Are IT Workers from Mars? An Examination of Their National Culture Dimensions

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Acknowledgments

This research is one of the publications from the larger study "The World IT Project" (http://theworlditproject.org).

Abstract

The information technology (IT) workforce is characterized by several unique and contextual factors, such as the technology, the occupation itself, and the human factors. Among the human factors, global information systems (IS) studies have examined the role of national culture to explain many workforce differences and nuances across nations. In such cross-cultural research, IS researchers have primarily utilized the published scores of national culture dimensions as provided by the preeminent social psychologist and culture scholar Geert Hofstede and have applied them to various IT populations within a country. Given that the IT profession is unique in many respects, and there is cultural heterogeneity within a country, our study embarked on independently measuring and verifying the national culture values of IT employees in 37 countries. By using the original Hofstede scales, scores were obtained on five national culture dimensions: power distance, uncertainty avoidance, individualism, masculinity, and long-term orientation. We found significant differences between the national culture scores of IT employees and those available in the literature for the general population. Our results are novel and have profound significance. There are major implications for both past and future studies in cross-cultural research as well as for practitioners who interpret and utilize the findings of such research.

Keywords: IT Workforce; National Culture; IT Occupation; Culture Dimensions; Cross-cultural Research.

Introduction

Studies about the information technology (IT) workforce and its characteristics have played an important role in information systems (IS) research for several decades (Wiesche et al., 2019). One of the salient findings from past research is that the IT workforce is characterized by unique occupational, human, and technological contextual factors (Prommegger et al., 2020). Many authors provide explanations for what makes IT workers different and special based on various theories. For example, Rao and Ramachandran (2011) use group and grid dimension analysis (Trice, 1993) to compare IS personnel and managers, and they find important differences. Guzman et al. (2008) utilize Trice's (1993) occupational framework and, based on a qualitative study, discover distinct features of the IT occupational culture. Brooks et al. (2011) develop a theoretical model of professional identification and empirically test it to examine IT workers' attachment to the IT profession. In short, there is plenty of evidence to suggest that the IT occupation is unique in many ways,

as has been empirically established in several recent studies (Jacks et al., 2018; Cranefield et al., 2022).

An important area within IT workforce research, as well as related domains, is the role of national culture when examining and comparing various IS practices and challenges across the many countries of the world. There are hundreds of articles in various areas of information systems that explicitly consider the role of national culture, e.g., technology development and implementation (Fang et al., 2016), consumer trust (Hallikainen & Laukkanen, 2018), information security (Flores et al., 2014), information privacy (Cockcroft & Rekker, 2016), technology acceptance (Srite & Karahanna, 2006), and e-government (Khalil, 2011). In addition, Leidner and Kayworth (2006) provide a review of culture in IS research that includes national culture as an important element. Thus, it is abundantly clear that national culture continues to be an enduring topic of interest in IS research (Kummer & Schmiedel, 2016).

What is surprising is that in spite of the many differences between the IT workforce, general population, and other occupations, the IT workforce is generally treated akin to the overall population in global studies that compare various IT-related phenomena across countries. When comparing countries, the role of national culture characteristics (also known as dimensions) (Hofstede, 1980; House et al., 2004) is considered an important antecedent or an explanatory variable in discussing any differences or similarities that are discovered. The tacit assumption made is that the IT workforce is similar to the general population in terms of their national culture dimensions. This is a questionable assumption, which, to the best of our knowledge, has never been challenged or tested (until now). If it is proven false, then any findings regarding the IT workforce based on national culture dimensions will be rendered inappropriate in many ways.

There are a multitude of reasons to suspect the validity of the above assumption, primarily because the IT workforce is dissimilar from the workforce in other professions as well as the general population. First, values, beliefs, and behavior of a workgroup can be influenced by different levels of culture. The "virtual onion" model provides an overarching framework for identifying the different layers of culture (Kummer & Schmiedel, 2016; Karahanna et al., 2005). These layers include not only national culture but also organizational culture, occupational culture, ethnicity, and religion. Second, IT employees work in a unique technological environment. Many of the traits of these employees are technological and detail-oriented, not necessarily characteristic of the general population (Jacks et al., 2018). Third, of particular importance is the role of the occupation. According to Schein (2010), the most important driver of behavior derives neither from country nor organization, but from occupation. As per the theory of occupational culture, an occupation has its own distinct culture if it displays seven characteristics: esoteric knowledge and expertise, extreme or unusual demands, consciousness of kind, pervasiveness, favorable self-image, primary reference group, and abundance of cultural forms (Trice, 1993). Based on these criteria, researchers have argued and shown that IT workers have their own unique occupational culture (Kaarst-Brown & Guzman, 2010; Guzman & Stanton, 2009; Guzman et al., 2008). Fourth, given the technological nature of the profession, even the gender distribution is different in the IS workforce, which may affect the overall cultural values. The proportion of women in the IT profession is much lower than that in other professions (Palvia et al., 2021), and women in IT exhibit their own unique characteristics (Serenko & Turel, 2021; Trauth et al., 2006; Gallivan, 2004).

For all of the above reasons, we investigate the national cultural characteristics of IT employees (as opposed to the general population) in different countries of the world. We have strong reasons to believe that IT professionals would display a unique set of cultural scores due to the aforementioned reasons. Thus, our research aims to address the following questions:

1. What are the values of the national culture dimensions of IT employees in different countries of the world?
2. How do the national culture dimensions of IT employees compare with those of the general population?

The key theoretical contribution of our research is that it challenges the concept of a unified culture for all segments of society within a nation and subsequently provides culture values unique to the IT profession. While the unified culture limitation is acknowledged in culture research, no one has attempted to verify it in any systematic manner and particularly in the IS context. IS researchers have largely used the national culture dimension values provided by prior researchers, particularly Hofstede (1980, 1981), as antecedents or moderators in IT phenomena and have made the tenuous assumption that they apply equally to IT employees. Our results demonstrate that this is not so. Thus, past IT studies need to be recalibrated and future studies need to use new culture scores in order to reach proper conclusion and interpretation. As a consequence, the implications for global IT and cross-cultural researchers are enormous. By the same token, for the practitioners and today's managers, the accurate understanding of cultural differences among IT workers across countries is of much significance.

The continuous increase in the number of multinational companies requires management to work frequently with a diverse workforce, including IT personnel, from a number of different cultures and countries. Thus, it becomes incumbent upon today's CIOs and IT managers to understand and appreciate the widespread differences in the values and behaviors of their IT employees and contractors who operate in different corners of the world. This is especially relevant as jobs become more and more decoupled from geography due to COVID and remote work (Serenko, 2023; Jacks, 2021).

Theoretical Background and Literature Review

We review the literature and theoretical concepts in two areas: national culture and the use of national culture in IS research.

Theoretical Concepts in National Culture

While the notion of national culture is commonly acknowledged by most people and theoretical cultural frameworks abound, there is a lack of a commonly accepted definition of culture in the literature. As Kroeber and Kluckhohn (1952) pointed out, there were more than 160 definitions of culture. Culture has both a tacit component (such as assumptions and core values) and an explicit component (such as norms and practices) (Jermier et al., 1991). Hofstede defines culture as "the collective programming of the human mind that distinguishes the members of one human group from those of another" (Hofstede, 1980, p. 24). Trompenaars (1996) defines national culture in terms of polar extremes, such as universalism versus particularism, affective versus neutral relationships, specificity versus diffuseness, achievement versus ascription, and internal versus external control. Other conceptualizations include polychronism versus monochronism (Hall & Hall, 1990), context (Hall, 1976), and time orientation (Trompenaars, 1996).

