are significant at $p < 0.05$

Considering the preceding comments together helps to reveal a potentially important finding that will be discussed later in the paper; this can be summarized in two observations: the two country samples score similarly in their overall attitude toward technology, based on the composite index (overall TRI), but differ significantly on the individual attitudinal dimensions, and in a perplexing way – the US sample scores lower on the inhibitor variables (*H4*) and higher on behavior (*H5*), as expected, but also scores lower on the contributor variables, which contrasts the expectation reflected in *H4*.

Regression analyses

To examine the effects of demographic variables and attitude toward technology on the actual adoption of new technologies, hierarchical multiple regression analysis was used. The independent variables were grouped into two separate blocks. The demographic variables (age, education, and gender) were entered in the first block and the four attitudinal dimensions of the TRI were entered in the second block. The score of each dimension was computed using the mean of the variables comprising each factor.

The five behaviors related to the actual adoption of new technologies, mentioned above in relation to inter-country behavioral differences (Table VI), were used as the dependent variables. Five separate regressions were run within each database for each of the dependent variables, and the results are presented in Table VII.

Both demographic and attitudinal independent variables explain some of the variance in the dependent variables. Demographic variables explain from 1 to 8 percent of the variance of the dependent variables in the US sample, and from 2 to 13 percent in the case of the Chilean sample. Attitudinal variables explain from 4 to 14 percent in the USA, and from 0 to 4 percent in Chile. The surprising difference that emerges when looking at both samples is that demographic variables are a better predictor of behavior in Chile, while attitudinal variables outperform demographics in the USA.

Among the demographic criteria, in both countries education emerges as the most significant independent variable by far (significant in nine out of the ten regressions presented in Table VII). The higher the educational level attained by respondents, the higher the willingness to adopt the corresponding technological development. Age in

Table VII. Hierarchical multiple regression explaining the adoption of technological products/services

Variables	USA					Chile				
Products	Booked travel arrangements	Purchased item costing < $10	Purchased item costing $10-$100	Purchased item costing > $100	Bought/sold stock or securities	Booked travel arrangements	Purchased item costing < $10	Purchased item costing $10-$100	Purchased item costing > $100	Bought/sold stock or securities
Demographics										
Age	−0.003	−0.017	0.065	0.045	0.077	0.084	−0.152*	−0.106*	0.018	−0.085
Education	0.107*	0.116*	0.182*	0.152*	−0.043	0.181*	0.103*	0.205*	0.208*	0.104*
Gender	0.000	−0.080	−0.070	−0.108*	−0.066	−0.005	−0.017	−0.077	−0.029	−0.008
R^2	0.044	0.057	0.082	0.075	0.010	0.041	0.078	0.133	0.067	0.022
Attitude toward technology										
Innovativeness	0.064	0.120*	0.109	0.135*	0.056	−0.015	0.026	0.111*	0.066	0.076
Optimism	0.098	−0.066	0.099	0.067	0.061	0.027	0.022	0.097*	0.046	−0.024
Discomfort	−0.009	0.102*	−0.038	0.044	−0.049	−0.011	−0.054	0.005	−0.072	0.052
Insecurity	−0.225*	−0.413*	−0.252*	−0.281*	−0.148*	−0.088	−0.134*	−0.110*	0.038	−0.026
R^2	0.101	0.141	0.110	0.101	0.043	0.009	0.027	0.040	0.012	0.006
Total R^2	0.145	0.198	0.192	0.176	0.053	0.050	0.105	0.172	0.078	0.028

Note: *Significant at $p < 0.05$

Chile, and gender (women) in the USA, were found to be negatively significant but only marginally at best.

Among the independent attitudinal dimensions, Insecurity is the most significant in all five regressions, and innovativeness in two, for the US sample. In the case of Chile, insecurity significantly predicts two behaviors, and innovativeness and optimism predict one each.

Overall, the aggregated results from this study reveal that demographic variables are better predictors of technology adoption in Chile, while attitudinal variables perform better in the USA. Therefore, *H6* is supported only in the latter case.

