Does culture frame technological innovativeness? A study of millennials in triad countries

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Abstract: Personal innovativeness is an important value-based human behaviour that is responsible for the ability to participate in the domain of technological innovations and to enhance economic growth. Our study investigates the technological innovativeness of millennials in a cross-cultural setting at the individual level. The research design includes technological involvement and knowledge and an individual-level measurement of five well-known cultural values as antecedents of technological innovativeness. Findings from structural equation modelling of 1527 millennials from six triad countries confirm that technological involvement and knowledge positively affect personal innovativeness in the technology domain. Above all, from a theoretical perspective on culture, individual measures of power distance, uncertainty avoidance and long-term orientation especially have a significant negative effect on technological innovativeness. Hence, in an international business context, individual cultural values play an important role for companies seeking, for example, an overseas location for their research and development (R&D) facilities or skilled and innovative personnel to persist

in attaining and sustaining international competition. From a theoretical perspective on international business, this study also sheds light on the individual-level measurement of cultural values, taking the individual as the unit of analysis.

Keywords: technological innovativeness; individual cultural values; value measurement; millennials; cross-cultural management; triad countries.

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1 Introduction

It has long been recognised that innovation capability plays an important role in international competitiveness, entrepreneurship, company survival and economic development (e.g. Fagerberg and Srholec, 2008; Aagaard and Andersen, 2014; Veenendaal et al., 2014; Hyytinen et al., 2015; Calabrò et al., 2016; Beliaeva et al., 2017). Porter and Linde (1995) argue that there is a paradigm of international competitiveness that is dynamic in nature and based on innovation. Tellis et al. (2009a) claim that consumer innovativeness, seen as the propensity to adopt new products, may be an important factor that drives a country's economic development as well as its relative position in global competition. In addition, Cantwell (2006) contends that

national policy should follow the pursuit of competitiveness through innovation as a laudable objective, and Fagerberg and Srholec (2008) call for the development of an innovation system as one of four critical factors to catch up with other nations. This is increasingly important, as the role of innovation has grown in modern knowledge-driven economies (Rosenzweig and Matzursky, 2014). Seen from an international business perspective, a recent study by Silva et al. (2017) finds empirical evidence that technological innovations especially exert a positive influence on the economic and strategic export performance of corporations. For markets that are less competitive, the positive relationship becomes even stronger.

Nevertheless, while markets for novel products and services can be a catalyst for innovation (Nakata and Sivakumar, 1996), the source of all innovation lies in the individuals of a country (Mansfeld et al., 2010), namely the individual innovativeness of its population. Innovativeness from this perspective reveals itself not only as the selling and buying of new products, but also as the ability to be creative and come up with ideas for new products and services that reinforce companies' human resources to persist in attaining and maintaining international competition (Florén et al., 2014; Veenendaal et al., 2014; Stephen et al., 2016). Hence, human resource management discusses the openness of companies to the creative capital available in a specific region, playing a critical role in innovation (Veenendaal et al., 2014), as well as open innovation in itself, i.e. the recovery of internal and external knowledge (Ferraris et al., 2017). Consequently, the international business literature considers innovation and innovativeness as key elements in increasing competitiveness (Aagaard and Andersen, 2014). Building on Dunning's (1988) work, Cano-Kollmann et al. (2016) also state that today's research in the international business domain recognises an increasing level of global connectivity among value chains leading to an increased level of knowledge creation and transfer. They point out the importance of location in knowledge creation for international corporations, but currently see a lack of understanding in the co-evolution between location and the process of knowledge creation. In this regard, Cano-Kollmann et al. (2016) call for a more nuanced view of the influence of location in the international business literature.

In our study, we survey millennials – also called digital natives – and their assumed higher propensity for individual innovativeness in the technology sphere, in particular as important drivers for international competitiveness through innovation (Tapscott, 2009; Hershatter and Epstein, 2010; Raskovic et al., 2016; Silva et al., 2017). Millennials constitute the generation who will determine the innovation capacity and the entrepreneurial potential of companies in international business in the future. As the workforce of today and tomorrow, millennials have an affinity for new technologies by nature and thus comprise an important generational cohort for honing a company's innovative capabilities. The literature defines the birth years of millennials as dating from 1979/1980 to 1994, or even up to 2000 (e.g. Smola and Sutton, 2002; De Hauw and De Vos, 2010; Myers and Sadaghiani, 2010; Kuron et al., 2015; Weber, 2015). Further, from a cross-cultural perspective, millennials are embedded in cultural settings that influence peoples' behaviour and also bring opportunities and/or barriers for the individual mind. It is widely accepted that culture comprises the characteristics and knowledge of a particular, but larger group of people – the collective programming of the mind – that distinguishes the members of one group from another (Hofstede, 2001; Schwartz, 2014). Thus, individual innovativeness in many different ways faces the

consequences of culture that can contribute to or hinder the development of novel ideas, products and/or services. In the international business context, Hoffmann (2014), for example, researches consumer boycott prevalence as significantly influenced by cultural background, especially the scores of in-group collectivism, which eventually influence the management decisions of companies affected by such boycotts.

In Hofstede's terms, culture expresses shared values and beliefs. Hofstede (2001) characterises cultural dimensions, which are widely accepted in cross-cultural research and the international business literature (see also Steenkamp et al., 1999; Beugelsdijk et al., 2017; Kirkman et al., 2017). The management of international corporations has to take into account such cultural differences, that is, the framing effect of culture in decisions about location and knowledge creation (Cano-Kollmann et al., 2016). The antecedents of specific individual innovativeness when, for example, searching for possible foreign joint venture partners, an overseas location for a research and development (R&D) facility, or recruiting and managing global talents play an important role in international business (Aagaard and Andersen, 2014; McDonnell et al., 2017). Steenkamp (2001) asserts that neglecting cross-cultural differences has been the cause of many business failures in the past. Stephan and Pathak (2016) even go beyond cultural values as important for entrepreneurship, discussing the mixed findings from the culture and entrepreneurship literatures. Nevertheless, whereas Hofstede (2001) discusses culture at the national level, there are also sub-groups of culture within a nation's borders that stem, for example, from family relationships or membership of specific organisations (Hoffmann, 2014). In addition, there are national sub-groups that bring in characteristics of other cultural values because of their own cultural background (McSweeney, 2002). Beyond this, Fischer and Schwartz (2011) discuss different perspectives in cultural studies of values and Beugelsdijk et al. (2015) find that cultural values are not stable over time, but rather are relatively positioned between countries. Finally, Fischer (2006) discusses whether individual values reflect cultural values. Building on such criticisms, we apply an individual-level measurement of antecedents influencing technological innovativeness, as well as an individual-level measurement of five well-known cultural dimensions. We highlight these issues in greater detail in the methodology and discussion sections.

