Why People Reject or Use Virtual Processes: A Test of Process Virtualization Theory

Completed Research Paper

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ABSTRACT

With the tendency of increasing virtualization of processes and services because of information technology, it becomes necessary to study this emerging phenomenon from a novel theoretical perspective. In this paper, we empirically investigate Process Virtualization Theory to contribute to an understanding of what factors affect the behavior of potential users when they face a virtual process. We are interested in why people reject or use virtual processes. Conceptually, we base our research on Process Virtualization Theory and we examine sensory requirements, relationship requirements, identification requirements, and control and synchronism requirements as antecedents of and their impact on attitude towards process virtualizability, user resistance, and virtual process use. We report on a survey-based pretest. We collected 190 completely answered questionnaires from users of online banking processes that are designed for monetary transactions. The results indicate that process characteristics in the form of requirements affect individual attitudes toward rejecting or using online banking processes.

Keywords

Process virtualization theory, user resistance, process virtualizability, process use, theory testing, pretest.

INTRODUCTION

Process virtualization is receiving increasing attention as an emerging paradigm in information systems (Overby, Slaughter and Konsynski, 2010). This paradigm shift refers to our understanding of today's increasingly "virtual" world: over the last decade, more and more commercial activities that have traditionally been conducted via physical channels are being conducted virtually by means of information technologies (Barth and Veit, 2011; Overby, 2008). For example, processes such as banking, grocery shopping, or travel check-in, which were previously delivered physically in branch offices and over the counter, are now increasingly conducted using the Internet (e.g., online banking, Fox and Beier, 2006; Pikkarainen, Pikkarainen, Karjaluoto and Pahnila, 2004). Some processes are more successful with virtualization while others are more successful with physical collaboration (Overby, 2008). This is supposedly due to the fact that some processes are more suitable for virtualization than others (Overby, 2008). *Process Virtualization Theory (PVT)* has been developed to explain this variance in virtualization success. PVT proposes a set of constructs and relationships to explain and predict how suitable a process is to being conducted in a virtual environment (Overby, 2012). However, it needs to be stressed that, ultimately, the individual customers decide whether they prefer to perform a process in the traditional (physical) or in a virtual manner. Thus, customer opinion and perception are important aspects when deciding whether a process can be virtualized, what virtualization solutions should be employed, and which processes are appropriate for virtualization. As a result, process virtualizability must be analyzed from an individual's perspective and the influencing factors have to be defined accordingly (Barth and Veit, 2011).

Due to this fact, researchers interested in process virtualization so far have investigated the use of information technology (IT) and process virtualizability from two sides. On the one hand, researchers seek to explain whether processes are suitable for migration into virtual environments before an IT artefact has been implemented in order to virtualize the process; on the other hand, after an IT artefact has already been implemented and a process has been virtualized for some time, researchers seek to explain how and why individuals actually conduct or reject a virtual process that is supported by IT (Overby and Konsynski, 2010). However, given the relative novelty of PVT, there has been little empirical testing (Overby, 2012). Only few studies have tried to investigate the virtualizability of specific (virtual) processes, or have tried to uncover the effects of

different requirements that influence people in their usage of different features of IT during the conduction of (virtual) processes (Barth and Veit, 2011). Until now, there is a scarcity of empirical studies that explore factors which capture the influence of process characteristics and users' perceptions of them on the virtualizability of processes.

Thus, there is a need for empirical studies of PVT in order to test whether the theory helps us to understand how different process characteristics actually influence the intention of people to conduct and execute IT-mediated processes virtually. This leads to our central research question in this paper: "*What is the impact of perceived process characteristics on process virtualizability and resistance to use the process virtually?"*

In order to address this question, we propose a research model that is based on PVT. We use the model to investigate perceived process characteristics from the users' perspective and demonstrate that these characteristics influence process virtualizability as well as users' resistance to conduct the process virtually. This enables us to test whether and how well PVT can explain the virtualization of a specific process. We seek to confirm and test PVT with an empirical study and aim at providing more insights regarding the question why different types of people do or do not use a virtual process, and why different types of people perceive a virtual process as useful or usable – the antecedents of usefulness and usability of the virtual process.