Discussion, conclusions, and future research

Discussion and implications for research

A key contribution of this study is the rigorous testing of the TRI in two culturally dissimilar countries, which takes the cross-country validation of the index well beyond the pioneering, but student-based, study of Meng *et al.* (2010). Using large consumer samples in a major developed country, the USA, and a very different developing, country, Chile, the present study performed all the necessary tests (reliability and validity, configural, measurement, and structural invariance) and used a variety of statistical methods (from *t*-tests and Pearson and Spearman correlations to CFA and multiple hierarchical regression) to conclude that indeed the TRI worked as well in a third country as in its original "home" application in the USA. This adds confidence that the TRI may indeed be usable in other environments as well.

Several past studies suggest that demographic variables are related to attitudes toward, and in some cases the adoption of, new technologies, and this receives cross-national (cultural) support here. It is evident from the results (Tables IV and V) that men, younger people, and higher-educated individuals tend to have more positive attitudes toward adopting technology. Further to considering this finding in and of itself for each country, the continuing influence of demographics may be of particular interest in the case of the USA considering its assumed high level of advancement not only in economic terms but overall: one might have expected that over time, by comparison to the earlier studies of technology adoption between, for example, the 1970s and 1990s, age, education, and gender-related differences in attitudes to technology would have waned, if not completely disappeared. After all, many of today's technologies have been around for some time in their basic form (a laptop or tablet today is not as big an innovation compared to desktop computers as when the latter replaced plain typewriters a generation ago) – and yet this study clearly shows that not only in Chile but also in the USA, female, older, and less educated consumers still share many of the concerns of their predecessors.

Turning to attitude, the fundamental assumption is that it has a significant role in guiding, influencing, directing, shaping, or predicting actual behavior (Kraus, 1995) – and this study confirms that attitudes toward technology are good predictors of adoption and use of technology-based products and services. However, the finding that Chileans actually scored higher than their American counterparts on the two attitudinal contributors (innovation and optimism) to TR is both surprising and highly interesting. At the same time, Chileans score higher on the inhibitors, thus canceling out the impact of the contributors on the overall TRI. Furthermore, as anticipated in *H5*, in terms of actual behavior Chileans are adopting specific new technologies at a much lower rate than Americans do. Why, then, do similar overall TR scores between the two countries translate into different levels of actual technology adoption?

As noted earlier, part of the answer may lie in the different levels of economic development, and therefore nominal income levels, of the two countries – but as also noted, above a certain level (which Chile has certainly exceeded) income is no longer a strong

explanator of behavior. Additional explanations for the higher TRI contributor scores of Chilean respondents may reside in the cultural differences between them and their US counterparts. For example, this finding may be a consequence of the social desirability bias that moves consumers to actually report higher intention levels than their actual behavior. This pattern is typically found in collectivist societies scoring high in power distance (De Mooij, 2011). Previous research suggests that the individualism-collectivism cultural value may play a role in technology usage (Srite and Karahanna, 2006; Westjohn *et al.*, 2009). Consistency between attitude and behavior traditionally reported for individualistic cultures like the USA does not occur in the same way in collectivist societies, such as Chile. In the latter, people tend to form their attitudes largely to fulfill their social identity functions, which helps them to maintain "face" among their peers – and Hofstede (2001) also noted that cultures scoring high on power distance are expected to have less need for technology.

Likewise, as noted earlier, individuals in countries closer to the right-end of the masculinity-femininity dimension (like Chile) are less interested in technology, while those that are short-term oriented (as in the case of the USA) are less patient and may have a greater interest in new technologies "here and now" instead of deferring their adoption (De Mooij, 2011). Finally, Chile scores one of the highest levels of UA (86) among the countries studied (vs the USA at only 46), and this reflects anxiety, a need for security, dependence on experts, and a great need for application of information (Hofstede, 2001). In line with both product life cycle and innovation diffusion theory, to cope with their high level of UA, late adopters tend to imitate others' behavior because they seem to benefit from the experience accumulated by early adopters (Rogers, 1995; Sundqvist *et al.*, 2005). Therefore, the significantly higher score of Chileans on insecurity in the TRI does not appear to be surprising.

