ARE WE READY FOR NEW TECHNOLOGIES? THE RELATIONSHIP BETWEEN HUMAN VALUES AND TECHNOLOGY READINESS APPLIED TO M-COMMERCE IN THE BRAZILIAN CONTEXT

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One of the goals of this work is to contribute to studies involving the values-attitude-behavior triad, mainly evaluating the predictive relationships between human values and technology readiness applied to mobile commerce (m-commerce) in a brazilian context by applying structural equation modeling. The study presents a evaluation of the relationship between human values and TRI 2.0 in a brazilian context and a construction of a theoretical-conceptual model, relating human values, attitudes towards technology, and purchase intention using mobile. Quantitative research, applying structural equation modeling. The adopted method involved a quantitative approach, with multivariate, inferential, and descriptive analyzes, based on cross-sectionally collected data through an electronic questionnaire. By structural equation modeling, human values predicted technology readiness, and attitude predicted online purchase intention, using a mobile device. Self-enhancement and openness to change had a positive influence on the technology readiness contributor factor. To the inhibtor factor, self-transcendence had a negative influence while conservation showed a positive influence. Theoretical and methodological contributions were mainly the development of a conceptual model involving human values and technology readiness, applying structural equation modeling Management contributions were the presentation of informations concerning online purchase intention, using mobile and a new study results involving m-commerce

Keywords: Technology Readiness, M-commerce, Purchase intention, Human Values, Structural Equation Modeling

Are We Ready for New Technologies? The Relationship Between Human Values and Technology Readiness Applied to M-Commerce in the Brazilian context

ABSTRACT

This study describes the relationship between human values and technology readiness applied to mobile commerce (m-commerce) in Brazil. An online survey including the Portrait Values Questionnaire Revised (PVQ-R), Technology Readiness Index 2.0, and SES items, was applied in all Brazilian states (N=2,171). By structural equation modeling, human values predicted technology readiness, and attitude predicted online purchase intention, using a mobile device. Self-enhancement and openness to change had a positive influence on the technology readiness contributor factor, self-transcendence a negative influence on the technology inhibitor factor, while conservation showed positive influence on the same factor. Theoretical and managerial contributions were mainly the development of a conceptual model involving human values and technology readiness, and the presentation of information concerning online purchase intention using mobile. The study can also help on the development of public policies related to information security, aiming at increasing consumer confidence while using new technologies in the m-commerce.

Keywords: Human Values; Technology Readiness; M-commerce; Structural Equation Modeling, Purchase intention.

1. Introduction

In the digital era, the demand for internet seems to have become a primary need for people, with online orders for transportation, food, and entertainment (Silitonga, Fakhrorazi, & Ikhsan, 2020). E-commerce has changed consumer behavior and has become very important over the last years, especially due to the virtual means adopted in relationships between customers and companies (Fujihara & Montezano, 2018). Moreover, online commerce has intensively increased, which has led to new motivating and limiting factors for the use of electronic commerce (Dannenberg et al., 2020).

Consumers can shop by using their smartphones, simply by looking and paying for products to receive them at home (Shaw & Sergueeva, 2019). Smartphones have become essential for people (Chung & Lai, 2017; Haucke, 2018), enabling several new activities, with access to the internet and to different resources, anywhere, anytime, including mobile commerce (Chong, 2013). Mobile commerce (m-commerce) further expanded the limits of virtual commerce revolution (Al-Adwan et al., 2019). With the rapid development of m-commerce in the last decade, studies have suggested the need to understand consumer decision making, regarding the use of m-commerce (Sun & Chi, 2017), especially considering the context of fast changes that organizations had to face in order to initiate or intensify their sales of products and services electronically, due to the new scenario of pandemic (Dwivedi et al., 2020).

Even though m-commerce is getting stronger, with the increase in purchases and with expansion trends, some industries face consumer resistance (Heinze, Thomann & Fischer, 2017). In part, this may be due to the productivity paradox highlighted by Brynjolfsson and Yang (1996), that is, users' difficulties to understand and to access innovations, increasing frustration in dealing with technology-based systems. Koenigstorfer and Groeppel-Klein (2012) corroborate this idea by emphasizing that, although technological innovations are designed to optimize consumers' time, some consumers refuse to use them or reduce their use over time. Heinze et al. (2017) investigated consumers' resistance to m-commerce, and listed several studies on barriers to the adoption of technology innovations. These studies

showed cognitive, affective, and attitudinal aspects concerning resistance to change that characterize barriers in the adoption of new technologies.

In order to understand people's resistance and barriers regarding new technologies readiness, and the use of m-commerce, the Technology Readiness Index (TRI 2.0), by Parasuraman and Colby (2014), was chosen in the present study to analyze consumers, from the perspective of human values (Schwartz, 1994). Schwartz's theory of values is widely used to predict attitudes and behaviors, and is considered a landmark in studies around the world, in different contexts and situations (Sousa & Fontenele, 2019), including cases of consumer behavior (Arruda et al., 2016). The choice of the model TRI 2.0 was due to the fact that it is still little explored, and because it allows working with the individual consumer in the market environment. The TRI segments are applicable in profiling mobile users' overall technology-readiness (Wiese & Humbani, 2019).

One of the goals of this work is to contribute to studies involving the values-attitude-behavior triad, mainly evaluating the predictive relationships between these constructs. According to Radons et al. (2020), personal values are relevant factors for the propensity to use technologies. The principles or beliefs about behaviors will determine the inclination, positive or negative, towards technologies.