The remainder of this paper is structured as follows. In the next section, we provide an overview of PVT. Based on the theory, we then develop and present our research model, our hypotheses, and the underlying constructs. Following this, we describe our research methodology and our data collection process as well as the measurement items that we used for conducting a pretest. This is followed by the results of the data analysis. In the concluding section, we summarize and discuss the most important outcomes of our pretest and give an outlook on further research.

RELATED WORK AND THEORETICAL BACKGROUND

PVT provides a general theoretical starting point for the investigation of factors that affect the virtualizability of a process from the customers' or users' perspective. In this context, Overby (2008) defines a "process" as a set of steps to achieve an objective, and applies to activities engaged in by organizations, individuals, and society in general; a "virtual" process is a process in which physical interactions have been removed. PVT has been designed to explain and predict whether a process is amenable or resistant to being conducted virtually. In addition, it describes how amenable a process is to being conducted without physical interaction between people or between people and objects (Overby, 2008).

According to PVT, some service processes are more amenable to virtualization than others. The main dependent variable in PVT is thus *process virtualizability*, which describes how suitable a process is to being conducted after the traditional physical interaction between people or between people and objects has been removed (Overby, 2008; Overby, 2012).

The main independent constructs and propositions of PVT are the characteristics of a process. Overby (2008) proposes four main process characteristics that can be used to assess how suitable a specific process is for virtualization: (a) sensory requirements, (b) relationship requirements, (c) synchronism requirements, and (d) identification and control requirements.

Sensory requirements describe the need of users or process participants to be able to enjoy a full sensory experience of the process as well as of the other process participants and objects. Such sensory experiences include seeing, hearing, smelling, tasting, and touching other process participants or objects, as well as the overall sensation that participants feel when engaging in a process, such as excitement (Overby, 2008, p. 280). *Relationship requirements* define the need for process participants to interact with one another. Such interactions often lead to knowledge acquisition, trust development, and friendship development (Overby, 2008, p. 281). *Synchronism requirements* relate to the degree to which the activities that make up a process need to occur quickly with minimal delay (Overby, 2008, pp. 281-282). *Identification and control requirements* specify the degree to which the process requires unique identification of process participants and the ability to exert control over their behaviour (Overby, 2008, p. 282).

According to PVT, each of these requirements is proposed to have a negative effect on process virtualizability; as each requirement increases, the process becomes less amendable for virtualization. In doing that, PVT in principle tries to open up the black box of the IT artefact (which is often treated as a whole) and allows us to focus on specific (perceived) characteristics of a virtual process. However, so far, we are only aware of few studies that try to corroborate these propositions of PVT (Barth and Veit, 2011; Overby and Konsynski, 2010). Therefore, our study is among the first attempts to test the key factors of PVT.

RESEARCH MODEL

Based on the foundation described in the previous section, Figure 1 presents and summarizes our preliminary research model, which shows the main constructs and their relationships. The *perceived process characteristics* stem directly from PVT and describe how amenable a process is to being conducted, from the perspective of a user, without physical interaction between people or between people and objects (Overby, 2008, p. 279). They are characterized by sensory requirements, relationship requirements, synchronism requirements, and identification and control requirements.