From the research perspective, the last-but-not-least insight from this study is that demographic variables were found to be better predictors than attitudes in Chile, and education emerged as the most significant demographic predictor. Considering that education is closely linked to social class, and that, by virtue of the telephone-based fieldwork, the study was limited to households with a telephone landline, the findings are suggestive of a typical contemporary "two-speed society": the higher-educated members of society are more aware of, and have very positive attitudes toward, new technologies, and are likely to be the first adopters of new products and services as soon as their incomes allow them to do so. Therefore, demographic variables may be more relevant as market segmentation bases in the early stages of technology diffusion through society in a developing country. On the other hand, in developed countries such as the USA, attitude toward technology overrides the importance of demographic characteristics and attitudinal variables become the main driver to explain technology adoption. In this study the predictive power of attitudinal variables accounted for more than 10 percent of the behavioral variance in the USA – which is considered a bottom-line threshold for enabling an argument in favor of the attitude-to-behavior path (McGuire, 1985). Therefore, the importance of having a psychographic tool to assess TR instead of demographic variables alone is highlighted when the object of analysis is consumers in a developed country.

One way to summarize the lopsided findings concerning demographics vs attitudes in developing vs developed countries is by saying that (a) both are important; (b) as demographic differences are normalized in a society (e.g. gender equality, more and more people obtaining higher levels of education), attitude will take over as the principal predictor of behavior; (c) but in countries where the preceding condition has not yet matured, demographics can still provide an adequate explanator of behavior. It should be noted that while the condition in (b) has not yet been achieved fully in the USA either, as we noted when discussing demographic differences earlier in this section, it is certainly more advanced in that country than in Chile.

Implications for management

The practical implications of the findings of this study can easily be derived from the research implications discussed above, and can be summarized in a small handful of key points. First and foremost, the availability of a TR index that has been validated cross-nationally and can be applied at the consumer level in various countries can be of great benefit to firms wishing to go beyond the basic question of whether a country has or has not yet passed through some infrastructure threshold (the type of information that industry indices provide).

Second, the findings from the demographic variables are of interest to firms from developed countries not only when they consider doing business in the less developed world, but also when they think about their own home markets: That females, older people, and those with lower education have less positive attitudes toward technology adoption may indicate that they prefer to deal and communicate with companies using interpersonal means rather than newer technologies such as online transactions. For example, depending on the market and the principal target(s) within it, a supplier of mobile phone services may opt to use online contact only for both promotion and selling, or traditional print advertising coupled with brick-and-mortar retailing, or, the "telephone ladies" in villages of Kalampur, Bangladesh, who are entrepreneurs that promote cellular telephony while also selling time in prepaid segments or longer-term programs as well as selling or renting cellular devices (Cateora *et al.*, 2011).

Third, the five dimensions of culture, and the positioning of countries on the corresponding measures, can provide significant insights on where and how to do business in the technology field. For instance, masculine developed countries such as the USA, Australia, Canada, or the UK would normally be the initial target for international companies and governments launching new technological devices oriented to end-users. More broadly, technology suppliers interested in countries whose consumers have low e-readiness levels would be advised to pay more attention to strategic communications with their target markets. For instance, the advertising strategy in a country with a high Insecurity score on the TRI would focus more on reducing uncertainty (e.g. by using endorsements from well-known and trusted local celebrities), while that in an environment of high optimism would emphasize the potential benefits of a new technological device or service.

Fourth, different markets think and behave differently, and this study shows that the differences are not always as neatly aligned as one might assume. This is indicated, among others, by the unexpected results concerning Chilean vs American attitudes on the inhibitor vs contributor dimensions of the TRI. Therefore, firms that rely on technology product and service offerings should be ready to develop and apply appropriate marketing strategies for both the offline and online interfaces to deal with customers from different cultures. In time, consumers from countries that are slower in adopting new technologies may be ready to interact with those interfaces that have been applied earlier in the tech-ready countries. Perhaps more importantly, in less advanced markets that are still in the early stages of technology diffusion demographic variables may be sufficient, as well as perhaps more fruitful, as bases for market segmentation.