Considering the described context, the present research assumes that studies have indicated the relationship of influence between the triad values-attitudes-behavioral intention. Personal, organizational and cultural values have been explored in the field of research involving the social and corporate world, considering that values are evaluated as predictors of attitudes and behaviors. Nevertheless, studies involving the predictive relationship between human values, technology readiness (TRI 2.0), and m-commerce's purchasing intention, more specifically using the mobile for online shopping, are scarce in the literature. Hence, the objective of this work is to evaluate the relationship between human values and technology readiness applied to mobile commerce in the Brazilian context, in order to analyze the predisposition to the use of mobile device technology for online shopping, using the theory of human values as a predictor of technology readiness.

2. Literature Review

In the present section, theoretical foundations are presented for understanding the context and the constructs used in this research: mobile commerce, technology readiness, the relationship between attitude and intention to use technologies, and human values.

2.1. Mobile Commerce (m-commerce)

Mobile commerce has become a worldwide phenomenon due to the proliferation of mobile technologies and the growing popularity of mobile devices (Zheng et al., 2019) and mobile payments have disrupted and dominated markets in both the developing and the developed world (Humbani & Wiese, 2019). M-commerce is an electronic transaction carried out by a mobile device, using wireless connection (Sissing, Dlamini, & Johnston, 2017). Considering the existence of barriers and benefits in using m-commerce, this theme has been object of studies in several research lines around the world, exploring topics, such as factors that influence the use of m-commerce (Eastin et al., 2016; Sun & Chi, 2017), the paradox between personalization and privacy in the use of location-based mobile commerce (Lee & Rha, 2016), and the cannibalization effect of adopting m-commerce on purchases over the web channel (Huang, Lu, & Ba, 2016).

In addition to identifying the global multiplicity of studies, recent research related to m-commerce also brings up the drivers of m-commerce's customer satisfaction (Marinkovic & Kalinic, 2017) and the intention behind the use of m-commerce (Chi, 2018). According

to Chi (2018), positive attitudes related to m-commerce lead consumers to the practice of marketing using a mobile device, and that people tend to use a mobile device to the extent that they believe it will help them (Moraes et al., 2014).

Trust has been one of the main topics of studies on m-commerce (Hillman & Neustaedter, 2017), with security, design, and content being the main trust factors while using m-commerce websites (Nilashi et al., 2015). Nevertheless, according to Gao and Waechter (2017), who studied payments using a mobile, the nature of the virtual transaction creates risk and uncertainty about purchasing online, once it physically distances the person from the service provider.

Sarkar, Chauhan, and Khare (2020), by carrying out a meta-analysis with 118 empirical studies, identified that the antecedents of trust in m-commerce are: perceived usefulness, perceived ease-of-use, system quality, information quality, service quality, user interface, perceived risk, perceived security, structural assurance, ubiquity, and disposition to trust. Moreover, the authors pointed out that the consequences of trust in mobile commerce are attitude, user satisfaction, behavioral intention, and loyalty.

2.2. Technology Readiness (TRI)

Technology readiness refers to people's propensity to adopt and use new technologies in order to achieve personal goals at home and at work (Parasuraman, 2000). There are two phases of the Technology Readiness Theory (TRI), with the development of two scales: the TRI (Parasuraman, 2000) and the TRI 2.0 (Parasuraman & Colby, 2014). The theory presents two study dimensions, classifying the aspects of optimism and innovation as contributors of technology readiness, and the aspects of discomfort and insecurity as inhibitors of technology readiness. This indicates that the contributor factors tend to promote people's use of technologies, and the inhibitor factors tend to prevent it (Parasuraman, 2000).

The first TRI scale was proposed with 36 items to assess individual's perception of new technologies within the four aspects of analysis: optimism, innovation, insecurity, and discomfort (Parasuraman, 2000). As studies progressed, a new and optimized scale (TRI 2.0) was developed with only 16 items (Parasuraman & Colby, 2014), maintaining the objective of assessing people's readiness to adopt and use new technologies, covering the same four aspects of analysis.

The application of the first scale (TRI) has been taking place in several research fields, in different countries, and in combination with other models of technology acceptance. A study in Japan and in the United Kingdom revealed that technology availability alone may not necessarily become the most significant predictor of the use of online public services (Shirahada, Ho & Wilson, 2019), for instance. A study in the health area showed that the discomfort aspect was related to the lack of control over technology or to the overload of technology-based programs, indicating hesitation about using computers (Marhefka, Turner & Lockhart, 2019). Kim & Chiu (2019) analyzed the TRI in the sports area, concluding that the contributor factors have a positive influence on the perception of sports technology use, and the inhibitor factors have a negative influence on it.

Publications citing the TRI 2.0 scale have started in 2016. Penz et al. (2017) cited the TRI 2.0, however they did not apply it. Zaidi and Faizal (2017) also cited it, and acknowledged the difficulty in finding articles with the application of the TRI 2.0, once it is still a recent instrument, besides, there is a long cycle for publications' approval. The first effective publications using the referred instrument have begun in 2018. Mukerjee, Deshmukh, and Prasad (2018) used the TRI 2.0 to assess smartphone use in the self-checkout service, and concluded that Indian consumers were moderately ready for the use of new technologies. Wiese and Humbani (2019) applied the TRI 2.0, highlighting that mobile users

are optimistic about use, but are still unsure about the purchasing experience. For Huy et al. (2019), optimism and innovation influence the perception of technology use in Vietnam hotels, with statistically significant results.