To sum up, this study takes a cross-cultural look into the antecedents of the individual innovativeness of millennials in a specific domain (Goldsmith and Hofacker, 1991; Steenkamp et al., 1999; Tellis et al., 2009b), namely in the area of technology (e.g. computers, smartphones or other handheld devices). This phenomenon has not been studied across the major countries and cultures of the world (except for Steenkamp et al., 1999). National culture was and is frequently overlooked (Nakata and Sivakumar, 1996). Even today, Kaushik and Rahman (2014) state that cross-cultural research in the area of innovativeness is still lacking. Hence, this study breaks new ground and contributes to filling this research gap by analysing the antecedents of the technological innovativeness of millennials, simultaneously taking into account cross-cultural settings at the individual level. We deem millennials important for a company's and/or a society's entrepreneurial and innovative potential, as well as its economic growth (see also Aagaard and Andersen, 2014). We also recognise differences at the individual level of cultures (Fischer and Schwartz, 2011), i.e. in terms of McSweeney (2002), national heterogeneity or cultural diversity (Beugelsdijk et al., 2017). Hence, we adapt our research to the millennial cohort in six different triad countries, namely the United States (USA), Germany, France,

South Korea, Japan and China. Finally, our study contributes to the current international business and management literature by offering managerial implications for companies acting in an international business context. It also underlines, from a theoretical perspective, the necessity of using individual scores rather than country scores whenever individual cultural values are assessed (Kirkman et al., 2017). Once again, our study follows two major research questions: (1) What are factors influencing technological innovativeness in the millennial cohort in a cross-cultural context? (2) How can we measure the effect of culture on the individual level, respectively, is there a difference about specific dimensions of culture influencing technological innovativeness in the millennial cohort?

2 Theoretical background and hypothesis development

2.1 Dimensions of the technological innovativeness construct

Innovativeness has been an expanding research theme across several disciplines for years (Kaushik and Rahman, 2014). Whereas Rogers (2003) defines the concept simply as the degree to which an individual is earlier in adopting an innovation relative to other members of his or her social system, others have gone further into different concepts and measurement methods. Midgley and Dowling (1978) examine the nature of innovativeness and its relationship with adoption in greater detail, but still conceptualise it at the general level (see also Midgley and Dowling, 1993). Following their definition, innovativeness is the degree to which an individual is receptive to new ideas. Midgley and Dowling (1978) draw a distinction between innate innovativeness (an unobservable personality trait) and actualised innovativeness (the adoption of new products). Moreover, Hirschman (1980) conceptualises innovativeness as the desire to seek the new and different, an inherent novelty-seeking tendency of one individual. Other authors discuss consumer innovativeness with varying connections and sub-dimensions. Foxall (1988) draws the connection between novelty-seeking behaviour, creativity and cognitive style. Price and Ridgway (1983) extend the understanding of innovativeness to the actual use of products, a term called use innovativeness, which requires creativity and curiosity from the consumer. In addition, Venkatraman and Price (1990) divide the innovativeness construct into cognitive innovativeness (a desire for new experiences with the objective of stimulating the mind) and sensory innovativeness (the desire for new experiences with the objective of stimulating the senses). In their approach, the authors categorise individuals based on unique demographic and personality profiles related to adoption. In line with Roehrich (2004), we state that there is no consensus on the conceptualisation of the innovativeness construct (see also Tellis et al., 2009b; Kaushik and Rahman, 2014). Definitions range from ‘inherent novelty seeking’ and ‘predisposition to buy new products’ to ‘independence in innovative decisions’ of individuals. In this research, we first apply the distinction of Midgley and Dowling (1978) by using the differentiation of innovativeness as both a personality trait and the adoption of novel products.

To counterbalance criticism of the more general but well-known two-dimensional scale of innovativeness developed by Midgley and Dowling (1978), we also apply the scale of Goldsmith and Hofacker (1991), who developed a self-report scale to measure

domain-specific innovativeness. Their scale is based on the critique of the general approach of Midgley and Dowling (1978) and also fits within our research context. The authors describe consumer innovativeness as concerning buyers who wish to learn about and own the latest products. Goldsmith and Hofacker (1991) argue that a major problem of measuring innovativeness lies in the poor reliability and validity of most innovativeness scales when predicting the future innovative behaviour of consumers within a specific product category (see also Foxall, 1988; Vandecasteele and Geuens, 2010). Furthermore, the earliest adopters in one product category are not necessarily early adopters in another category (Goldsmith and Flynn, 1992). Im et al. (2003) discover in the context of the adoption of electronic products in young households that the prediction of adoption from a generalised personality trait is weak, but still statistically significant (see also Im et al., 2007). Therefore, we also adapt Goldsmith and Hofacker's (1991) measure by employing parts of their scale to assess the individuals' domain-specific innovativeness. Our area of research depicts the domain of technological products (e.g. tablets, smartphones and other handheld devices). Mainly building on the conceptualisations of Midgley and Dowling (1978) and Goldsmith and Hofacker (1991), we define individual technological innovativeness as a second-order construct. On the one hand, there is a personality trait that involves tinkering and experimenting with new technology products in general; on the other hand, there is a predisposition towards seeking and adopting novel technological products relatively earlier than others within their social system (i.e. an individual's circle of friends; see also Steenkamp et al., 1999).

2.2 Antecedents of individual technological innovativeness

To begin with, there is a gap in the literature regarding the antecedents of domain-specific individual innovativeness at the individual level from a cross-cultural perspective. Nevertheless, we initially start with two different antecedents in our model that have found consensus in the different innovativeness studies (Kaushik and Rahman, 2014) to examine the propensity for technological innovativeness among millennials, namely technological involvement and technological knowledge. Subsequently, we add cultural value dimensions that originated from Hofstede's (2001) approach, but transferred to the individual level, as suggested by Soares et al. (2007) and Yoo et al. (2011), to account for cross-cultural differences, that is, the framing effect of culture.

Drawing a conclusion from Im et al. (2003), we first include technological involvement in our study (see also Flynn and Goldsmith, 1993). Involvement results in both cognitive intensity and affective arousal when approaching the technological sphere in general, or acquiring and consuming a novel technological product (Laurent and Kapferer, 1985). Its intensity separates the characteristics of the passionate supporter of the technological environment from the mainstream users of technologies. Consumer involvement is defined as the perceived personal importance or interest attached to the acquisition and consumption of products, services, or ideas (Laurent and Kapferer, 1985; Zaichkowsky, 1985; Mittal, 1995). Whereas we focus on the enduring part of involvement in technological products, Celsi and Olson (1988) describe involvement as a motivation to process information at certain times and in certain situations, since even objects important to an individual are not experienced as personally relevant at all times (see also Richins and Bloch, 1986; Richins and Root-Shaffer, 1988). Nevertheless, in an

early work, Bloch (1981) emphasises the involvement construct as a significant explanatory variable for the outcomes of consumer behaviour (see also Mitchell, 1981). Laurent and Kapferer (1985) find that consumers may be passive or active when they receive advertising communications, depending on their involvement level, while Beatty and Smith (1987) discuss the positive relationship between involvement and the information search effort for consumer electronic products. Individuals differ in the extent of their decision process and their search for information depending on their level of involvement (Laurent and Kapferer, 1985). Overall, the relationship between technological involvement and individual technological innovativeness is based on the high importance and relevance of technology in an individual's life. Hence, we state the following hypothesis:

Hypothesis 1: The higher the technological involvement, the higher the technological innovativeness.

As findings in the literature concerning the involvement construct also suggest, technological involvement acts as an explanatory variable for the individual's propensity to gather technological knowledge, another important antecedent of an individual's technological innovativeness. People high in technological involvement seek a deeper knowledge and comprehension of technology in general (see also Celsi and Olson, 1988). Moreover, Rosenzweig and Matzursky (2014) state in the company context that knowledge emerges as a main resource for technological innovativeness and entrepreneurship. Hence, we see technological knowledge as a mediator between technological involvement and technological innovativeness and formulate the following hypothesis:

Hypothesis 2: The higher the technological involvement, the higher the technological knowledge.