As a synthesis, a commonly accepted definition of national culture in management as well as IS research is that culture is primarily a manifestation of the core value patterns shared by members of a collective group (Geeling et al., 2019; Karahanna et al., 2005; Straub et al., 2002). Of all the definitions and operationalizations of national culture based on values, the works of Hofstede (1980, 1991, 2001) have received the most attention and traction. Other noteworthy contributions were made in the early 1990s by Shalom Schwartz (1994) and in late 1990s by Robert House and colleagues (2004) in their GLOBE Project. Schwartz (1994) suggested seven cultural domains based on universal human value types. Schwartz (1994) defined human values as "desirable goals, varying in importance, that serve as guiding principles in people's lives" (p. 88). Under the GLOBE Project, culture is defined as the "shared motives, beliefs, identities and interpretations or meanings of significant events that result from common experiences of members of collectives that are transmitted across generations" (House et al., 2004). These works develop dimensional frameworks and theories of national culture, where national culture is represented by a set of dimensions. They also provide instruments to measure and operationalize the dimensions. We describe the three frameworks below.

Hofstede's National Culture Model

While working at IBM, Hofstede was able to access a large survey database about values and related sentiments of people in more than 50 countries around the world (Hofstede, 1980). Upon analysis and reflection, he observed great cultural differences among employees from different countries and regions, even within one company. From his analysis and later works, he developed a dimensional model of national culture (Hofstede, 1980, 1991). Originally, there were four dimensions in Hofstede's framework: power distance, individualism/collectivism, masculinity/femininity, and uncertainty avoidance. Later, Hofstede added a fifth dimension, based on Confucian dynamism, called long-term orientation versus short-term orientation (Hofstede & Hofstede, 2005). These five dimensions have become prevalent in the literature, although a sixth dimension, called indulgence versus restraint, has since been added (Hofstede at al., 2010). Table 1 shows the national culture dimensional framework by Hofstede.

Schwartz's Culture Model

In his studies, Schwartz (1992, 1994) was able to map the world with different cultural values and aspects. While Hofstede derived his framework empirically, Schwartz developed his framework theoretically. Using multidimensional scaling procedures, Schwartz (1994) developed seven culture level value types, which were summarized into three dimensions: embeddedness versus autonomy, hierarchy versus egalitarianism, and mastery versus harmony. The seven culture types are depicted in Table 2.

It is worthy of note that despite their origins, there are remarkable similarities between Schwartz's and Hofstede's dimensions. Embeddedness is important where people live in close groups with embedded social norms; thus, it is akin to the collectivism dimension of Hofstede. The opposite of embeddedness is autonomy. With autonomy, members of a society have their own privileges and can act as they wish. This is similar to the individualism dimension of Hofstede. In the mastery culture,

success is achieved through personal activities and determination, requiring independence, ambition, bravery, and competence, thus being similar to the masculinity dimension of Hofstede. In the harmony culture, people are after self-improvement and consider the whole more than their individual selves; this is similar to the femininity dimension of Hofstede. In hierarchical cultures, people show great deference and respect to power and authority, whereas more egalitarian cultures do not give much value to power distinction. These are both aspects of the power distance dimension of Hofstede.

House et al.'s National Culture GLOBE Model

Launched in 1993 by Robert House, GLOBE is a study of cross-cultural leadership that spans 62 societies (i.e., countries and cultures) (House et al., 2004). The GLOBE study was designed to replicate and expand on Hofstede's (2001) work and to test various hypotheses that had been developed on leadership topics. The researchers measured culture at different levels of industry and organization, with both practices and values existing at various levels. The project produced a set of nine dimensions, and each dimension was measured twice in order to reflect practices and respective values. The GLOBE study developed nine national cultural dimensions encompassing both actual practices (i.e., "as is") and values (i.e., "should be"). These nine dimensions are shown in Table 3. Six of these nine dimensions have their roots in the dimensions identified by Hofstede, i.e., uncertainty avoidance, power distance, institutional collectivism, in-group collectivism, gender egalitarianism, and assertiveness.

Table 1. Dimensions of Hofstede's National Culture Model

Culture Dimension	Explanation
Power Distance	Power distance is the degree of people's acceptance of group inequality as a norm. Employees in high power distance countries accept hierarchical structure; by contrast, management practices in low power distance countries are more democratic.
Individualism/Collectivism	Individualism is the degree of desires or preferences of people in a group or country to act individually as opposed to a group. As its opposite, collectivism is people's desire to act as a member of a group, where in-group ties are strong, and loyalty is expected.
Masculinity/Femininity	Masculinity means assertiveness, performance, material success, and where competition is more preferred and valued in a society. Femininity is the opposite of masculinity; it puts more value on personal relations, requires a modest approach to life, and appreciates the quality of life.
Uncertainty Avoidance	Uncertainty avoidance refers to the degree of people's preference for clear and structured situations and behaviors over unclear and unstructured ones. High uncertainty avoidance would make people take less risk and be rigid, whereas low uncertainty avoidance would make them higher risk takers, adventurous, and entrepreneurial.
Long-Term vs. Short-Term Orientation	People in countries high on long-term orientation are able to adapt easily to changing conditions and show perseverance to achieve final results. In contrast, those low on long-term orientation prefer immediate gains and short-term performance.

Table 2. Schwartz's Culture Types

Culture Type	Explanation
Conservatism (Embeddedness)	A society that emphasizes close-knit harmonious relations, maintains status-quo, and avoids actions that disturb traditional order.
Intellectual Autonomy	A society that recognizes individuals as autonomous entities who are entitled to pursue their own intellectual interests and desires.
Affective Autonomy	A society that recognizes individuals as autonomous entities who are entitled to pursue their own stimulation and hedonistic interests and desires.
Hierarchy	A society that emphasizes the legitimacy of hierarchical roles and resource allocation.
Mastery	A society that emphasizes active mastery of the social environment and an individual's rights to get ahead of other people.
Egalitarian Commitment	A society that emphasizes the transcendence of selfless interests.
Harmony	A society that emphasizes harmony with nature.

Table 3. Dimensions of House et al.'s GLOBE Model

Culture Dimension	Explanation
Power Distance	The degree to which members of an organization or society expect and agree that power should be shared unequally.
Uncertainty Avoidance	The extent to which members of collectives seek orderliness, consistency, structure, formalized procedures, and laws to cover situations in their daily lives.
Institutional Collectivism	The level at which a society values and rewards collective action and resource distribution.
In-Group Collectivism	The level at which a society values cohesiveness, loyalty, and pride in their families and organizations.
Humane Orientation	Ideas, values, and prescriptions for behavior associated with the dimension of culture at which a society values and rewards altruism, caring, fairness, friendliness, generosity, and kindness.
Performance Orientation	The level at which a society values and rewards individual performance and excellence.
Assertiveness	A set of social skills or a style of responding amenable to training or as a facet of personality.
Gender Egalitarianism	The level at which a society values gender equality and lessens role differences based on gender.
Future Orientation	The extent to which a society focuses on the future and believes in planning for developing their future.