2.3. Attitude and Intention to Use Technologies

Attitude has been a central object of studies in Social Psychology, and has been applied to behavioral assessments (Edison & Geissler, 2003). The concept of attitude is considered one of the most important for studies in Social and Consumer Psychology (Cacioppo, Gardner, & Berntson, 1999), once attitudes influence decisions and behaviors (Nowlis, Kahn, & Dhar, 2002). In the context of this research, attitude is understood from the perspective of Rosenberg and Hovland (1960), who proposed the concept of attitude, according to a hierarchical model composed of three components: affective, cognitive, and behavioral. Consumers learn through the relationship with social and physical environments (Moschis & Churchill, 1978), and acquire knowledge through the accumulation of information absorbed in the process of influence from social and environmental factors. If consumers believe that a certain technology can provide benefits, they will use it, and the attitude, benefits, and convenience perception serve as the basis for the interest in using it (Masudin et al., 2018).

Attitude is formed by beliefs and evaluations about objects, people, and situations (Ajzen & Fishbein, 1980). Kundu and Rani (2008) also state that the cognitive dimension is related to beliefs and thoughts about an attitude' object. The study of attitudes has been considered a multidisciplinary topic with respect to the internet, and some measurement scales have been applied (Mota, 2020).

In the present study, attitudes were evaluated from the perspective of m-commerce, specifically in the use of mobiles on online purchases, with questions that address the affective, cognitive, and behavioral intention dimensions, focused on the use of new technologies. With respect to technology, Shirahada, Ho, and Wilson (2019) point out that attitudes towards social interaction can affect the level of trust in online interaction. According to Rojas-Méndez, Parasuraman, and Papadopoulos (2017), the consistency between attitude and behavior can vary between countries due to cultural factors, therefore, it is important to conduct research in different countries for comparative purposes.

The intention to use technology, in turn, has been used as a dependent variable in the Technology Acceptance Model - TAM (Davis, 1989) and in the Unified Theory of Acceptance and Use of Technology - UTAUT (Venkatesh, Morris, Davis, & Davis, 2003), and has been explained, mainly, by the variables perceived usefulness and perceived ease-of-use. By adopting the TAM model, the intention to use technology was the object of a study with mobile users for m-commerce and m-payment (Kim et al., 2010), which are topics of interest to technology companies, financial institutions, and retail market. In the UTAUT model, the intention to use technology is analyzed from the perspective of performance expectations, expected results, facilitating conditions, and social influence. In the present study, the analysis regarding intention to use was carried out from the direct perspective of the attitude related to purchases using the mobile. Cheng, Sharma, Sharma, and Kulathunga (2020) demonstrated that performance expectation, habit, hedonic motivation, and facilitating conditions have positively affected the intention of continuous use of mobile application users, confirming that attitudes precede behaviors and can be used to predict behavioral intentions of use.

In an empirical study with Canadian smartphone users, Shaw and Sergueeva (2018) demonstrated that perceived value and hedonic motivation have a strong effect on intention to use technology. The research by Sun and Chi (2017) highlights that perceived usefulness

positively influences the intention to use m-commerce in the clothing market, and that there is a satisfactory explanatory power for consumers' intention to use m-commerce. Considering the technology readiness model TRI 2.0 and the interest in analyzing the relationship influence of human values on attitudes related to the use of m-commerce, the theory of human values is described below.

2.4. Human Values

Another construct adopted in the present study is that of human values by Schwartz (1994), widely used to predict attitudes and behaviors. Published articles involving human values using Schwartz's instrument have focused on quantitative research, adopting different versions of the Schwartz scales in different contexts, such as: Schwartz Value Survey (SVS), with 56 items (Coelho et al., 2019), Portrait Values Questionnaire-21 (PVQ- 21) (Madarie, 2017), and Portrait Values Questionnaire-52 (PVQ-52) (Martinez, Samaniego, & Moretin, 2015). The refined theory of human values (Schwartz et al., 2012) is configured in two ways, with four motivational types and 19 values, whose concepts are described in Table 1.

Table 1
Conceptual definitions of human values in the refined model by Schwartz et al. (2012)

Categories	Motivational Types	Values	Conceptual definitions in terms of motivational goals
Growth - Self-Expansion	Openness to Change	Self-direction (Thought)	Freedom to cultivate one's own ideas and abilities
		Self-direction (Action)	Freedom to determine one's own actions
		Stimulation	Excitement, novelty, and change
	Self-Transcendence	Humility	Recognizing one's insignificance in the larger scheme of things
		Benevolence (Dependability)	Being a reliable and trustworthy member of the ingroup
		Benevolence (Caring)	Devotion to the welfare of ingroup members
		Universalism (Concern)	Commitment to equality, justice, and protection for all people
		Universalism (Nature)	Preservation of the natural environment
		Universalism (Tolerance)	Acceptance and understanding of those who are different from oneself
Self-Protection – Anxiety-Avoidance	Self-Enhancement	Hedonism	Pleasure and sensuous gratification
		Achievement	Success according to social standards
		Power (Dominance)	Power through exercising control over people
		Power (Resources)	Power through control of material and social resources
	Conservation	Face	Security and power through maintaining one's public image and avoiding humiliation
		Security (Personal)	Safety in one's immediate environment
		Security (Societal)	Safety and stability in the wider society

Categories	Motivational Types	Values	Conceptual definitions in terms of motivational goals
Self-Protection – Anxiety-Avoidance (cont.)		Tradition	Maintaining and preserving cultural, family, or religious traditions
		Conformity (Rules)	Compliance with rules, laws, and formal obligations
		Conformity (Interpersonal)	Avoidance of upsetting or harming other people

Source: Schwartz et al. (2012).

With the refinement of the theory, some values, such as universalism, for instance, were broken down into subtypes, considering the adjacency in their understanding. Hence, universalism came to have three values: universalism (concern), universalism (nature), and universalism (tolerance) (Schwartz et al., 2012).