Downscaling knowledge to the individual level, domain knowledge constitutes past cognitive information and experience gained in the technological product space. Alba and Hutchinson (1987) draw a clear distinction between a consumer's expertise (i.e. the ability to perform product-related tasks – more or less specific brand knowledge in a narrower sense) and product-related experience (i.e. familiarity, a category knowledge in a broader sense) (see also Jacoby et al., 1986). In this study, we use the aspect of experience in a domain-specific context to reduce model and multi-item scale complexity (Drolet and Morrison, 2001). Moreover, in pre-studies we also found a high correlation between experience in the technology-related area and the more specific product/brand expertise. Obtaining domain-specific knowledge constitutes gathering information from the media, advertising exposure, sales personnel interactions and other resources (Alba and Hutchinson, 1987; see also Goldsmith and Flynn, 1992). Brockman and Morgan (2003) emphasise the role of existing knowledge in new product performance and innovativeness in the product development context. Overall, the literature draws a positive relationship between knowledge and innovativeness, since prior knowledge and opinion leadership in a certain product category support making independent judgments about novel products and also early adoption (Gatignon and Robertson, 1985; Midgley and Dowling, 1993; Manning et al., 1995; Goldsmith et al., 1998; Wang et al., 2008). In addition, Im et al. (2003) argue that product category involvement and knowledge might be better predictors of consumer innovativeness than personal characteristics (i.e. sociodemographic variables in particular). Also Ram and Jung (1994) ascertain a positive relationship between product involvement and early adopters (purchase

innovativeness) and Flynn and Goldsmith (1993) find not only a positive correlation between involvement and innovativeness, but also between knowledge and innovativeness. Hence, we state the following hypothesis:

Hypothesis 3: The higher the technological knowledge, the higher the technological innovativeness.

2.3 The role of individual cultural values

According to Triandis (1989), a person's dispositions and behaviours are affected not only by his/her own makeup, but also by norms and beliefs in the cultural environment. This environment comprises the characteristics and knowledge of a particular group of people that distinguishes groups from one another; it represents their universal way of life (e.g. language, norms and symbols). Hofstede (2001) describes culture as the programming of the mind, i.e. socially learned and shared behaviours, beliefs and values typically determined relatively early in one's life (see also Mueller and Thomas, 2000). Such programming implies distinction from other groups and substantial within-group agreement (Schwartz, 2014). The individual's innovativeness also faces the consequences of culture in many different ways. Culture as an antecedent can either contribute to or block the individual generation of novel ideas, products and/or services. In this context, Hofstede (2001) developed by far the most influential and accepted national cultural framework (Steenkamp, 2001; Dwyer et al., 2005; Kirkman et al., 2006; Beugelsdijk et al., 2017; Kirkman et al., 2017). Despite its limitations (e.g. McSweeney, 2002; Smith 2002), the Hofstede framework is widely used in the international business and marketing literature (e.g. Nakata and Sivakumar, 1996; Steenkamp et al., 1999; Furrer et al., 2000; Mueller and Thomas, 2000; van Everdingen and Waarts, 2003; Singh, 2004; Dwyer et al., 2005; Kwok and Uncles, 2005; Schumann et al., 2010; Sarooghi et al., 2015).

More recently, a number of articles have critically discussed the limitations and misuse of the original framework when applied to the individual level instead of the national (environmental) level (Smith 2002; Brewer and Venaik, 2012; De Mooij, 2013; Venaik and Brewer, 2013). This critical view of the interpretation of the Hofstede framework at the individual level has lately been extended in Minkov and Hofstede (2011). The criticism is also in line with Fischer and Schwartz (2011), who state that values associated with, for example, autonomy or competence are individually shaped rather than constituting a shared meaning system (see also Fischer, 2006; Schwartz, 2014). Moreover, Kirkman et al. (2017) state that instead of relying exclusively on country, there is more than one container of culture and Hoffmann (2014) also discusses other sub-groups, for example families and organisations, that influence the cultural behaviour of individuals. According to Kirkman et al. (2006), researchers have frequently adapted the approach to the individual level. Hence, there is a general call for more individual-level analyses in cross-cultural research or whenever there is an interest in cultural values affecting individual behaviour (Fischer, 2006; Kirkman et al., 2006; Venaik and Brewer, 2013; Kirkman et al., 2017), supplemented with the critique that the borders of countries do not necessarily equal the similarity of cultures within them (Fischer and Schwartz, 2011). Based on this criticism, there have been efforts to adjust Hofstede's original scales to individual-level research (Schwartz, 1992; Donthu and Yoo,

1998; Bearden et al., 2006; Patterson et al., 2006; Soares et al., 2007; Schumann et al., 2010; Sharma, 2010; Yoo et al., 2011; Yoo and Shin, 2017). One of the resulting measurement scales is the cultural values scale (CVSCALE) developed by Yoo et al. (2011), which we apply to measure cultural dimensions at the individual level in this research.

Therefore, we start with an individual-level discussion of the five cultural value dimensions originating from Hofstede (2001) as antecedents for technological innovativeness and develop corresponding hypotheses for individual-level measurement, before referring to the research methodology section and measurement scales in detail. As our study breaks new ground with a cross-cultural perspective on innovativeness at the individual level, we developed hypotheses from available references in the international business and marketing literature that were applicable to our understanding of the technological innovativeness of millennials in different cultures in both Eastern and Western spheres. Most articles in this area relate to either product development (e.g. Nakata and Sivakumar, 1996; Mueller and Thomas, 2000), or the adoption of novel products (e.g. Steenkamp et al., 1999; van Everdingen and Waarts, 2003; Dwyer et al., 2005). They also mainly address the national level (e.g. Manu, 1992; Lynn and Gelb, 1996; Yeniyurt and Townsend, 2003; Murray et al., 2005; Un, 2015). Once again, for the individual-level measurement of cultural dimensions, we discuss the CVSCALE (Yoo et al., 2011; Yoo and Shin, 2017) in our research methodology section.

2.3.1 Long-term orientation

The long-term orientation of a society as a dimension associates the connection of the past with current and future actions/endeavours. Lower values indicate that a society honours traditions and is oriented towards the past and present, whereas higher values indicate a pragmatic problem-solving type of society that is oriented towards the future (Hofstede, 2001). Nevertheless, on the individual-level scale of Yoo et al.'s (2011) measure, administered in this study, high values indicate steadiness, stability, a penchant for savings and careful behaviour by giving up today's fun (long-term orientation) as opposed to the original work of Hofstede (2001). Hence, individuals scoring high on long-term orientation at the individual level reveal themselves not inclined to innovative behaviour and higher risk taking in general. A long-term orientation hinders spending time and money on novel ideas and new technological products. In contrast, individuals scoring low on the long-term dimension are perceived as applying a rather 'keeping up with the Joneses' approach (see also Dwyer et al., 2005), which exerts social pressure, encourages creative thinking, provides impetus for 'the new' and finally supports innovativeness regardless of cost. Therefore, we formulate the following hypothesis:

Hypothesis 4: The higher the individual long-term orientation, the lower technological innovativeness.