Finally, the combination of results from the demographic and attitudinal variables in this study, seen through the lens of inter-country cultural differences, suggest that companies should approach various international markets with their new products at different points in time: Using a TR-based strategy, a firm would prioritize those countries that have higher levels of e-readiness and defer entry to those that will take longer to adopt the new technology. In addition to several other benefits, doing so would help avoid the significant costs that would accrue to the firm and its distributors due to slower market diffusion and therefore lower product turnover rates.

Limitations and further research

As all research, this study has certain limitations which at the same time suggest fruitful avenues for future research. First, the penetration rate of telephone land-lines between the two countries in this study is very dissimilar, and so alternative options for data collection may be considered to further enhance the representativeness and comparability of the samples. Second, in line with many other marketing studies we used national culture, drawing on the Hofstede's (2001) paradigm, as an umbrella lens through which to examine, interpret, and add further insight to the findings. While this should not be a major issue in itself in the present study, since our samples are deemed to be representative of their respective populations, in future research direct measures of culture at the individual respondent level can strengthen the results. Third, while using Hofstede's (2001) culture dimensions is common throughout international business research, other paradigms such as Schwartz's and the Globe Project may also be used to examine country clusters and inter-country cultural distances (Schwartz, 1992; House *et al.*, 2004).

Considering the rapid advance of various technologies around the world, and the need of firms, governments, and users to better understand the relevant processes and issues involved, the range of potential new research in his area is broad indeed. Additional specific avenues for research would include, but are by no means limited to:

(1) Studying other country clusters in regions such as Asia, continental Europe, or the Middle East, to explore how cultural dimensions may be related to the adoption of new technologies; this may be done both via direct application of a TR model such as the one used here, as well as by expanding the model to include additional variables.

(2) Examining technology adoption behavior with regards to newer technology manifestations available to consumers (e.g. "smart" watches or 3D printing); as noted earlier, many TR studies use "global" measures of e-readiness, even though the behaviors involved in, for example, trading stocks online vs buying a mobile phone are entirely different. While our study improved on past research by using specific technologies in testing for behavior, clearly there is much more scope for additional research that would focus specifically on a wider cross-range of technologies.

(3) Extending the investigation into the importance of demographics vs attitudes as potential predictors of technology-related behavior; our study is a first step in the right direction on this score, but, whether adopting our overall approach or other models, future studies can extend the research design by including additional or different demographic and/or attitudinal variables. Two variables that come to mind on the demographics side are social class, which is a multi-faceted construct whose components may exercise differential effects on behavior, and occupation, since the behavior of people-as-consumers may be influenced by their alternative personae of people-as-workers (e.g. two people may be otherwise similar but differ in their exposure to technology by virtue of their profession, such as a software analyst compared to a church pastor). Concerning attitudes and the broader areas of emotion, cognition, and personal factors, research involving psychographics based on the activities, interests, opinions model and/or on the Big Five model of personality (extraversion, neuroticism, openness to experience, conscientiousness, and agreeableness) would seem to be most promising.

(4) Testing the external validity of the generally accepted path of attitude→behavior in different cultural contexts, as a means to, among others, identify discrepancies, and their antecedents and consequences, between people's intent and what they actually do. Such research may be particularly important since companies with an advanced

understanding of "research" tend to go beyond demographics and also study attitudes – but if the next link, from attitude-to-behavior, is not as stable as they might think, knowing the potential causes of discrepancies and how to address them can be paramount for success.

To conclude, the continuing rapid advances in most technology sectors, coupled with the presence of markets with very large population segments that are still far from being technology-ready (e.g. the vast rural populations in India and China), clearly suggests that on-going studies of the type reported here can help to enhance our research understanding of the relevant issues, improve the efficiency and effectiveness of practitioners' global expansion strategies, and also, and perhaps most importantly, enhance and contribute to the welfare of people in both the producing and consuming societies.

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