It is worth highlighting the meta-analysis developed to test the variance of basic human values in Brazil, using the Schwartz Values Inventory, which identified systematic differences in basic personal values between the five regions of Brazil (Torres et al., 2015). Torres, Schwartz, and Nascimento (2016) indicated that the instrument which measures the refined values is suitable for use with Brazilian samples, once it was possible to discriminate the 19 values in Brazil, representing an advancement in the measure previously used.

Some studies relating Schwartz's value model to technology were identified in the literature. Martinez et al. (2015) is an example of this type of research, in which the authors analyzed the relationship between values and video game consumption habits of 110 adolescents, highlighting that there are individualist and collectivist values. Capacity, success, and social recognition appear in 6 out of the 7 games examined, while daring, being useful, and loyalty appear in 5 out of the 7 video games most used by teenagers (Martinez et al., 2015). Bezerra (2016) emphasizes the questioning of the "self" in the dialogue and use of technology, characteristic of the self-enhancement value when the "self" is reflexively organized, seeking promotion and competitive favoring in social media.

Madarie (2017) analyzed the behavior of computer hackers and the motivations for debugging existing programs and designing new programs for destructive purposes. The characteristic related to self-transcendence and openness to change was found in the entire sample, indicating that intellectual challenge and curiosity were classified as the most important motivators for circumventing security systems. Nevertheless, aversion to conservation values was also characterized, indicating that hackers seem to be more motivated by what they do not like, and not by what they value (Madarie, 2017).

White, McMurray, and Rudito (2017), in turn, carried out a study with the theories of values and the Technology Readiness Index (TRI), however, focusing on Customer Perceived Value (CPV). The proposed model dealt with the relationship between the values of conservation, self-enhancement, and openness to change as predictors of technology readiness, using customers' perceived values regarding quality, price, emotion, and social aspects as mediators. The reduced value instrument with only 10 items was used, in addition to the 36-item TRI and the 19-item CPV instruments, different from the one proposed in the present study. The results indicated that the perceived values are mediators of the relationship between values and the TRI.

In this context, taking into consideration that Indahingwati et al. (2019) state that consumers' buying decisions involve emotional perceptions, and that consumption can take

place in a rational or irrational way, the present article proposes an analysis of the relationship between human values, technology readiness, attitude, and intention to use m-commerce, defining the hypotheses, as shown in Figure 1 and Table 2.
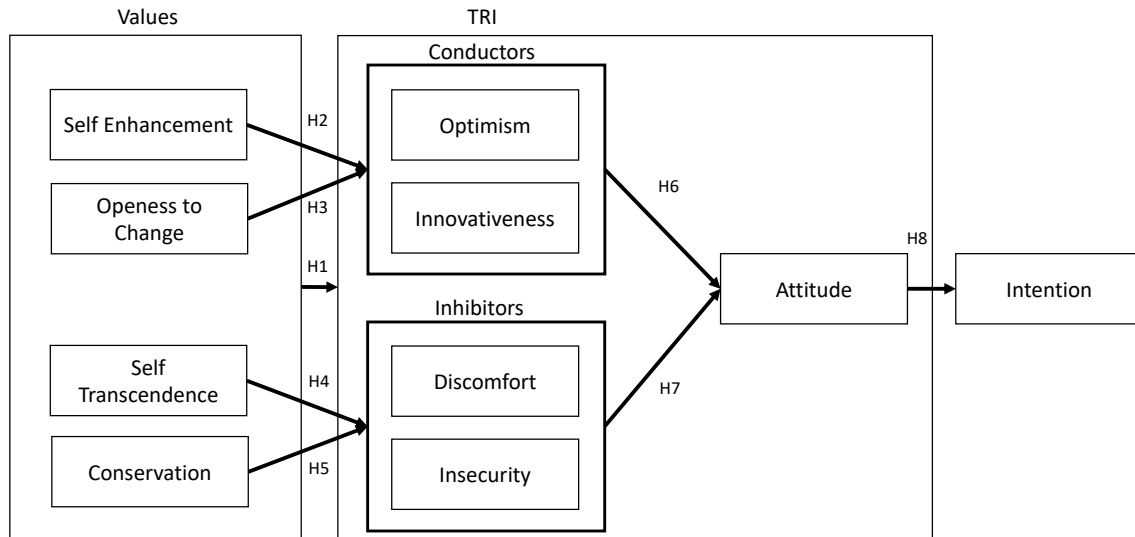

Figure 1. Theoretical-conceptual model of the relationship between human values and Technology Readiness Index (TRI 2.0)
Sources: elaborated by the authors

Table 2
Hypotheses

Code	Hypotheses
H1	Motivational types have an influence on attitudes regarding technology readiness.
H2	Self-Enhencement has a positive influence on the TRI contributor factor.
H3	Openness to change has a positive influence on the TRI contributor factor
H4	Self-transcendence has a positive influence on the TRI inhibitor factor.
H5	Conservation has a positive influence on the TRI inhibitor factor.
H6	The contributor factor has a positive influence on the attitude of online purchase intention, using mobile (m-commerce).
H7	The inhibitor factor has a negative influence on the attitude of online purchase intention, using mobile (m-commerce).
H8	The online purchase attitude using a mobile (m-commerce) has a positive influence on online purchase intention using mobile (m-commerce).

Sources: elaborated by the authors

3. Method

In order to evaluate the model (Figure 1), the adopted method involved a quantitative approach, with multivariate, inferential, and descriptive analyzes, based on cross-sectionally collected data through an electronic questionnaire.