2.3.2 Uncertainty avoidance

Uncertainty avoidance defines a society's tolerance for ambiguity. High values indicate a society that tries to avoid the unexpected/unknown and likewise favours the status quo because individuals feel uncomfortable with uncertainty (Hofstede, 2001). Members

reduce their stress levels by enforcing rules and structures guiding their activities and providing predictability (Dwyer et al., 2005; Schumann et al., 2010). As opposed to this, societies with low values on the uncertainty avoidance dimension show more acceptance of differing thoughts and ideas with fewer regulations. Novel ideas and innovativeness in general relate to situations of high uncertainty. Individuals cannot fully anticipate the outcomes of 'the new', therefore may run high risks when investing in new technologies and applying novel processes (Steenkamp et al., 1999; Tellis et al., 2003). While in strong uncertainty-avoidance cultures, a longing for security and resistance to innovation predominates (Hoffmann, 2014), in low uncertainty-avoidance cultures, there is a high tolerance as well as acceptance for deviant or novel ideas and behaviour (De Mooij and Hofstede, 2011). They give the benefit of the doubt to unknown situations (Steenkamp et al., 1999; Mueller and Thomas, 2000; Schumann et al., 2010). Hence, we state the following hypothesis:

Hypothesis 5: The higher the individual uncertainty avoidance, the lower the technological innovativeness.

2.3.3 Collectivism

The collectivism dimension exhibits the degree to which people in a society are part of groups. Societies with low values are individualist with only loose ties, often connected to another individual or immediate family only – a loosely-knit social framework (Hofstede, 2001). In general, they emphasise the 'I' versus the 'We'. As Schumann et al. (2010) argue, in individualist cultures the most important distinction is between the self and other individuals of that culture, whereas in collectivist cultures the self is always defined in the context of social networks. Hence, in a more collectivist society individuals show themselves as integrated within groups with undoubted loyalty and support for each other when conflict arises with other in-groups or individuals outside that particular society. Collectivist societies provide a communication context with strong ties within an individual's social network that on the one hand encompasses many rules for the regulation of people's behaviour, but on the other hand further enhances word-of-mouth and the acceptance of innovations (Schumann et al., 2010). Moreover, research on teamwork shows a positive influence of the ability to work in teams on the overall team output because of better communication and combined knowledge (e.g. Ruef, 2002; Cooper and Kagel, 2005; Østergaard et al., 2011). Finally, Dwyer et al. (2005) find evidence for more pronounced information sharing and acquisition behaviour among people in collectivist societies. This supports the positive effect of strong social ties. Thus, we offer the following hypothesis:

Hypothesis 6: The higher the individual collectivism, the higher the technological innovativeness.

2.3.4 Power distance

Power distance indicates the extent to which less powerful members of institutions, i.e. organisations, companies, or families, accept and expect an unequal distribution of power. With a higher degree of power distance, inequality, power and hierarchy are clearly established and executed in society without doubt or reason; everyone has a place

that needs no further justification (Hofstede, 2001). In addition, individuals cherish status symbols and powerful people are entitled to privileges and aim to impress others. Lower values signify that individuals question authority and attempt to distribute power between the members of that particular society. In other words, people strive to equalise the distribution of power and demand justification for inequalities of power.

Whereas Dwyer et al. (2005) consider high power distance as a driver for the diffusion of new products, we take the view that high power distance prevents individuals from questioning tradition and shaping the future in relation to generating novel ideas, creating new technologies and being innovative in general. In addition, with high power distance, responsibility is clearly located at the top management level or with superordinate individuals in that particular society. Such circumstances restrict communication and the generation of new ideas. Furthermore, they also hinder the contradiction of processes being implemented and the encouragement of change. Finally, as Dawar et al. (1996) argue concerning the exchange of information, people in cultures with high power distance have a distrust of others because they are aware that power resting with individuals is often coercive rather than legitimate in nature. Therefore, we formulate the following hypothesis:

Hypothesis 7: The higher the individual power distance, the lower the technological innovativeness.

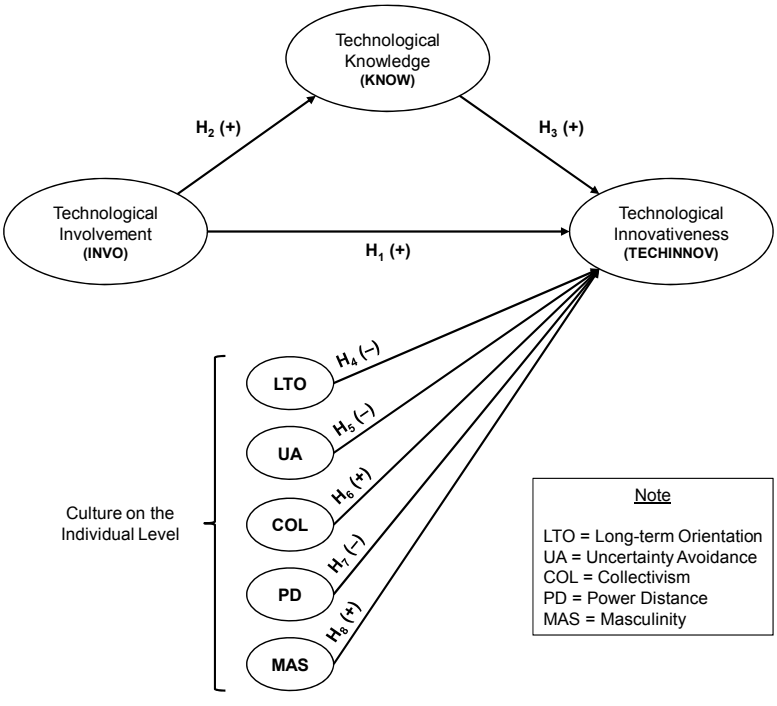
2.3.5 Masculinity

Masculinity determines a preference for achievement, heroism, assertiveness and material rewards for success in a society (tough values), whereas its counterpart, femininity, stands for cooperation, modesty, quality of life and caring for the weak (tender values). High degrees of masculinity also relate to societies that are more competitive by nature (Hofstede, 2001). In contrast, societies with lower degrees of masculinity show a greater consensus orientation. Feminine societies stress a concern for the living environment, placing a primary interest in people and the environment, not in 'things' (Tellis et al., 2003). As opposed to this, a higher degree of masculinity in a society is perceived as 'getting things done' instead of seeking social consensus. In the context of innovativeness, masculinity therefore positively influences the propensity for generating novel ideas and looking beyond the status quo. In addition, masculine societies grant material rewards for success (Dwyer et al., 2005), which also positively affects innovativeness (Steenkamp et al., 1999). Finally, Porter and Sakakibara (2004) state that in the case of Japan, one of the most masculine cultures, higher competition in certain industries has led to internationally successful companies. Clearly, competition has a positive effect on the output of novel ideas and product innovation. Hence, we formulate the following hypothesis:

Hypothesis 8: The higher the individual masculinity, the higher the technological innovativeness.

Figure 1 depicts the proposed overall research model with corresponding hypotheses. We discuss measurement scales, data gathering and results in the next section.

Figure 1 Proposed research model and hypotheses



3 Research methodology

3.1 Measurement scales

In this study, we combine personal characteristics and the adoption behaviour of novel products from the Midgley and Dowling (1978) approach and we also apply items from the domain-specific scale of Goldsmith and Hofacker (1991) in our second-order measurement of individual technological innovativeness (see also Agarwal and Prasad, 1998). To address technological involvement, we use the four-dimensional scale of Laurent and Kapferer (1985) concerning consumer involvement. We reduce the original scale to three dimensions: importance, pleasure and sign value (see also Bauer et al., 2006). Hence, according to the respective literature, we also define involvement as a second-order construct. We measure technological knowledge employing only the aspect of experience, i.e. a more general category of knowledge (Alba and Hutchinson, 1987), in a domain-specific context. Thereby, we are able to reduce model and multi-item scale complexity (Drolet and Morrison, 2001). For this purpose, we partly adapt the multidimensional scale of Kleiser and Mantel (1994) and supplement the 'analysis dimension' with additional items concerning information access and gathering to make the instrument more relevant to the study context. Finally, we use the CVSCALE (Yoo et al., 2011) to measure the five afore-mentioned cultural dimensions of Hofstede (2001) at the individual level as antecedents for individual technological innovativeness. This scale has been validated in a variety of studies concerning cross-cultural research and

international management (e.g. Donthu and Yoo, 1998; Patterson et al., 2006; Soares et al., 2007; Schumann et al., 2010), finding cross-cultural generalisability (Yoo et al., 2011; Yoo and Shin, 2017). All scale endings for the exogenous and endogenous constructs in our proposed research model were administered using a five-point Likert scale format, from '1 = strongly disagree' to '5 = strongly agree'.