While the three models of Hofstede, Schwartz, and GLOBE provide unique insights to researchers into the complexities of national culture, there have been raging debates over the usefulness and superiority of each model and which one to use in cross-cultural research, especially in the choice between Hofstede versus GLOBE (e.g., see Shi & Wang, 2011). There are proponents on each side of the debate, and it is not our intent to engage in this discourse. For the purpose of this study, we selected Hofstede's dimensional framework for the following reasons. First, the three models have significant overlaps, i.e., GLOBE's six dimensions have their origins in the Hofstede model (House et al., 2004), and there are similarities between Schwartz's and Hofstede's models (Schwartz, 1994; Hofstede, 1980, 1991). Second, compared to the other two frameworks, an advantage of Hofstede's framework is its parsimony with five dimensions and a small number of survey items (compared to GLOBE's nine dimensions and many more items, and a lengthy process for the Schwartz model). As Hofstede (2011) points out, for epistemological reasons, the number of meaningful dimensions should be small. Third, Hofstede's framework, despite its critics, has survived the test of longevity and is the most widely used culture framework in management research (Kirkman et al., 2006) and IS research (Leidner & Kayworth, 2006). Furthermore, Hofstede's culture typology has been confirmed and validated by many cross-cultural and social sciences studies (Yoo et al., 2011). The GLOBE and Schwartz models, while less used worldwide than the Hofstede model (Chu et al., 2019; Kirkman et al., 2006; Leidner & Kayworth, 2006), apparently have more rigor and are less criticized, not necessarily because there are no contentious issues, but because researchers have had less time to fully analyze them, and the leading model gets the most scrutiny.

Theoretical Extensions in IS Research Based on National Culture

Over the last three decades, national culture has been a subject of much attention in IS research (Kummer & Schmiedel, 2016). Leidner and Kayworth (2006) conducted a critical review of culture in IS research and identified six themes: culture and IS development; culture and IT adoption and diffusion; culture and IT use and outcomes; culture and IT management and strategy; IT's influence on culture; and IT culture itself. A more recent review was conducted by Chu et al. (2019) on cross-cultural IS research wherein they discovered three streams of transitions: from national-level to individual-level cultural values, from corporate users to end users, and from Western to Eastern countries.

There are reasons to believe that the values and behaviors of IT workers are different from those in other occupations and the general population. According to Schein (2010), occupation is a more important driver of behavior than either country or organization. According to the theory of occupational culture, an occupation has its own distinct culture if it shows evidence of seven characteristics: esoteric knowledge and expertise, extreme or unusual demands, consciousness of kind, pervasiveness, favorable self-image, primary reference group, and abundance of cultural forms (Trice, 1993). Researchers have argued that the IT profession meets these criteria (Kaarst-Brown & Guzman, 2010; Guzman et al., 2008) and even have shown empirically that IT workers have their own unique occupational culture (Guzman & Stanton, 2009), which is different from traditional business management culture (Jacks et al., 2018; Rao & Ramachandran, 2011). In a similar spirit, Prommegger et al. (2020) illustrate how IT personnel are different from others in three aspects: occupational, human, and technological.

Theoretical contributions in the IS literature have not created new models or modified existing dimensional models of national culture, such as the ones described above. The existing dimensional models are well established and grounded. It is our view as well that these models need not be modified as it would not be a wise use of IS researchers' skills and expertise. What IS researchers have accomplished is to globalize IS research by augmenting various theoretical models in different areas of IS research with the addition of national culture variables. Spanning across various themes, hundreds of global/international studies have been conducted that utilize national culture typically as an antecedent, a mediator, or a moderator. The vast majority of the studies have adopted the "core values" conceptualization of culture. This is because values are easier to recognize and measure in quantitative research than other cultural artifacts, such as practices (Chu et al., 2019; Geeling et al., 2016).

Much of the IS research employs Hofstede's (1980, 1991) culture value dimensions described above. According to the reviews conducted by Leidner and Kayworth (2006) and Chu et al. (2019), Hofstede's cultural framework is dominant. Leidner and Kayworth (2006) describe four areas where national culture has a bearing: IS development, IT adoption and diffusion, IT use and outcomes, and IT management and strategy. Chu et al. (2019) classify cross-cultural studies into three categories: business-related, organization-related, and end-user-related. A critical observation is that the end-user and individual-level research employs the national level dimensions at the individual level despite the fact that national culture can be very heterogeneous (Geeling et al., 2016; Gallivan & Srite, 2005), both in sub-populations and at individual levels, thus resulting in an "ecological fallacy" (Straub et al., 2002). In order to avoid this problem, some authors have actually measured the cultural value dimensions of individuals and called them "espoused" national culture values (e.g., Hoehle et al., 2015; Srite & Karahanna, 2006).

The role of national culture is deemed important in much of the global IS literature, and there are many significant results. While the coverage of the entire literature is outside the scope of this paper, we provide a few examples. Technology adoption studies are very popular in IS research and are predominantly rooted in the Technology Acceptance Model (TAM) (Davis, 1989) and the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh et al., 2003). Cross-cultural studies have shown that cultural differences play a crucial role in IT/IS diffusion and adoption in corporate organizations (McCoy et al., 2007; Srite & Karahanna, 2006). The oft-cited study by Srite and Karahanna (2006) used four national culture dimensions of Hofstede as moderators in a modified TAM model; they found that uncertainty avoidance was a significant moderator of the relationship between subjective norms and intended behavior. In another study, Bagchi et al. (2004) found that even after controlling for national economic and social differences, national cultural dimensions significantly predict most IT product adoptions.

There have been several studies on the influence of national culture on IS development. The general conclusion emerging from these studies is that the variation across cultural values may lead to differing perceptions and approaches to IS design and development. For example, Kummer et al. (2012) conducted a literature review and analysis of publications related to the design of what they called "culturally sensitive information systems." They reported findings of the effect of national culture in all phases of system development, i.e., preliminary phase, analysis phase, design phase, realization phase, and implementation phase, both in terms of the values of the developers and the artifacts that were produced. Many of the studies in their literature review relied on Hofstede's culture dimensions. In one study, Zhao (2011) analyzed two sets of indexes for 84 countries: the e-government development index available from the United Nations surveys and Hofstede's culture dimension scores. This study found correlations of differing degrees between e-government development and the five culture dimensions; however, only individualism, power distance, and long-term orientation were significantly correlated with e-government development (Zhao, 2011).

Another important area where culture differences have been examined is end-user behavior. Dinev et al. (2009) examined the cross-cultural differences between South Korea and the United States in user behavior toward protective information technologies. They used cultural moderators and found most of the moderation effects to be significant. In addition, a recent study on IS security behavior by Karjalainen et al. (2020) concluded that different paradigms of learning are more effective in particular countries, which further highlights the importance of national culture.

Yet another prominent area that has employed national culture variables is global IS/IT outsourcing. Various phenomena in outsourcing are affected in a multi-national environment, such as the decision to outsource itself, ongoing management of the outsourcing contract, and the global team performance. As an example, Dibbern et al. (2012) found that systemic effects on outsourcing decisions are stronger in an individualistic culture than in a collectivistic culture. With respect to offshore project success, Rai et al. (2009) argued that cultural

differences both at the organizational level and the team level affect offshore IS project success. In a recent case study by Könning et al. (2021), the researchers considered all of Hofstede's five dimensions and found that power distance was the most influential dimension in the relationship between a German client and its Malaysian and Indian vendors.