3.1. Participants

The population defined for the present research was that of Brazilians older than 16, aiming at covering different ages, genders, and regions of the country. The final sample was composed of 2,171 people from all 5 geopolitical regions of Brazil. Once the target population tends to infinity, it was possible to use non-probabilistic convenience sampling (Cochran, 2007). Three analysis groups were established: youth, adults, and the elderly, based on the current national legislation criteria.

The survey participants presented the following profile by geographic region: North (5.9%); Northeast (17.3%); Midwest (30.2%); Southeast (32.8%), and South (13.4%). The distribution by sex was balanced, with 50.3% of women and 49.7% of men. The frequency by income was distributed as follows: Class A (14.7%), Class B (26.5%), Class C (44.2%), Class D (11.0%), and Class E (2,9%) (0.8% of respondents did not indicate income). The distribution by age group was: Youth (between 15 and 29 years old) (9.9%); Adults (between 30 to 59 years old) (82.0%); and Elderly (older than 59 years old (8.1%). The age distribution was based on Brazilian legislation regarding the elderly statute and the youth statute.

3.2. Instrument

The research instrument was composed of four blocks: presentation and informed consent form, scale of technology readiness, frequency of technology use, online purchase intention using the mobile, and scale of human values. On the first block, the participant was informed about the research purposes, guarantee of anonymity, information about the fact that the research obeyed the ethical principles of academic research, and, finally, there was a question of consent for voluntary participation. The research complied with the Brazilian Law 12.965/2014 on the principles of security and anonymity of research using the internet. Moreover, the Resolution 510/16 of the Brazilian National Health Council (CNS) establishes that public opinion surveys with unidentified subjects are exempted from an ethical analysis by the Research Ethics Committee (CEP) and by the National Research Ethics Commission (CONEP).

The second block contained the Technology Readiness Index - TRI 2.0 by Parasuraman and Colby (2014), which was adapted to the Brazilian context; the third block contained the scale of intention to use mobiles for online purchases; and the forth one contained the refined scale of human values for Brazil by Torres et al. (2016). At the end, questions for assessing sociodemographic data of the survey participants were included.

In order to translate the TRI 2.0 scale, the backtranslation procedures suggested by Brislin (1970) were followed. A total of six bilingual translators were consulted, including one certified translator, three of them translating from English into Portuguese and three of them from Portuguese into English. Then, the questionnaire went through the content validation process (Hernández-Nieto, 2002). The Content Validation Coefficient (CVC) was calculated, which evaluates the agreement between evaluators, regarding language clarity, representativeness (practical relevance), and theoretical relevance of the items. Five experts participated in the evaluation. The 16-item scale, segmented into two factors, presented Cronbach's alpha of 0.632 for the inhibitor factor and 0.736 for the contributor factor. The 5-point Likert scale was used (1- Strongly disagree, 2- Disagree; 3- Neither Agree nor Disagree; 4- Agree; 5- Strongly agree), and consists of 16 questions, segmented into 4 factors: optimism, innovativeness, insecurity, and discomfort.

The second scale was built in two parts, the first one the frequency of technology use with the 5-point Likert scale for frequency of use (1- Never; 2- Rarely; 3- Sometimes; 4- Frequently; 5- Always), and the second one regarding attitudes and online purchase intention using the mobile, using the 5-point Likert scale (1- Strongly disagree, 2- Disagree; 3- Neither Agree nor Disagree; 4- Agree; 5- Strongly agree). The 14 items were established based on the literature (Kim, Mirusmonov, & Lee, 2010; Moore & Benbasat, 1991; Parasuraman, 2000; Van der Heijden, Verhagen, & Creemers, 2003; Venkatesh & Davis, 2000; Yang & Yoo, 2004), and adapted to the research theme. The questionnaire went through the same content validation procedure (Cassepp-Borges, Balbinoti, & Teodoro, 2010), with the CVC calculation (Hernández-Nieto, 2002). The scale was composed of two factors: frequency of technology use ($\alpha = 0.717$) and online purchase intention using the mobile ($\alpha = 0.902$).

The third adopted scale was the PVQ-R (Portrait Values Questionnaire - Revised) by Schwartz et al. (2012), already validated for Brazil (Torres et al., 2016), but not yet explored under the aspect of influence of technology consumption in the country. The scale presents 57 items segmented into 19 motivational types, with Cronbach's alphas ranging from 0.676 to 0.891. The 6-point scale was used, ranging from 1 (= it looks nothing like me) to 6 (= it looks a lot like me).

3.3. Data collection and analysis procedures

Data collection was performed electronically, online, with dissemination on social networks and e-mails. The self-administered questionnaire was made available through an access link to the SurveyMonkey platform.

First, data was analyzed in detail and treated to meet the requirements established for the use of multivariate analysis (Marôco, 2010), using the SPSS software. The first step was a general database check-out, which initially presented 2,412 respondents. After analyzing missing data and outliers, using descriptive and graphical statistical analysis, 241 questionnaires were removed from the original database, remaining 2,171 valid cases.

The final sample was adequate to meet the assumptions for the application of multivariate statistical techniques (Hair et al., 2005), and did not indicate problems of collinearity between the variables, once the tolerance values were higher than 0.1 (Myers, 1990), and the Variance Inflation Factor (VIF) was lower than 10 (Myers, 1990).

Structural equation modeling was used to meet the objective of analyzing the influence of human values motivational types on technology readiness factors, considering attitudes and online purchase intention using the mobile. The parameters of the proposed model were estimated by using the Maximum Likelihood method, once it produces consistent, centered, and unbiased estimates (Hair et al., 2005; Marôco, 2010). This method does not require linearity between the variables, and is robust to the violation of the assumption of multivariate normality, as long as the asymmetry and kurtosis indexes of the distributions are not very high (Marôco, 2010).