To prevent a language-based bias (Costa et al., 2014), the original questionnaire was compiled in English and translated back and forth to the additional five languages of the countries that took part in the survey (besides the USA, Germany, France, South Korea, Japan and China). First, bilingual translators executed the translation from English into German, French, Korean and Japanese. Back translation was undertaken by a second translator using the back translation method (Brislin, 1970; Brislin, 1986). Discrepancies between the two versions were resolved between researchers and translators by carefully checking and critically discussing final versions of the questionnaire. After the translation process, we pretested the final version of the questionnaire in each country with individuals not taking part in the research.

3.2 Data gathering

We gathered data over a considerable period in 2015 and 2016 in major university cities of each participating country, starting in Germany, with the help of research assistants who received comprehensive instruction prior to the survey. While one of the authors solely supervised the German data collection process in the vicinity of Düsseldorf (North Rhine-Westphalia), a second author was responsible for the US data (New York area) and for parts of the Asian data also due to familiarity and constant business travel. With this in mind, the second author collected data in South Korea (Seoul). Another co-author collected as a native speaker data in the vicinity of Tianjin in China, which is close to Beijing, while a fourth author collected data from France (Paris area). Finally, we carefully briefed an additional researcher from Japan about the purpose of this study, who collected data in the vicinity of Kyoto. Hence, except for the Japanese data, all authors supervised the entire data collection process to ensure accurate data as much as possible. In the data collection process, participants self-completed an interviewer-administered structured questionnaire in written form and in the presence of the extensively briefed interviewers in order to clarify questions during the survey. We also used both paper-based and online questionnaires (laptop-based with interviewer support). Overall, data were gathered from a group of millennials ($n = 1527$) as respondents (average age per country between 20.29 and 25.78 years) who fully completed the questionnaire (Germany $n = 335$; USA $n = 370$; France $n = 228$, South Korea $n = 183$; Japan $n = 192$; China $n = 219$), except for some missing values in the demographics section.

Table 1 presents the sample characteristics, such as age, gender, education, profession and area from which the respondents originated. As this study does not provide any point or interval estimates of the participating population (Calder et al., 1981), but examines the relationship between antecedents (i.e. technological involvement, technological knowledge and five cultural dimensions at the individual level) and the dependent variable 'technological innovativeness of millennials', we deem our sample appropriate for this kind of research (Bello et al., 2009). Nevertheless, in the discussion section we carefully argue the managerial implications and limitations of the study of individual technological innovativeness of millennials in this setting.

Table 1 Sample characteristics

Country	*Variables*					
	N	*Age (s.d./m.v.)*	*Gender m/f (m.v.)*	*Education High School/ Coll. Or Univ./ Other (m.v.)*	*Profession Stud./Empl./Entrepr./ Other (m.v.)*	*Area (Maj. Cities/Suburbs/Mid-Size or Large/Small Towns or Rural Other (m.v.)*
Germany	335	24.94 (4.67/4)	40.3/59.7 (0)	51.8/45.7/2.4 (7)	67.7/25.1/2.1/5.1 (1)	29.3/21.5/24.8/24.5/0.0 (4)
USA	370	22.12 (5.21/5)	44.1/55.9 (3)	15.6/84.4/0.0 (5)	92.3/5.2/1.9/0.5 (4)	23.0/23.8/14.2/38.1/0.8 (5)
France	228	25.78 (7.12/0)	34.4/65.6 (1)	9.2/90.4//0.4 (0)	84.0/12.3/1.4/2.3 (9)	29.5/30.0/23.6/6.4//0.5 (8)
South Korea	183	24.89 (3.79/4)	35.5/64.5 (0)	47.5/42.1/10.4 (0)	93.4/2.7/.0/3.8 (1)	64.6/8.8/20.4/5.0/1.1 (2)
Japan	192	20.29 (2.29/5)	76.6/23.4 (4)	89.4/9.0/1.6 (3)	99.0/.0/.5/0.5 (1)	26.8/14.8/12.0/43.7/2.7 (9)
China	219	23.15 (4.51/0)	40.6/59.4 (0)	3.7/95.9/0.5 (1)	89.9/4.1/0.9/5.0 (1)	24.3/9.2/21.6/44.5/0.5 (1)
Total	1527	23.54 (5.24/18)	44.3/55.7 (8)	33.9/64.0/2.1 (16)	86.3/9.5/1.3/2.8 (17)	31.0/19.2/19.5/29.5/0.8 (29)

Notes: *N* = sample size; s.d. = standard deviation; m.v. = missing values; m = male; f = female.

Table 2 Measurement properties of technological innovativeness, involvement, and knowledge

Factor name	*Mean*	*s.d.*	*Factor loading*	*α*	*CR*	*AVE*	*β*	*p*	*Hypotheses*
Technological Innovativeness (TECHINNOV)	**3.17**	**1.19**		0.707	0.860	0.607			
I like to tinker with new technology products. (PE)	3.21	1.24	0.761						
I like to experiment with new technology products. (PE)	3.38	1.17	0.849						
I am among the last in my circle of friends to buy a new technology product when it appears. (r) (AD)	2.97	1.20	0.724						
Compared to my friends I own only a few new technology products. (r) (AD)	3.13	1.15	0.778						
Technological Involvement (INVO)	**3.43**	**1.02**		0.774	0.897	0.559	**0.427** **0.601**	**0.000** **0.000**	**H_1** **H_2**
Technological products are not relevant to me. (r) (IM)	3.71	1.05	0.530						
Technological products are important to me. (IM)	3.66	0.96	0.783						
Technological products are fun. (PL)	4.01	0.83	0.811						
Technological products are fascinating. (PL)	3.90	0.92	0.815						
Technological products tell other people something about me. (SV)	2.99	1.09	0.730						
Technological products help me express my personality. (SV)	2.84	1.15	0.841						
Technological products are part of my self-image. (SV)	2.91	1.15	0.676						
Technological Knowledge (KNOW)	**2.66**	**1.19**		0.870	0.855	0.596	**0.679**	**0.000**	**H_3**
I regularly seek to learn something about technological products.	2.98	1.13	0.765						
I continuously read about technology topics in the media.	2.49	1.23	0.746						
I regularly search websites which provide information on new technology products.	2.50	1.26	0.773						
Compared to my friends, I have a lot of experience with different types of technological products.	2.66	1.13	0.804						

Notes: TECHINNOV: PE = Personality, AD = Adoption; INVO: SV = Sign Value, IM = Importance, PL = Pleasure; r = reversed coded.
All scale endings were administered with a five-point Likert scale format from '1 = strongly disagree' to '5 = strongly agree'.