The above are just a few of the many examples of the nature of IS research utilizing national culture constructs. Essentially, national culture augments existing research models and theories in various IS domains. A significant limitation of most of these studies is that they employ the existing national culture dimension scores as provided by Hofstede and his partners, and as available on their website (https://www.hofstede-insights.com) (e.g., Bagchi et al., 2004; Dibbern et al., 2012; Dinev et al., 2009; McCoy et al., 2007; Zhao, 2011). How do we know or assume that these scores are valid for IT employees? The simple answer is that we cannot assert with any degree of confidence that these scores apply to the IT employees of the world. It seems to be a huge leap of faith to assume cultural homogeneity within a country and, therefore, in sub-groups within a country, such as IT employees (McCoy, 2003). As discussed in the introduction section of this paper, there are many reasons to question this assumption. We summarize these again. The IT workforce is dissimilar from that of most other functional areas as well as the general population in terms of their values, beliefs, and behavior (Kummer & Schmiedel, 2016; Karahanna et al., 2005). IT employees work in a unique technological and detail-oriented environment (Jacks et al., 2018; Myers & Tan, 2002). IT workers have their own unique occupational culture (Guzman & Stanton, 2009) that is different from traditional business management culture (Jacks et al., 2018; Rao & Ramachandran, 2011). Even the gender distribution is different in the IS profession compared to other professions, which may affect its overall cultural values (Palvia et al., 2021; Trauth et al., 2006; Gallivan, 2004). For these reasons, we embarked on measuring the national culture dimensions of IT workers across the globe using Hofstede's dimensional framework.

Methods

Primary data was collected for this research under the auspices of the World IT Project between 2015 and 2017. The World IT Project is a multi-year, multi-country mega project involving more than 80 researchers from 37 countries (Palvia et al., 2020; Palvia et al., 2018; Palvia et al., 2017). In order to collect data on a global scale, country investigators were carefully selected to lead the data collection effort and assist in navigating local cultural concerns. More than 80 country investigators (CIs) helped collect data for the project from 37 countries, which represented a diverse range of cultures, economic levels, political systems, and religious beliefs in different regions of the world (see Table 4). In some cases, it was necessary for the CIs to translate the survey into the local language with an additional step of back-translation for validation.

It is generally known that immigrant IT workers play an essential role in helping organizations in the United States and other advanced countries in performing their various IT functions (New American Economy, 2020). Over two decades, the immigrants have become an integral part of the IT workforce in many countries and even assimilated into their cultures. As the focus of this study is to examine the entire IT workforce in a country, we did not make any attempt to separate the immigrants from the native-born workers as it would only distort a complete 360-degree view of the IT workforce in any country.

Table 4. Countries Included in the World IT Project

Country	Sample Size	Country	Sample Size	Country	Sample Size
Argentina	309	Iran	357	Portugal	224
Bangladesh	284	Italy	310	Romania	328
Brazil	348	Japan	310	Russia	147
Canada	311	Jordan	253	South Africa	304
China	297	Lithuania	146	South Korea	301
Egypt	175	Macedonia	294	Taiwan	303
Finland	144	Malaysia	283	Thailand	634
France	293	Mexico	333	Turkey	287
Germany	308	New Zealand	516	United Kingdom	96
Ghana	304	Nigeria	93	United States	309
Greece	106	Pakistan	301	Vietnam	298
Hungary	273	Peru	159		
India	350	Poland	300		

While the World IT Project collected data from IT employees on a whole range of issues (Palvia et al., 2017), we describe only the parts that are relevant to this study. Overall, we received more than 10,000 responses from the 37 countries, with most countries achieving or exceeding a target sample size of 300 valid responses. Given the wide disparity in population sizes and development levels among the countries of the world, it was not feasible to achieve true representative sampling, but our goal was to collect a large dataset that would be respected for its breadth of cultures and countries. Fortunately, we were able to achieve a good representation of IT employees by instructing the country teams to collect data from small, medium, and large organizations in a variety of industries.

In this study, we focused on Hofstede's five cultural dimensions: uncertainty avoidance, power distance, masculinity, individualism, and long-term orientation (Hofstede & Hofstede, 2005). In order to remain faithful to Hofstede's seminal work, we used the Values Survey Model 2008 (Hofstede et al., 2008) and included Hofstede's original items to measure the national culture scores of IT employees. We also applied the formulas described in the Values Survey Model to compute the index scores for the five dimensions for all 37 countries. Details of these formulas can be found in the Values Survey Model (Hofstede et al., 2008). All calculations were done independently by two authors of this paper to avoid accidental mistakes and cross-checked afterwards. No discrepancies between their results were found.

Analysis and Results

Demographics

Table 5 shows the demographic and basic professional characteristics of the responding IT employees in the 37 countries. The respondents represent a broad variety of backgrounds. The sample demographics are broadly representative of the IT occupation in general, with the typical profile being a young (under 40) male with at least a college degree and about ten years of experience working in an IT department. The most common IT roles include a programmer, an analyst, a project manager, and a system administrator. The field is dominated by men; the male/female ratio is about 3:1.

Table 5. Descriptive Statistics (All 37 Countries)

Characteristics	n*	%	Characteristics	n*	%
Age			Gender		
18–20	316	3.0	Men	7,509	72.8
21–29	3,371	32.5	Women	2,801	27.2
30–39	3,344	32.2			
40–49	2,106	20.3	Education level		
50–59	1,013	9.8	High school or less	793	7.6
60+	227	2.2	Associate degree	1,342	12.9
Type of IT role			Bachelor's degree	4,998	48.2
Programming	1,857	18.0	Master's degree	2,988	28.8
Analysis & Design	1,009	9.8	Ph.D.	250	2.4
Maintenance	503	4.9			
Operations	662	6.4			
Testing	356	3.5			
Database Administration	383	3.7			
Systems Administrator	703	6.8	Years of work experience		
Telecommunications	368	3.6	0–4	2,392	23.1
Management & Strategy	795	7.7	5–9	2,487	24.0
Consulting	473	4.6	10–19	2,843	27.5
Help Desk	350	3.4	20–29	1,726	16.7
Project Management	741	7.2	30+	907	8.8
Financial	408	4.0	Years of IT experience		
Application Support	307	3.0	0–4	2,975	28.7
			5–9	2,717	26.2
			10–19	2,789	26.9
			20–29	1,398	13.5
			30+	500	4.8

*The totals for each attribute may not match the total number of responses due to missing values.

Power Distance

Power distance is the degree of inequality among people, from relatively equal (small power distance) to extremely unequal (large power distance). Using the formula in the Value Surveys Model, these values were computed for all 37 countries. As per Hofstede, these scores are relative or interval scores (i.e., there is no inherent zero) providing only relative comparisons and can be scaled up or down by adding or subtracting a constant number (Hofstede, 2011). We added 50 points to the scores in order for them to have a positive range and for the highest number to be close to 100. The second and third columns of Table 6 show our results. For comparison purposes, the scores and ranks reported by Hofstede (https://www.hofstede-insights.com) are shown in columns four and five.