In order to assess the influence of human values and technology readiness applied to m-commerce, the SPSS 22.0 AMOS software was used, which indicated the identifiability of the model with 569 degrees of freedom. After analyzing adjustment indexes, covariance of residuals, and estimated regression weights, it was decided to exclude the non-significant relationships and the variables with high correlation of residuals, in addition to establishing the covariance relationships between the variables indicated for the re-specification of the model (Marôco, 2010; Hair et al., 2005).

4. Results

High standardized residual covariance in the symmetric matrix were identified, indicating that the variables may distort the model, once they may influence normal distribution. Hence, the following variables were removed: a) human values: stimulation (ST), hedonism (HE), face (FAC), universalism-nature (UNN), benevolence-dependability (BED), and benevolence-care (BEC); b) technology readiness: figuring out technology without help from others (INN3), freedom of mobility (OPT2), dependence on technology (INS1); and c) attitudes related to the use of mobiles: ease-of-use when purchasing using the mobile (USECEL4), laziness in learning how to purchase using the mobile (USECEL7), and using personal information on the mobile (USECEL10). The correlation between the variables that were indicated by the modification indexes generated by the analysis was also performed. The model was, then, re-specified, as shown in Figure 2.
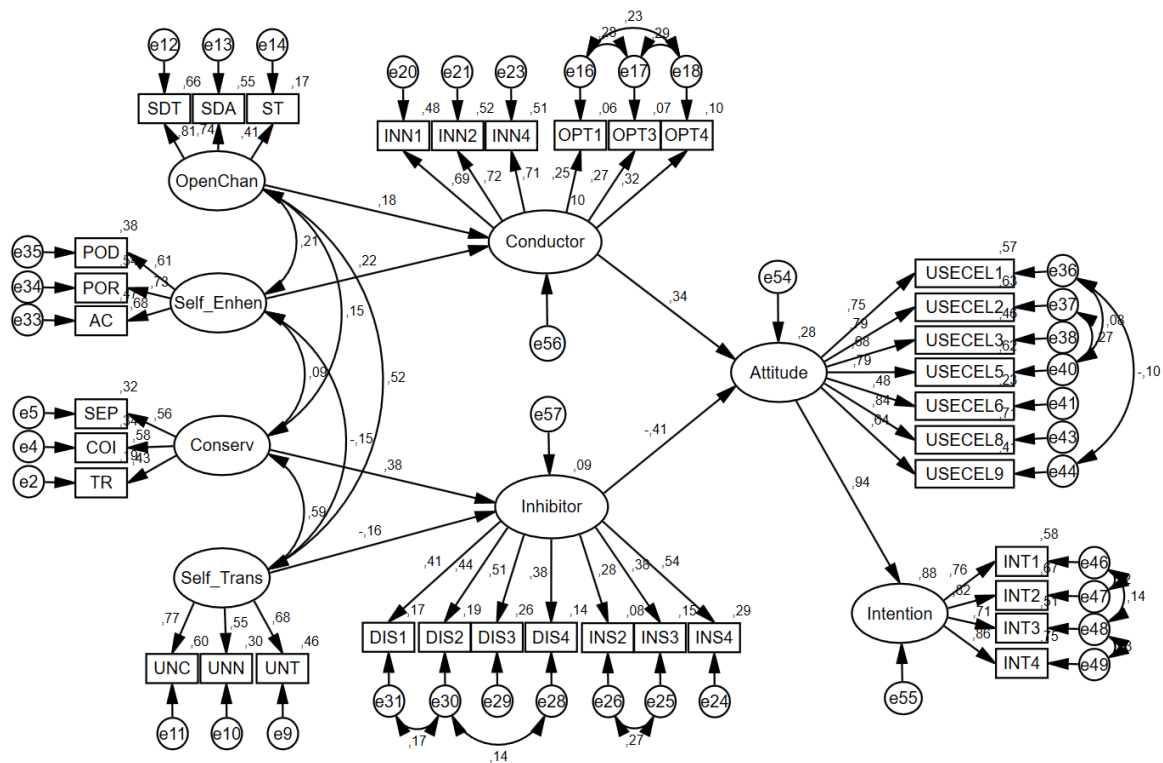
Figure 2. Re-specified Global Model of the relationship between human values, technology readiness, and attitude related to purchases using the mobile.

Sources: elaborated by the authors

Analysis of the re-specified model shows significant results ($X^2/g.l. = 5.242$; PGFI = 0.792; CFI = 0.911; GFI = 0.927; PCFI = 0.823; and RMSEA=0.044), with indexes meeting the criteria established by the literature (Hair et al., 2005), as shown in Table 3.

Table 3
Re-specified global model indexes

Adjustment indexes	Index	Result for the initial model	Result for the re-specified model	Criteria (Hair et al., 2005)
Absolute indexes	$\chi^2/g.l.$	7.991	5.242	$1 \leq \chi^2/g.l. \leq 5$
	p	0.000	0.000	<0.05
	GFI (AGFI)	0.836 (0.819)	0.927 (0.914)	>0.90
	SRMR	0.0706	0.0599	<0.10
Relative indexes	CFI	0.801	0.911	>0.90
	TLI	0.758	0.902	>0.90
Parsimony indexes	PCFI	0.757	0.823	>0.60
	PGFI	0.758	0.792	>0.60
Population discrepancy indexes	RMSEA	0.057	0.044	<0.10

Adjustment indexes	Index	Result for the initial model	Result for the re-specified model	Criteria (Hair et al., 2005)
Model comparison indexes	AIC	9106.495	3176.615	The lower, the better
	BIC	9754.351	3727.860	The lower, the better

CAIC	9868.351	3824.860	The lower, the better
ECVI	4.197	1.464	The lower, the better

Table 4 presents the estimates of the relationships between motivational types (MT) and technology readiness factors (TRI), in which the p-value column indicates that all relationships were significant at 5% level.