Table 3 Measurement properties of cultural values on the individual level

Factor name	*Mean*	*s.d.*	*Factor loading*	*α*	*CR*	*AVE*	*β*	*p*	*Hypotheses*
Long-term Orientation (LTO)	**3.41**	**1.07**							
Long-term planning is very important for me.	3.71	1.00	0.810	0.591	0.623	0.464	**–0.089**	**0.034**	**H_4**
Generally, I give up today`s fun for success in the future.	3.11	1.13	0.521						
Uncertainty Avoidance (UA)	**3.72**	**0.92**							
It is important to have instructions spelled out in detail so that I always know what I´m expected to do.	3.67	0.97	0.635	0.771	0.779	0.543	**–0.100**	**0.014**	**H_5**
It is important to closely follow instructions and procedures.	3.66	0.96	0.811						
Rules and regulations are important because they inform me of what is expected of me.	3.82	0.82	0.753						
Collectivism (COL)	**3.26**	**1.02**							
Individuals should stick with the group even through difficulties.	3.45	1.01	0.578	0.820	0.825	0.491	0.016	0.618	H_6
Group welfare is more important than individual rewards.	3.32	1.02	0.806						
Group success is more important than individual success.	3.30	1.03	0.846						
Individuals should only pursue their goals after considering the welfare of the group.	3.18	1.03	0.633						
Group loyalty should be encouraged even if individual goals suffer.	3.05	1.03	0.597						

Table 3 Measurement properties of cultural values on the individual level (continued)

Factor name	*Mean*	*s.d.*	*Factor loading*	*α*	*CR*	*AVE*	*β*	*p*	*Hypotheses*
Power Distance (PD)	**1.99**	**0.99**							
People in higher positions should make the most decisions without necessarily consulting people in lower positions.	2.12	1.02	0.602						
People in higher positions should avoid social interaction with people in lower positions.	1.64	0.89	0.661	0.741	0.737	0.412	**–0.129**	**0.000**	$\mathbf{H_7}$
People in lower positions should not disagree with decisions by people in higher positions.	1.97	0.99	0.688						
People in higher positions should not delegate important tasks to people in lower positions.	2.21	1.05	0.613						
Masculinity (MAS)	**2.63**	**1.23**							
It is more important for men to have a professional career than it is for women.	2.42	1.29	0.671						
Men usually solve problems with logical analysis; women usually solve problems with intuition.	2.68	1.16	0.701	0.767	0.775	0.466	0.021	0.574	H_8
Solving difficult problems usually requires an active, forcible approach, which is typical for men.	2.42	1.15	0.792						
There are some jobs that men can always do better than a woman.	3.01	1.30	0.545						

Note: All scale endings were administered with a five-point Likert scale format from '1 = strongly disagree' to '5 = strongly agree'.

3.3 Reliability and validity of scales

We checked the reliabilities of all scales used for antecedents and technological innovativeness by performing structural equation modelling in SPSS Amos 23. Structural equation modelling is an established and powerful multivariate approach for simultaneously testing and estimating models with causal relations such as those used in this study. Nevertheless, we applied a two-step approach as recommended by Anderson and Gerbing (1988) for separate estimation and re-specification of the measurement model with confirmatory factor analyses prior to the simultaneous estimation of the measurement and structural models. In the first step, we removed items with less than 0.50 factor loadings to improve measurement model estimation (Bagozzi and Yi, 1988). After the cleaning process, the model contained 33 items belonging to the antecedents of technological involvement (INVO), technological knowledge (KNOW), long-term orientation (LTO), uncertainty avoidance (UA), collectivism (COL), power distance (PD), masculinity (MAS) and the dependent construct technological innovativeness (TECHINNOV).

Tables 2 and 3 present the remaining items, means, standard deviations (SD) and factor loadings with averages per dimension depicted in bold letters next to each latent variable. All scale endings – exogenous and endogenous constructs – were administered with a five-point Likert scale format from '1 = strongly disagree' to '5 = strongly agree'. In line with Leung and Bond (1989), we also standardised the data before item reduction to control for the positioning effect in cross-cultural research (see also Yoo et al., 2011). In addition, Cronbach's alpha (α) and the composite reliability (CR) of items belonging to each latent variable were calculated and displayed as measurement properties of the constructs. Finally, we present path coefficients (β) and significance levels (p) for the discussion of our results in the next paragraph on the right-hand side of Tables 2 and 3 (significant values highlighted in bold).

All seven antecedents display satisfactory CR values: 0.897 for technological involvement (INVO; $\alpha = 0.774$); 0.855 for technological knowledge (KNOW; $\alpha = 0.870$); 0.623 for long-term orientation (LTO; $\alpha = 0.591$); 0.779 for uncertainty avoidance (UA; $\alpha = 0.771$); 0.825 for collectivism (COL; $\alpha = 0.820$); 0.737 for power distance (PD; $\alpha = 0.741$); 0.775 for masculinity (MAS; $\alpha = 0.767$). The technological innovativeness scale also shows a satisfactory CR value: 0.860 (TECHINNOV; $\alpha = 0.707$). Moreover, all the concept-to-domain coefficients (factor loadings) displayed in Tables 2 and 3 are statistically significant. Thus, our results demonstrate high convergent validity for the constructs. Following Fornell and Larcker (1981), discriminant validity for the exogenous variables was estimated by comparing the average variance extracted (AVE) by each individual-level cultural dimension and involvement in the technology domain with the squared correlation between them. Table 3 (column AVE) in combination with Table 4 (correlations) shows that the AVE for each factor is far greater than the squared correlation. Although Hu and Bentler (1999) set a threshold level of 0.5 for AVE, Malhotra et al. (2017) argue that AVE is often too strict and CR alone also functions as a good indicator of reliability. Hence, we deem our sample results to be appropriate for our baseline study in this area. Finally, we did not consider measurement invariance to be an issue in this research (Steenkamp and Baumgartner, 1998) as no point or interval estimates between country samples are compared (see also Yoo and Shin, 2017).

Table 4 Correlations of exogenous constructs

Factor	*INVO*	*LTO*	*UA*	*COL*	*PD*	*MAS*
Involvement (INVO)	1					
Long-term Orientation (LTO)	0.185	1				
Uncertainty Avoidance (UA)	0.251	0.460	1			
Collectivism (COL)	0.111	0.135	0.256	1		
Power Distance (PD)	0.021	0.002	0.004	0.019	1	
Masculinity (MAS)	0.063	–0.046	0.065	0.179	0.389	1

4 Results

We simultaneously tested the eight hypotheses concerning the relationship between diverging antecedents and the technological innovativeness of millennials at the individual level with structural equation modelling using the maximum likelihood estimation method in SPSS Amos 23. We also applied well-known fit indicators from the literature.

Figure 2 displays the modelling results with path coefficients and fit statistics. The overall fit of the structural and the applied measurement models are very satisfactory. The χ^2 statistics of goodness-of-fit for the model yield a value of $\chi^2 = 1{,}468.559$ with df = 463 and a *p*-value of 0.000. Ideally, the *p*-value should be high, but low *p*-values for structural equation models are not a cause for concern for model fitness since low *p*-values usually emerge for χ^2 goodness-of-fit results using large samples (Bentler and Bonett, 1980; Hoelter, 1983; Tanaka, 1987; Byrne, 2009). Bearing this limitation in mind, several other goodness-of-fit indicators, such as χ^2/df, the goodness-of-fit index (GFI) and adjusted goodness-of-fit index (AGFI) for overall fit, as well as the confirmatory fit index (CFI) and Tucker–Lewis index (TLI) for measurement model fit, were simultaneously used to avoid poor model evaluation (Bentler, 1990; Tanaka, 1993; Hu and Bentler, 1999; Jackson et al., 2009).