Table 6. Power Distance Scores and Ranks

COUNTRY	As per the World IT Project		As reported by Hofstede	
	Score	Rank	Score	Rank**
Argentina	69.30	17	49.00	28.5
Bangladesh	63.01	27	80.00	7.5
Brazil	72.21	16	69.00	14.0
Canada	76.67	13	39.00	33.0
China	80.32	8	80.00	7.5
Egypt	106.80	1	70.00	12.0
Finland	73.23	14	33.00	36.0
France	78.48	10	68.00	15.5
Germany	63.75	26	35.00	34.5
Ghana	56.60	31	80.00	7.5
Greece	83.05	7	60.00	21.5
Hungary	64.00	24	46.00	30.0
India	54.50	32	77.00	10.0
Iran	31.25	37	58.00	23.5
Italy	69.20	18	50.00	27.0
Japan	46.80	35	54.00	26.0
Jordan	101.45	2	70.00	12.0
Lithuania	79.40	9	42.00	31.0
Macedonia	59.50	30	90.00	3.5
Malaysia	78.10	11	100.00	1.0
Mexico	43.25	36	81.00	5.0
New Zealand	66.20	22	22.00	37.0
Nigeria	52.80	34	80.00	7.5
Pakistan	60.70	29	55.00	25.0
Peru	64.05	23	64.00	18.5
Poland	68.90	19	68.00	15.5
Portugal	89.30	4	63.00	20.0
Romania	54.15	33	90.00	3.5
Russia	62.45	28	93.00	2.0
South Africa	72.45	15	49.00	28.5
South Korea	66.95	21	60.00	21.5
Thailand	84.30	5	64.00	18.5
Taiwan	96.10	3	58.00	23.5
Turkey	63.80	25	66.00	17.0
United Kingdom	67.65	20	35.00	34.5
United States	77.10	12	40.00	32.0
Vietnam	83.70	6	70.00	12.0
Std. Deviation	15.47		18.55	

**When scores are equal, ranks are split between the countries.

Based on the World IT Project (or simply WIT) data, the five countries with the highest power distance, in order, are Egypt, Jordan, Taiwan, Portugal, and Thailand. The five countries lowest in power distance are Iran, Mexico, Japan, Nigeria, and Romania. Many of the western countries, contrary to expectation based on national culture values, actually place somewhere in the middle. For example, the United States is in 12th place, and the United Kingdom is in 20th place.

It is instructive to examine the WIT scores in comparison with Hofstede's scores. A visual examination suggests wide disparities between the two sets of scores. As both sets of scores are interval scores with no inherent zeroes, it is not possible to do a direct comparison or conduct a paired *t*-test. Instead, ranks are provided to be able to compare them on a relative basis. Twenty-four of the 37 countries are more than ten ranks apart in the WIT and Hofstede's lists, suggesting a wide disparity. The lack of correlation is confirmed by Pearson correlation (r = -0.098, p = 0.565) and Spearman rank-order correlation (ρ = -0.172, p = 0.310).

Uncertainty Avoidance

Uncertainty avoidance is the extent to which a society feels threatened by uncertain situations and avoids these situations. Note that higher uncertainty avoidance implies less risk-taking propensity and vice versa. We used the formula provided in the Value Surveys Model to compute these scores. As to the value of a constant, we chose to add 100 so as to avoid negative scores and have a range between 0 and 100. Table 7 shows our scores and ranks as well as those of Hofstede.

Table 7. Uncertainty Avoidance Scores and Ranks

COUNTRY	As per the World IT Project		As reported by Hofstede	
	Score	Rank	Score	Rank
Argentina	43.88	22	86.00	9.5
Bangladesh	79.64	10	60.00	25.0
Brazil	36.68	29	76.00	16.0
Canada	41.29	24	48.00	31.0
China	64.06	15	30.00	36.5
Egypt	85.64	7	80.00	15.0
Finland	7.08	37	59.00	26.5
France	58.74	18	86.00	9.5
Germany	33.60	32	65.00	21.5
Ghana	37.10	28	65.00	21.5
Greece	48.70	21	100.00	1.0
Hungary	35.80	30	82.00	13.5
India	42.25	23	40.00	33.0
Iran	101.90	1	59.00	26.5
Italy	75.65	13	75.00	17.0
Japan	87.95	5	92.00	5.0
Jordan	62.70	16	65.00	21.5
Lithuania	66.85	14	65.00	21.5
Macedonia	38.45	27	87.00	7.5
Malaysia	79.70	9	36.00	34.0
Mexico	59.80	17	82.00	13.5
New Zealand	15.25	36	49.00	29.5
Nigeria	40.40	25	55.00	28.0
Pakistan	82.15	8	70.00	18.0
Peru	23.85	35	87.00	7.5
Poland	55.05	20	93.00	4.0
Portugal	38.80	26	99.00	2.0
Romania	57.15	19	90.00	6.0
Russia	92.70	4	95.00	29.5
South Africa	34.55	31	49.00	29.0
South Korea	98.45	2	85.00	11.5

COUNTRY	As per the World IT Project		As reported by Hofstede	
	Score	Rank	Score	Rank
Thailand	95.10	3	64.00	24.0
Taiwan	85.70	6	69.00	19.0
Turkey	76.31	12	85.00	11.5
United Kingdom	26.70	33	35.00	35.0
United States	24.10	34	46.00	32.0
Vietnam	79.40	11	30.00	36.5
Std. Deviation	25.52		20.29	

The five countries highest in uncertainty avoidance (i.e., low risk-takers) are Iran, South Korea, Thailand, Russia, and Japan. The five lowest in uncertainty avoidance (i.e., high risk-takers) are Finland, New Zealand, Peru, the United States, and the United Kingdom. Compared with Hofstede's scores, there is more commonality in countries that are high risk-takers than low risk-takers. At the same time, there is wide disparity when looking at all countries. Of the 37 countries, 21 countries are more than ten ranks apart in the WIT and Hofstede's lists. The lack of correlation is confirmed by Pearson correlation (r = 0.142, p = 0.402) and Spearman rank-order correlation (ρ = 0.137, p = 0.419).

Individualism/Collectivism

Individualism/collectivism contrasts a society in which the individual takes care of his/her own with a society in which groups take care of each other. Higher scores are characteristic of individualistic societies, and lower scores represent collectivistic societies. We used the formula provided in the Value Surveys Model to compute these scores and added 50 as the constant term. Table 8 shows the results for both WIT and Hofstede.

From the WIT results, the five countries highest in the individualistic dimension are Germany, Finland, New Zealand, the United Kingdom, and Portugal. The United States, which is often touted as a highly individualistic country, is also high and comes at number ten. The five countries low in individualism and high on collectivism are Mexico, Bangladesh, Jordan, Turkey, and Iran. Overall, there is less disparity between the WIT scores and Hofstede scores; only 12 countries, or one-third of the 37 countries, are more than ten ranks apart in the two studies. The level of similarity is corroborated by the statistical significance of both Pearson correlation (r = 0.520, p = 0.001) and Spearman rank-order correlation (ρ = 0.515, p = 0.001).