Table 4
Relationship estimates MT x TRI

MT	→	TRI	Estimate	S.E.	C.R.	p-value
OpenChan	→	Contributors	0.153	0.024	6.258	0.001
SelfEnh	→	Contributors	0.191	0.025	7.504	0.000
SelfTrans	→	Inhibitors	-0.083	0.024	-3.500	0.000
Conserv	→	Inhibitors	0.193	0.028	6.800	0.000

Note. S.E.: Standard Error; C.R.: Critical Ratio.

The results show that the motivational types of Openness to Change and Self-Enhancement positively influence the technology contributor factor. On the other hand, with respect to the technology inhibitor factor, the motivational type Conservation positively influences it, and the motivational type Self-transcendence negatively influences it. Table 5 presents standardized estimates of the relationships between motivational types and technology readiness indexes.

Table 5
Standardized estimates of the relationship MT x TRI

MT	→	TRI	Estimate
OpenChan	→	Contributors	0.176
SelfEnh	→	Contributors	0.219
SelfTrans	→	Inhibitors	-0.163
Conserv	→	Inhibitors	0.376

Table 6 presents the estimates of the relationships between technology readiness factors (TRI) and the attitude to purchase online using the mobile, in which the p-value column indicates that all relationships were significant.

Table 6.
Estimates of the relationship TRI X attitude to purchase online

TRI	→	Attitude to purchase online	Estimate	S.E.	C.R.	p-value
Contributors	→	Attitude	0.354	0.027	13.188	0.000
Inhibitors	→	Attitude	-0.741	0.068	-10.839	0.000

It is noted that the technology contributor factor positively influences the attitude to purchase online using the mobile, and the inhibitor factor negatively affects the same purchasing attitude. Table 7 presents the standardized estimates of the relationships between technology readiness factors and attitude factor to purchase online using the mobile.

Table 7.
Standardized estimates of the relationship TRI x attitude to purchase online

TRI	→	Attitude to purchase online	Standardized estimate
Contributors	→	Attitude	0.337
Inhibitors	→	Attitude	-0.415

Sources: elaborated by the authors

Table 8 presents the estimate of the relationship between the attitude to purchase online using the mobile in relation to the purchase intention and the standardized estimate, indicating that there was a significant result at 5% level. There is a positive influence of the attitude to purchase online on the purchase intention using the mobile. When the attitude grows by 1 standard deviation, the intention grows by 0.936, indicating strong positive relationship between the variables.

Table 8.
Estimates of the relationship attitude x purchase intention and standardized estimate

Purchase	→	Intention	Estimate	S.E.	C.R.	p-value
Attitude	→	Intention	1.127	0.027	41.090	0.000
Purchase	**→**	**Intention**	**Standardized estimate**			
Attitude	→	Intention	0.936			

Sources: elaborated by the authors

Based on the regression coefficients, it was possible to explain the dependent variables of the relationships, according to which human value variables explain 9.5% of the technology inhibitor factor and 9.5% of the technology contributor factor; the TRI variables explain 28.3% of the purchasing attitude variability; and the purchasing attitude has a high explanatory power of the purchase intention variability (87.7%).

According to the results presented, the tested model has adjustment indexes considered to be very good, according to the analysis criteria (Hair et al., 2005) established by the literature. All statistical results found are discussed in light of the literature review in the discussion section.

5. Discussion

According to the analysis of the theoretical-conceptual model proposed in this research, results indicate that motivational types of human values are predictors of technology readiness through their second-order motivational types. Self-enhancement, through the values of Power-Dominance, Power-Resources, and Achievement, has a positive influence on the technology contributor factor, indicating that people who seek success, excitement, challenges, and power through exercising control over people and through control of material and social resources are more willing to use technology. This result corroborates the study by Bezerra (2016), which states that people emphasize on social media aspects that competitively promote and favor their "self".

Openness to change has a positive influence on the technology contributor factor through the values of Self-direction (thought), Self-direction (action), and Stimulation, indicating that people who seek novelty, change, and freedom to cultivate their own ideas and determine their own actions have greater willingness to use technology. According to Baumeister (2010), the self is related to interpersonal relationships, once it does not emerge from within the person, but is formed by interactions and relationships with others, and

technology, through social media, increases these relationships, and helps in understanding the self.

Self-transcendence has a negative influence on the TRI inhibitor factor through the value of Universalism. At first, it was expected that people who scored high on Universalism would not be willing to use technology, however results showed an opposite relationship with technology inhibitor factors, indicating that those who value Universalism may be predisposed to technology. Arruda et al. (2016) highlight, for instance, that collaborative consumption is a global trend that is leveraged by individual, environmental, social, and economic motivations, as a way, using technology, to foster more conscious and sustainable consumption, intrinsic characteristics of Universalism.

Conservation, through the values of Conformity (interpersonal), Tradition, and Security (personal), has a positive influence on the TRI inhibitor factor, indicating that people who seek safety in their environment, preservation of traditions, and compliance with rules are not predisposed to technology. Hillman and Neustaedter (2017) highlight that, historically, one of the problems involving the adoption and use of electronic commerce is the trust that involves quality and security control. In this study about trust and m-commerce in North America, the surveyed groups demonstrated concerns of reliability regarding security while entering personal information over wireless networks.