The relative chi-square (χ^2/df), an index of how much the model fit is reduced by dropping one or more paths, should be around or less than 3.0 (Carmines and McIver, 1981). For this study, the value of χ^2/df = 3.172 is slightly above 3.0, which we deem acceptable in our cross-cultural context since all other fit values are satisfactory. For the remaining four indices, a value above 0.9 is evidence of good model fit (Doll et al., 1994; Hair et al., 2009). For our model, all four values are above 0.9 (GFI = 0.941; AGFI = 0.929; CFI = 0.943; TLI = 0.935). The literature also considers the root mean squared error of approximation (RMSEA) to be one of the most informative indicators of goodness of fit as it estimates the amount of error of approximation per degree of freedom and takes into account sample size. The RMSEA value for our model is 0.038, which is less than the required value of 0.05 to be considered a close fit for the model (Browne and Cudeck, 1992) and the corresponding PCLOSE value (1.000) is at the threshold level of 1 (Hair et al., 2009). These results suggest that the hypothesised model describes very well the relationship between technological involvement (INVO), technological knowledge (KNOW), long-term orientation (LTO), uncertainty avoidance (UA), collectivism (COL), power distance (PD), masculinity (MAS) and technological innovativeness (TECHINNOV).

Figure 2 Structural equation modelling results

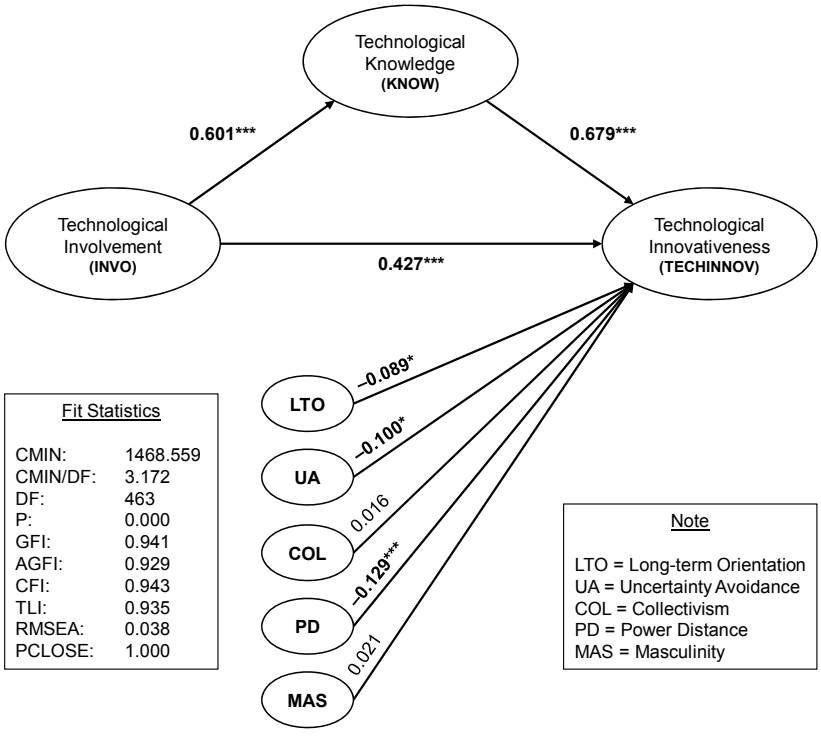


Figure 2 also displays the results of hypothesis testing as path coefficients with β weights and corresponding significances. As we can see from Figure 2, except for collectivism and masculinity, all dimensions show significant effects on technological innovativeness. In detail, H_1, stating that the higher technological involvement, the higher technological innovativeness, is confirmed ($\beta = 0.427$, $p \leq 0.001$), as is H_2, indicating that the higher technological involvement, the higher technological knowledge ($\beta = 0.601$, $p \leq 0.001$). Moreover, H_3, stating that the higher technological knowledge, the higher individual technological innovativeness, is also confirmed ($\beta = 0.679$, $p \leq 0.001$). Hence, involvement and knowledge in the domain of technology strongly influence millennials' technological innovativeness in the countries studied.

From a cultural viewpoint, H_4, stating that the higher the individual long-term orientation, the lower technological innovativeness, is confirmed ($\beta = –0.089$, $p \leq 0.05$). The higher the individual's long-term orientation, that is, stability and careful planning, the lower the person's technological innovativeness. Similarly, H_5, stating that the higher the individual uncertainty avoidance, the lower technological innovativeness ($\beta = –0.100$, $p \leq 0.05$) and H_7, stating that the higher the individual power distance, the lower technological innovativeness ($\beta = –0.129$, $p \leq 0.001$) are also confirmed. Uncertainty avoidance and power distance clearly have a negative effect on risk taking and being individually innovative in the technology sphere. Nevertheless, H_6, stating that the higher individual collectivism, the higher technological innovativeness ($\beta = 0.016$, $p = 0.618$) and hypothesis H_8, stating that the higher individual masculinity, the higher technological

innovativeness ($\beta = 0.021$, $p = 0.574$) could not be confirmed as the values have the correct sign, but they are not significant. Table 5 displays the overall results from testing our hypotheses.

Table 5 Overall results of hypotheses testing

	Hypotheses	*Result*
$H_1(+)$:	The higher the *technological involvement* the higher the *technological innovativeness*.	Confirmed
$H_2(+)$:	The higher the *technological involvement* the higher the *technological knowledge*.	Confirmed
$H_3(+)$:	The higher the *technological knowledge* the higher the *technological innovativeness*.	Confirmed
$H_4(-)$:	The higher the individual *long-term orientation* the lower the *technological innovativeness*.	Confirmed
$H_5(-)$:	The higher the individual *uncertainty avoidance* the lower the *technological innovativeness*.	Confirmed
$H_6(+)$:	The higher the individual *collectivism* the higher the *technological innovativeness*.	Not significant
$H_7(-)$:	The higher the individual *power distance* the lower the *technological innovativeness*.	Confirmed
$H_8(+)$:	The higher the individual *masculinity* the higher the *technological innovativeness*.	Not significant

5 Discussion

This study contributes to a better understanding of individual technological innovativeness and the entrepreneurial potential of millennials in a cross-cultural setting in different ways. We discuss our findings in the following section and integrate them within the current academic context of international business and management (see also Kirkman et al., 2006; Beugelsdijk et al., 2017). Finally, our individual-level results concerning cultural values measured using an adaptation of the CVSCALE scale developed by Yoo et al. (2011) also add value to the discussion of the individual-level measurement of culture taking individuals as the unit of analysis (Kirkman et al., 2017).

In line with Midgley and Dowling (1978) and Goldsmith and Hofacker (1991), we define innovativeness in the technology sphere as a personality trait that involves tinkering and experimenting with new technological products in general and the predisposition to seek out and adopt novel technological products relatively earlier than others. We find that antecedents such technological involvement and technological knowledge have the expected influences on technological innovativeness in our cross-cultural study. These findings are in line with Kaushik and Rahman (2014), who discuss in their literature review involvement and knowledge as key constructs for domain-specific innovativeness. On the one hand, we discover a direct effect of technological involvement on an individual's technological innovativeness, i.e. domain-specific innovativeness. On the other hand, we detect a mediating effect of technological knowledge, namely the more involved an individual is in the technology sphere, the higher the striving for technological knowledge – above all, the higher the technological

innovativeness. Hence, companies have first to explore a person's individual interest and knowledge in technological areas, namely a person's creative capital, which might offer evidence of global talent in the technology sphere (Veenendaal et al., 2014; McDonnell et al., 2017). In sum, our results offer management implications for international companies seeking new technology markets, possible foreign joint venture partners, an overseas location for R&D facilities, or innovative personnel and global talents with high potential to help them in future idea generation and strengthening international competitiveness (Aagaard and Andersen, 2014; McDonnell et al., 2017).