Table 8. Individualism/Collectivism Scores and Ranks

COUNTRY	As per the World IT Project		As reported by Hofstede	
	Score	Rank	Score	Rank
Argentina	106.25	6	46.00	14.5
Bangladesh	32.10	36	20.00	30.5
Brazil	105.32	7	38.00	18.0
Canada	76.11	16	80.00	3.5
China	62.73	24	20.00	30.5
Egypt	51.98	31	25.00	27.0
Finland	116.13	2	63.00	10.0
France	72.45	18	71.00	7.0
Germany	119.30	1	67.00	8.0
Ghana	51.40	32	15.00	36.0
Greece	85.35	12	35.00	20.0
Hungary	79.05	14	80.00	3.5
India	58.40	27	48.00	13.0
Iran	44.05	33	41.00	16.0
Italy	78.00	15	76.00	6.0
Japan	62.60	25	46.00	14.5
Jordan	34.60	35	30.00	22.5
Lithuania	97.95	9	60.00	11.5

COUNTRY	As per the World IT Project		As reported by Hofstede	
	Score	Rank	Score	Rank
Macedonia	102.50	8	22.00	28.0
Malaysia	61.20	26	26.00	26.0
Mexico	31.45	37	30.00	22.5
New Zealand	115.80	3	79.00	5.0
Nigeria	63.30	23	30.00	22.5
Pakistan	53.50	29	14.00	37.0
Peru	74.85	17	16.00	35.0
Poland	57.00	28	60.00	11.5
Portugal	108.10	5	27.00	25.0
Romania	66.80	19	30.00	22.5
Russia	87.10	11	39.00	17.0
South Africa	84.65	13	65.00	9.0
South Korea	66.10	20	18.00	33.0
Thailand	64.35	21	20.00	30.5
Taiwan	52.80	30	17.00	34.0
Turkey	40.73	34	37.00	19.0
United Kingdom	113.35	4	89.00	2.0
United States	92.70	10	91.00	1.0
Vietnam	63.30	22	20.00	30.5
Std. Deviation	25.21		23.75	

Masculinity/Femininity

Masculinity/femininity reflects whether the dominant values are associated with collection of money and things (masculine) versus values associated with caring for others and quality of life (feminine). Higher scores represent masculine societies, while lower scores correspond to feminine societies. We used the formula provided in the Value Surveys Model to compute these scores and added 50 as the constant term. Table 9 shows the results for both WIT and Hofstede.

The five countries highest in masculinity scores are Portugal, Poland, Romania, Egypt, and Iran. The five countries lowest in masculinity (or high in femininity) are Finland, Japan, Mexico, Canada, and Germany. Italy and the United States follow these top five feminine countries. Thus, our findings directly contradict Hofstede's results. In fact, 22 countries are more than ten ranks apart in the WIT and the Hofstede results. The statistical analysis shows that there is actually a negative and marginally significant correlation between the two sets of scores (Pearson correlation: r = -0.273, p = 0.102 and Spearman rank-order correlation: ρ = -0.269, p = 0.107). These are confounding results and difficult to explain. We will offer our arguments later in the Discussion section.

Long-Term Orientation

Long-term orientation focuses on the future, as opposed to short-term orientation, where the focus is on the present or past. Higher scores represent societies with long-term orientation, while lower scores characterize societies with short-term orientation. We used the formula provided in the Value Surveys Model to compute these scores and added 50 as the constant term. Table 10 shows the results for both WIT and Hofstede.

The countries with the highest long-term orientation scores in the WIT study are Russia, India, Japan, Germany, and Portugal. The countries with the lowest scores and the most short-term orientation are Turkey, Nigeria, Egypt, Peru, and the United States. There seems to be a fair degree of similarity between the WIT and Hofstede studies. Only 14 of the 37 countries are more than ten ranks apart in the two studies. Statistical analysis also shows a positive significant correlation between the two studies, as corroborated by both Pearson correlation (r = 0.346, p = 0.036) and Spearman correlation (ρ = 0.293, p = 0.078).

Table 9. Masculinity/Femininity Scores and Ranks

COUNTRY	As per the World IT Project		As reported by Hofstede	
	Score	Rank	Score	Rank
Argentina	79.69	6	56.00	14.5
Bangladesh	72.43	12	55.00	16.0
Brazil	57.44	25	49.00	20.0
Canada	41.22	34	52.00	17.0
China	76.87	8	66.00	6.0
Egypt	84.40	4	45.00	23.0
Finland	26.12	37	26.00	36.0
France	74.25	10	43.00	26.5
Germany	41.25	33	66.00	6.0
Ghana	68.90	15	40.00	30.5
Greece	71.70	14	57.00	13.0
Hungary	58.75	23	88.00	2.0
India	61.55	19	56.00	14.5
Iran	80.80	5	43.00	26.5
Italy	42.30	32	70.00	3.0
Japan	34.25	36	95.00	1.0
Jordan	76.25	9	45.00	23.0
Lithuania	61.20	21	19.00	37.0
Macedonia	73.10	11	45.00	23.0
Malaysia	58.75	22	50.00	18.5
Mexico	36.00	35	69.00	4.0
New Zealand	46.50	30	58.00	12.0
Nigeria	72.05	13	60.00	11.0
Pakistan	67.15	18	50.00	18.5
Peru	76.95	7	42.00	28.5
Poland	88.15	2	64.00	8.0
Portugal	91.30	1	31.00	35.0
Romania	86.40	3	42.00	28.5
Russia	68.55	16	36.00	33.0
South Africa	61.55	19	63.00	9.0
South Korea	55.25	27	39.00	32.0
Thailand	48.95	29	34.00	34.0
Taiwan	58.40	24	45.00	23.0
Turkey	53.90	28	45.00	23.0
United Kingdom	56.30	26	66.00	6.0
United States	46.15	31	62.00	10.0
Vietnam	68.55	16	40.00	30.5
Std. Deviation	16.26		15.58	

Table 10. Long-Term Orientation Scores and Ranks

COUNTRY	As per the World IT Project		As reported by Hofstede	
	Score	Rank	Score	Rank
Argentina	80.98	6	20.00	32.0
Bangladesh	68.68	13	47.00	17.0
Brazil	65.53	19	44.00	20.0
Canada	50.58	31	36.00	24.0
China	56.09	29	87.00	4.0
Egypt	43.83	35	7.00	36.0
Finland	58.25	26	38.00	22.5
France	58.18	27	63.00	8.0
Germany	88.20	4	83.00	5.0
Ghana	66.05	17	4.00	37.0
Greece	62.90	21	45.00	19.0
Hungary	79.00	7	58.00	11.0
India	92.20	1	51.00	14.5
Iran	59.20	24	14.00	34.0
Italy	49.65	32	61.00	10.0
Japan	88.35	3	88.00	3.0
Jordan	75.90	9	16.00	33.0
Lithuania	76.35	8	82.00	6.0
Macedonia	66.70	16	62.00	9.0
Malaysia	75.85	10	41.00	21.0
Mexico	60.65	23	24.00	31.0
New Zealand	59.05	25	33.00	26.0
Nigeria	39.55	36	13.00	35.0
Pakistan	67.75	15	50.00	16.0
Peru	45.60	34	25.00	30.0
Poland	56.20	28	38.00	22.5
Portugal	86.65	5	28.00	28.0
Romania	65.65	18	52.00	13.0
Russia	92.20	1	81.00	7.0
South Africa	64.90	20	34.00	25.0
South Korea	54.55	30	100.00	1.0
Thailand	68.45	14	32.00	27.0
Taiwan	75.60	11	93.00	2.0
Turkey	38.80	37	46.00	18.0
United Kingdom	68.75	12	51.00	14.5
United States	48.15	33	26.00	29.0
Vietnam	60.80	22	57.00	12.0
Std. Deviation	14.30		25.26	

Discussion

Our results are contrary to the commonly held yet implicit assumption that national culture is homogeneous throughout a country and therefore the national culture scores can be applied to IT workers as well—as has been done by many researchers in the past. However, this study's findings support our fundamental argument that it is somewhat of a stretch to assume that national culture dimensions of all segments of a society within each country are effectively the same. We specifically examined IT employees in 37 countries for their national culture dimensions and found important differences from the commonly used and widely available national culture dimensions of Hofstede (2005, 2010). We did also find some similarities, as discussed below.