With respect to the relationship between TRI and attitude to purchase online using the mobile, results show that the contributor factors positively predict attitude, indicating that innovativeness and optimism lead people to purchase using the mobile. The result goes along with what Moraes et al. (2014) state about purchases using the mobile and ability to use it, demonstrating that the higher the mobile's ease-of-use, the greater the consumers' motivation to use the service.

On the other hand, inhibitor factors negatively predict attitudes, indicating that insecurity and discomfort lead people not to purchase using the mobile. Walczuch, Lemmink, and Streukens (2007) conducted a survey, indicating that discomfort, a variable of the inhibitor factor, has an impact on the ease-of-use perception in which people feel overwhelmed with technology complexity. Moreover, insecurity leads people to perceive technology as less useful and difficult to use. Rojas-Méndez et al. (2017) evaluated that the younger people scored lower in discomfort and insecurity than the older ones. TRI results collaborate with management issues, once companies can launch educational programs for consumers who are not familiar with new technologies (for instance, the elderly) in order to reduce their discomfort and insecurity (Kim & Chiu, 2019).

At last, results showed that the purchasing attitude has a positive influence on the online purchase intention using the mobile. Optimism, that is, having a positive view towards technology and the belief that it offers greater control, flexibility, and efficiency to people's lives, can partly explain the intention of continued use (Pires & Costa e Filho, 2008). This result agrees to what was found in the study by Mohammadi (2015), in which attitude explains intention to use a bank using the mobile. Other studies have indicated that consumer's attitude and purchase intention are key predictors that influence the acceptance of technological services (Schierz, Shilke, & Wirtz, 2010; Puschel, Mazzon, & Hernandez, 2010). The results presented were based on the analysis of the proposed theoretical-conceptual model. Hypothesis results indicate that only hypothesis 4 was rejected, as showed in Table 9.

Table 9.
Hypothesis conclusion

Code	Hypothesis	Conclusion
H1	Motivational types have an influence on attitudes regarding technology readiness.	Not rejected

Code	Hypothesis	Conclusion
H2	Self-Enhencement has a positive influence on the TRI contributor factor.	Not rejected
H3	Openness to change has a positive influence on the TRI contributor factor	Not rejected
H4	Self-transcendence has a positive influence on the TRI inhibitor factor.	Rejected
H5	Conservation has a positive influence on the TRI inhibitor factor.	Not rejected
H6	The contributor factor has a positive influence on the attitude of online purchase intention, using mobile (m-commerce).	Not rejected
H7	The inhibitor factor has a negative influence on the attitude of online purchase intention, using mobile (m-commerce).	Not rejected
H8	The online purchase attitude using a mobile (m-commerce) has a positive influence on online purchase intention using mobile (m-commerce).	Not rejected

Sources: elaborated by the authors

6. Conclusion

The main objective of this study was to evaluate the relationship between human values and technology readiness, applied to mobile commerce in the Brazilian context. Seven of the hypothesis was not rejected, showing the influence of human values on technology factors. The result goes along with the findings of Radons et al. (2020) that personal values are relevant factors for the propensity to use technologies.

The theoretical contributions of the present study are related to researches on human values, on technology readiness (TRI) with validation and application of the new instrument TRI 2.0 in Brazil, and to the construction of a theoretical-conceptual model, relating human values, attitudes towards technology, and purchase intention using mobile. The proposed model complements the studies on the triad values-attitude-behavioral intention. Moreover, still from an academic perspective, this study contributed to the sequence of studies on technology acceptance and readiness (Davis, 1989; Parasuraman, 2000; Parasuraman & Colby, 2014; Venkatesh et al., 2003), in addition to being rare among the few studies that jointly involves the analysis of human values related to the technology readiness theory, in the perspective of use of mobiles for purchase purchases. The TRI 2.0 research instrument was evaluated, indicating the need for review, contributing to future studies on technology readiness.

From a market perspective, a managerial contribution of the research was to evaluate the online purchase intention using the mobile. The study indicated that the researched group is highly connected to technology and to mobiles, and there is a strong purchase intention using the mobile. The identification of factors related to technology consumption behavior yielded essential information for companies that deal with services that are influenced by technological advances. The high explanation of the purchase intention using the mobile demonstrates a potential market for applications and purchase stores for the entrepreneurial corporate world. Moreover, by working with human values, it is possible for marketing professionals to reach consumers with greater accuracy and ultimate success.

Inspite of the valuable results, the study has limitations that need to be considered when evaluating the analyzes. Although it was carried out in all Brazilian states, the sample was not representative for all states. The questionnaire was disseminated online, by using email and social networks, adopting the SurveyMonkey software, which de-characterizes the non-probabilistic sample of the survey. Hence, research cannot be extrapolated, once it addressed only those with access to the internet, turning it a research by convenience. Another limitation refers to the fact that other models related to technology adoption studies have already used other variables, such as social norms, which could increase the prediction capacity of the developed model, nevertheless, the objective proposed here was focused on the relationship of human values and the specific theory of technology readiness (TRI 2.0) by Parasuraman and Colby (2014).

The research was carried out, focusing on m-commerce, more specifically on purchases using mobile. Other technological services can also be studied based on the model that was proposed and tested, such as, for instance, the use of mobile applications and the consumption of virtual currencies, such as bitcoin, a new and current topic. Another study to be carried out refers to the evaluation of the model in other countries for comparative purposes of attitude towards new technologies and the use of m-commerce. The analysis of human values of consumers, bank customers, and telephone companies' customers can generate insights and sales and advertising actions. At last, it is possible to explore the inclusion of variables or the use of other technology models, such as the TAM and the UTAUT, along with the human values theory.

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