We also shed light on the entrepreneurial capabilities of millennials in triad countries (see also Beliaeva et al., 2017) and add value to the discussion in the international business literature concerning the reinforcement of companies' location-based human resources to enable them to persist in attaining and sustaining international competition (Florén et al., 2014; Veenendaal et al., 2014; Cano-Kollmann et al., 2016; Stephen et al., 2016). Hence – and perhaps even more important from an international business perspective – companies striving for international talents have to focus not only on the technological skills of individuals, but also on their individual cultural values and cultural backgrounds when searching for the most innovative surroundings. This offers ample opportunities for companies acting in international business (Beugelsdijk et al., 2017). Based on our individual-level research, cultural dimensions and the individual's attitude towards them – especially long-term orientation, uncertainty avoidance and power distance – play an important, albeit statistically insignificant role, when identifying hot spots with respect to incubators of innovativeness in a cross-cultural context. As Yeniyurt and Townsend (2003) also find in their macro-level study, power distance and uncertainty avoidance hinder the acceptance of new products (see also van Everdingen and Waarts, 2003; Singh, 2004). With our research, we can transfer this to the technological innovativeness sphere, but at the individual level. It is the individual's attitude towards different cultural values that creates the cultural map of a country, including regions or socioeconomic groups (e.g. Fischer and Schwartz, 2011; Hoffmann, 2014; Schwartz, 2014; Kirkman et al., 2017). This is in line with Hofstede's (2001) critique of national cultural values, namely their adaptation to individuals of a country, but also in contrast to individual-level measurements according to the CVSCALE (Yoo et al., 2011). We agree with Hoffmann (2014) that cultural values in several sub-national regions within the same country or even in organisations and families might be expressed differently. Hence, this research is also congruent with the theoretically driven line of argument of Kirkman et al. (2017), who argue that the country level is a critical unit of analysis whenever individual cultural values are the relevant unit of analysis, as in this kind of research. In our opinion, for domain-specific topics such as technological innovativeness there has to be an individual-level perspective on cultural values, which also takes greater account of a country's heterogeneity (McSweeney, 2002). In this context, Beugelsdijk et al. (2015) find in their study that cultural values change over time, but their relative position between countries is rather stable. In contrast to this finding, De Mooij (2000) and Hofstede (2007) argue that cultural values seem to be strongly rooted in history and tradition and they appear to be stable over time (see also Peng et al., 2009; Horak and Klein, 2016). Nevertheless, according to our findings, the more open a society is, the more risk-inclined and the more innovative the individuals in that particular society will be. Hence, the cultural map of a society's individuals remains a significant factor in international business and the management of technological innovativeness and entrepreneurship in general (see also Fischer and Schwartz, 2011;

Beliaeva et al., 2017). In view of these findings and in accordance with Fischer (2006) and Venaik and Brewer (2013), we call for more individual-level research on cultural values (see also Kirkman et al., 2006, Kirkman et al., 2017), especially in a domain-specific context such as technological innovativeness.

6 Conclusion

This study makes a significant contribution to the research on the influence of cultural values in international business and management by measuring the technological innovativeness of millennials at the individual level in a cross-cultural setting. First, companies should look at the technological involvement and knowledge of individuals when seeking an innovative workforce or catering to their R&D centres. Second, they should also keep in mind the cultural map of a society, namely the individual backgrounds of their potential future employees in terms of cultural values. In this context, we deem millennials to be an important workforce in terms of their affinity with technology. First, as so-called digital natives, they are ascribed a higher propensity for individual innovativeness in the technology sphere (Tapscott, 2009; Hershatter and Epstein, 2010). Second, they are the generation that will determine innovation capacity, i.e. the creative capital and the entrepreneurial potential of companies and economies for the future. From our viewpoint, both transpire to be important drivers for continuing prosperity.

As with any research, ours has some limitations. We regard our study as a starting point in cross-cultural research at the individual level in the domain of technological innovativeness and its antecedents. First, the survey covers only one part of society, namely millennials, to whom we attribute technological knowledge and involvement, as well as a high propensity for technological innovativeness because they are digital natives. Hence, this study does not cover societies as a whole and the results are therefore inevitably limited to a younger generation in their twenties. In this context, we also see possible criticism in the fact that our samples are exclusively located in larger cities of the countries surveyed. Hence, we cannot deem our sample representative of the entire cultural map available in each sample country. Second, our study is restricted in that we focused on triad countries from the most important economic areas in the world (USA – NAFTA; Germany and France – European Union; South Korea, Japan, and China – East Asia), but we do not cover other regions around the globe. Therefore, our results are only valid for economically highly developed countries. We cannot make assumptions regarding, for example, Russia, India, or Latin American countries, which in terms of the number of inhabitants and size are also important nations.

We noted at the beginning of this paper that researchers have to some degree overlooked the importance of cultural values, especially at the individual level. With our study, we have broken new ground and contributed to filling this research gap in the international business literature by analysing the antecedents of the technological innovativeness of millennials and simultaneously taking into account cross-cultural settings at the individual level. Nevertheless, building upon our limitations, further research should add more constructs that influence technological innovativeness (e.g. creativity or cognitive styles of individuals). Moreover, there is an on-going discussion in literature on international business about the use of norms rather than values in intercultural research. In this context, authors proposed the tightness–looseness

construct regarding the sanctioning of cultural norms in a society. However, current literature debates the theory of intercultural norms as a complementary, not a competing – in terms of excluding – approach in multi-level cultural research (e.g., Gelfland et al., 2006; Ozeren et al., 2013; Shin et al., 2017). We did see this criticism, but did not include it in our study so far.

In addition, the scales for cultural values might need some advancement as we found the hypothesised signs, which we derived from the existing literature, but no significance for collectivism and masculinity. There might be some issues in the diversity of the subsamples, that is, the different countries that we integrated into our standardised dataset, which we did before item reduction to control for the positioning effect in cross-cultural research (Leung and Bond 1989). Future research endeavours might take into account the clustering of countries before measuring either values or norms on the individual level of culture. This might also positively influence and, likewise, reduce the criticism, which we extensively discussed in this research, about the difference of national borders and cultures. Another reason for difficulties in measuring, for example, masculinity might be the definition, the applied items, and, similarly, the misunderstanding of the concept in terms of domination of men over women. One can criticise that items of the CVSCALE of Yoo et al. (2011) measure typical sexist behaviour or attitudes, gender inequality, or discrimination rather than masculinity in terms of being achievement-oriented, assertive and prioritising competition and material rewards for success. In this context, there are also other measures of cultural values, as well as additional dimensions in the international business literature, for example the GLOBE study and World Values Survey (WVS), which can also be transferred to the individual level and integrated in a model of domain-specific individual technological innovativeness (see also Beugelsdijk et al., 2017). Moreover, researchers should re-think the innovativeness construct and add more dimensions (e.g. cognitive and sensory innovativeness) to this construct. Further research should also expand the database to other important and/or less developed regions in the world. Finally, the sample characteristics comprise millennials only. There is also a call for the integration of moderators such as age, gender and education (Kirkman et al., 2006; Kirkman et al., 2017). Future studies should broaden the sample base to the elderly and focus on a more balanced proportion of males and females, as well as incorporating the moderating effects resulting from these aspects in all cultures researched.

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