On all five cultural dimensions, the scores of IT employees in almost every country are different from those of Hofstede. An exact match was never expected, but it is the magnitude of differences that is astonishing. The scores from the two sources (our WIT study and Hofstede's study) could not be compared

directly due to the "interval nature of the scores and no defined zero," yet the comparison of the ranks reveals stark differences. On the power distance dimension (Table 6), 24 of the 37 countries are more than ten ranks apart in the WIT and Hofstede's lists. As an illustration, consider the United States and the BRIC countries (i.e., Brazil, Russia, India, and China), as they account for about half the world's population and drive much of the global economic growth (Bird & Cahoy, 2006). Hofstede ranked the United States, Brazil, Russia, India, and China as numbers 32, 14, 2, 10, and 7, respectively (a lower number means higher power distance, and a higher number means lower power distance). In contrast, the WIT study, based on IT employees, ranks the United States, Brazil, Russia, India, and China as numbers 12, 16, 28, 32, and 8, respectively. These ranks are quite different, especially for the United States, Russia, and India. It is interesting to note, however, that the variation in the power distance scores in the WIT study was less than that in the Hofstede studies (standard deviation of 15.47 versus 18.55), suggesting that the IT employees in the 37 countries were closer in relation to power distance.

The story repeats itself with the uncertainty avoidance dimension (Table 7). Of the 37 countries, 21 are more than ten ranks apart on the uncertainty avoidance dimension in the WIT and Hofstede's lists. On the United States and BRIC countries, Hofstede ranked the United States, Brazil, Russia, India, and China as numbers 32, 16, 29, 33, and 36, respectively (a higher rank represents lower uncertainty avoidance or higher risk propensity). In contrast, the WIT study based on IT employees ranks the United States, Brazil, Russia, India, and China as numbers 34, 29, 4, 23, and 15, respectively. Again, there are wide differences.

Hofstede (1994) contended that the two dimensions of power distance and uncertainty avoidance are particularly important in the organizational context. Power distance determines who decides what, and uncertainty avoidance dictates what problems to navigate and the need for rules and structures. Yet, we cannot assume that the values of these dimensions provided by the seminal Hofstede studies apply to IT employees. If we equate the two, it will lead to erroneous results in past and future studies; consequently, any organizational initiatives based on these results would also be fraught with risk.

In the individualism/collectivism dimension, there is actually less disparity (Table 8). Only 12 countries, or one-third of the countries, are more than ten ranks apart. Statistical tests show a significant positive correlation between the two. On the United States and BRIC countries, Hofstede ranked the United States, Brazil, Russia, India, and China as numbers 1, 18, 17, 13, and 30, respectively (a lower number represents higher individualism, and a higher number represents higher collectivism). By contrast, the WIT study based on IT employees ranks the United States, Brazil, Russia, India, and China as numbers 10, 7, 11, 27, and 24, respectively. Note that while there is strong positive correlation, the ranks are not the same. But at least, these results tell us that on the individualism/collectivism dimension, the IT employees are not very different from their fellow countrymen.

The masculinity/femininity dimension is the most intriguing (Table 9). Our WIT results are in direct contradiction to Hofstede's results, and 22 countries are more than ten ranks apart. In fact, the two sets of ranks were in opposite directions with a negative and marginally significant correlation (p = 0.10). On the United States and BRIC countries, Hofstede ranked the United States, Brazil, Russia, India, and China as numbers 10, 20, 33, 14, and 6, respectively (a lower number represents higher masculinity, and a higher number represents higher femininity). In contrast, the WIT study based on IT employees ranks the United States, Brazil, Russia, India, and China as numbers 31, 25, 16, 19, and 8, respectively. We offer two explanations for the wide disparity between Hofstede's and WIT's results. First, our main argument is that the IT employees are different from the general population as was elaborated in preceding sections, and second, people's values may have changed with the passage of time, due to many social movements related to feminism and emancipation (see Mohanty & Samantaray, 2017; O'Neill, 2013). A more nuanced explanation is that masculinity and femininity may not be mutually exclusive; an individual can exhibit both characteristics at the same time. In fact, we conjecture that, presently, masculinity and femininity may be two separate dimensions and should be measured independently. This idea is supported by previous researchers who observe that Hofstede's masculinity dimension lacks face validity and is confounded by the presence of multiple constructs (House et al., 2004; Shi & Wang, 2011). Scholars have also observed that Hofstede's studies did not measure feminine scores directly, but instead a lack of masculinity was considered feminine (Parboteeah et al., 2005).

On the long-term orientation dimension, there was a fair degree of similarity between the WIT and Hofstede's studies (Table 10): only 14 of the 37 countries were more than ten ranks apart. Statistical analysis also shows a positive correlation between the two studies. Thus, on the long-term orientation dimension, the IT employees are not very different from their fellow countrymen. For the United States

and BRIC countries, Hofstede ranked the United States, Brazil, Russia, India, and China as numbers 29, 20, 7, 14, and 4, respectively (a lower number represents long-term orientation, and a higher number represents short-term orientation). In contrast, the WIT study based on IT employees ranks the United States, Brazil, Russia, India, and China as numbers 33, 19, 1, 1, and 29, respectively. The reversal of scores only seems to be for India and China.

In summary, we found no significant correlation between WIT and Hofstede results for the power distance and uncertainty avoidance dimensions, positive significant correlation for the individualism/collectivism and long-term/short-term dimensions, and a negative marginally significant correlation for the masculinity/femininity dimension. These results are both fascinating and confounding. There are many contradictions. The all-important question is: how do we explain them?

We offer several explanations for these differences and urge the research community to corroborate our results as well as find scientific explanations. There are at least four explanations.

The first and the primary explanation is the nature of the IT occupation itself. IT employees constantly work with technology—both hardware and software. Thus, many of the attributes of these employees are technological and detail-oriented, not necessarily characteristic of the general population (Jacks et al., 2018). While we were not able to find prior studies that directly measured the national culture values for the IT occupation, there was at least one study (Wu, 2006) that measured the five national culture dimensions in the United States and Taiwan for employees in higher education and found differences from Hofstede's work—thus providing support for differences due to the occupation. An overarching framework used for identifying the different layers of culture is the "virtual onion" model (Kummer & Schmiedel, 2016; Karahanna et al., 2005). Cultural groups can be examined at various layers of the onion: national, organizational, and occupational. These levels collectively affect an individual's values and behavior, and we argue that they are intertwined (Trice,1993) as they have overlapping values. An occupation has its own distinct culture if it displays evidence of seven characteristics, as were outlined earlier. The IT occupation displays all seven characteristics, has its own recognizable culture, and is unique in many ways (Kaarst-Brown & Guzman, 2010; Guzman et al., 2008). Recently, Jacks et al. (2018) identified six dimensions of IT occupational culture: autonomy, structure, precision, innovation, reverence for knowledge, and enjoyment. These dimensions are particularly important to IT employees, and they generally score higher on these dimensions than other organizational members (Jacks et al., 2018). Some of these dimensions have a bearing on Hofstede's national culture dimensions, e.g., autonomy and power distance may be related, and structure and uncertainty avoidance may be related. In summary, members of the IT occupational culture may display different national characteristics than the general population.

The second explanation is due to the differences in labor markets, workforce conditions, and regulations across countries, which may affect the IT workforce and their values and behaviors. National differences may arise due to national labor laws (e.g., employment protection, unions) (Stone, 2006), terms of employment (e.g., empowerment, workload, schedule flexibility), type of employment (e.g., short-term contracts, outsourcing, fixed employment), and type of IT work (e.g., help desk, programmer, analyst, software engineer, project manager). According to the World Bank, significant structural issues exist in labor markets across the world, especially in terms of inequality. In spite of continuing globalization, inequalities persist in access to work and its quality and include segmentation of workers by their form of employment, gender, age, or location (e.g., urban versus rural areas) (World Bank, 2021). These are worthy concerns, and their effects on the IT workforce need to be explored in future endeavors. As an example, the participation of women in the IT workforce is much lower than in most other professions; in our study, women represented only 27 percent of the global IT workforce, and the proportion was even below 15 percent in some countries. As a specific country example, in recent years, Brazil has faced unprecedented political, economic, and social crises with substantial impact on the labor market, including the IT sector (Bellini et al., 2019), although it may have impacted IT workers less than other Brazilians. As another example, the Japanese workplace is unique, characterized by *shushin koyosei*, which can be translated as "lifetime commitment" or "lifetime employment" (Abegglen, 2006). Furthermore, collectivism is an important attribute of the Japanese workplace (Huff & Kelley, 2003), where loyalty towards the company is highly regarded, so much so that human resource management even launches months-long training programs for new employees so that they can build social networks at the workplace. At the same time, recent evidence suggests that Japanese IT professionals are affected by individualistic factors, which undermines the very principles of long-term employment and makes them different from their non-IT counterparts (Serenko et al., 2022).

The third explanation is more controversial, being critical of Hofstede's research method and his reported scores. In spite of his method's popularity, Hofstede has his own critics and detractors (e.g., Ailon, 2008; Baskerville, 2003; Jones, 2007; McSweeney, 2002). Criticisms include the following: the model and the dimension scores were initially developed based on a single organization (i.e., IBM Corporation) (Shore & Venkatachalam, 1996; Jones, 2007; McSweeney, 2002); an assumption of cultural homogeneity within a nation (Jones, 2007; McSweeney, 2002); confounding organizational culture with national culture (McSweeney, 2002); statistical integrity and construct validity (Blodgett et al., 2008; Jones, 2007); and outdated data (Jones, 2007). Although many of Hofstede's scores have been updated over time, concerns still stem from the over-reliance on data from only one company, IBM Corporation; thus, the national culture scores may be confounded with the company's organizational culture. Among other things, IBM was known for its selective recruitment mainly from the middle class (McSweeney, 2002), and the survey responses came largely from marketing and sales employees. In short, while the critics do not necessarily question the culture dimensions per se, they raise doubts about the dimension scores as representative of each nation's culture.

The fourth explanation is the implicit assumption of the stability of culture over time and the criticism that Hofstede failed to capture the malleability of culture over time (Kirkman et al., 2006). The world of today is far different from that of the 1970s and the 1980s, with unprecedented economic, technological, and global changes, as well as demographic changes. To assume equivalence in national values over time may seem like a stretch, yet arguments can be found both favoring and opposing it (Jones, 2007; Beugelsdijk et al., 2015; Tarabar, 2019). The convergence hypothesis in economics suggests that countries would converge in terms of per capita income over time. Furthermore, technological convergence, increased communication, and growing trade and travel between countries have the potential to bring them together in many respects (Craig et al., 1992). There is some support for these claims. A study by Beugelsdijk et al. (2015) provides some interesting results. Their findings indicate that, on average, contemporary societies score higher on individualism but lower on power distance than past societies. However, these changes are absolute rather than relative, meaning that countries' scores relative to the scores of other countries have not changed much. A recent study by Tarabar (2019) investigates whether economic changes since 1970 have caused shifts in the Hofstede dimension scores. He finds that an increase in GDP per worker is associated with an increase in individualism scores in both young and old cohorts and a reduction in power distance scores only in young cohorts. In summary, with the passage of time, there may have been major shifts in cultural values of countries, especially of the IT workers, due to a variety of interacting factors and the fact that IT itself has undergone major changes over the years.

Implications

Given that it is the first national culture study aimed at IT workers, our results have strong implications for both research and practice. Most IS researchers have used previously published national culture scores provided by Hofstede and other scholars (e.g., House et al., 2004). If these scores are applied at an individual level, they result in an "ecological fallacy" (Straub et al., 2002). What our study points out is that the application of the country scores even at a group level higher than the individual but smaller than the country is fraught with risk and may result in misleading conclusions. Based on our data, we show that the IT workers exhibit different national culture characteristics, and assuming equivalence to the entire country's population would be extraordinary and an untenable leap of faith. In future studies, we therefore recommend that IS investigators use one of the following strategies: (1) apply the country scores by Hofstede (1980) or House et al. (2004) only if they conduct a country-level study using the general population (e.g., the end users); (2) use the scores provided by this study (and similar studies in the future) if they conduct group-level studies where groups represent IT employees or other occupations; or (3) measure the "espoused" national culture dimensions in their own research if they conduct individual-level studies. We have provided IS national culture scores for not all but 37 countries (albeit they represent a broad cross-section), so in terms of future research, we ask investigators to develop these scores for more countries. Another important step would be to corroborate our findings with more samples in each country.

For practitioners, we ask that they exercise a healthy level of skepticism when looking at culture-based recommendations in past, current, and future studies. Of particular importance is the type of data that a particular study relies on for its culture-based observations. Practitioners need to make sure that there is congruence between a study's target population and the type of culture scores used by this study. It may seem like a little more effort on their part, but it is a worthwhile investment in order to avoid costly mistakes. In order to aid in this effort, we would expect that the authors of any culture-based study will provide greater clarity in their use of culture scores.

Limitations

We acknowledge several limitations to our work. First, for the skeptics, there is a distant possibility that our results are flawed. We ascribe minimum probability to this reasoning as we followed Hofstede's procedures precisely using identical survey items and the same formulas for computing the dimension scores. Thus, our method has the same level of validity as Hofstede's own method. The second limitation is associated with surveys in general, e.g., sample size and representativeness. In most countries, the sample size exceeded the established threshold of 300, which is adequate and comparable to past studies. While no explicit attempts were made to randomize the sample to achieve representativeness, we did our best in terms of finding respondents at various levels, in organizations of various sizes, and in different industries. Third, as the instrument was developed in English, its implementation in some countries posed some challenges. The instrument had to be translated into 12 languages. In order to maintain semantic equivalence, we took several steps. The instrument was translated into the local language and then back translated to English by a different individual. The core team maintained regular communication with the local investigators to resolve any discrepancies. We also allowed a limited number of changes to accommodate local meaning and expressions. There were several more challenges in the World IT Project, as documented in Palvia et al. (2017).

Conclusion

In this study, we investigated the national cultural characteristics of IT employees in 37 countries using Hofstede's (1980) five cultural dimensions. Our findings indicate that the national culture scores of IT employees are different from those of the country scores available in the literature and are widely used by IS researchers to date. In fact, we found no significant correlation between the results of IT employees and Hofstede's results for the power distance and uncertainty avoidance dimensions, positive correlation for the individualism/collectivism and long-term/short-term dimensions, and a negative correlation for the masculinity/femininity dimension. These findings are novel and revealing; as such, they would seriously impact current practices in research and have profound implications. Our message is simple yet compelling. To the researchers, we say: exercise caution in deciding which national culture scores to use in your studies; and to the practitioners, we say: exercise due diligence in the way you interpret results from national culture studies.

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