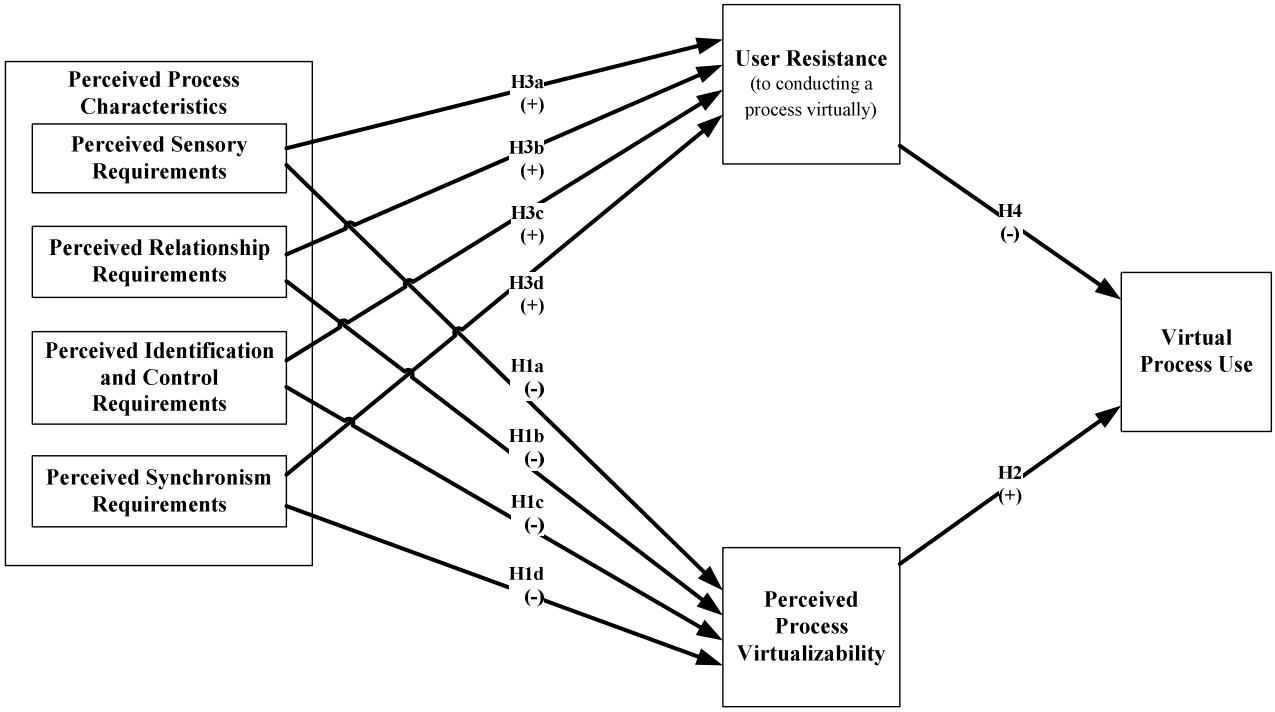

Figure 1: Research Model

According to PVT, these factors have a negative effect on the virtualizability of a process. The higher the requirements of a process are (concerning the sensory, relational, control and synchronism experience), the less will people execute a process virtually. Processes that rely on those factors provide additional information to process participants who need the contextual information in order to execute a process. For this reason, from a user's point of view, if a process is not amenable to virtualization, this will have a negative effect on process virtualizability. Therefore, we propose:

> ***H1a.*** *The higher the perceived sensory requirements of a process, the lower is perceived process virtualizability.*
>
> ***H1b.*** *The higher the perceived relationship requirements of a process, the lower is perceived process virtualizability.*
>
> ***H1c.*** *The higher the perceived identification and control requirements of a process, the lower is perceived process virtualizability.*
>
> ***H1d.*** *The higher the perceived synchronism requirements of a process, the lower is perceived process virtualizability.*

We assume that low levels of virtualizability in process characteristics (i.e., high levels of requirements) have a negative impact on process virtualizability.

Process virtualizability reflects the degree to which a process is suitable to being conducted without any physical interaction. Therefore, process virtualizability reflects proactive intentions to use a virtual process, and thereby we expect it to lead to the increased use of the virtual process (Laumer and Eckhardt, 2012). Therefore, we hypothesize that:

> ***H2.*** *The higher perceived process virtualizability, the higher is virtual process use.*

The perceived process characteristics will have a positive influence on the users' resistance to conduct the process virtually. User resistance can be understood as the action of resisting, which means withstanding an action or effect and trying to prevent by action or argument (Laumer and Eckhardt, 2012, p. 65; Spanes and Stevenson, 2005). In this case, user resistances means that users refuse to execute a process virtually. Users who expect higher sensory requirements, relationship requirements, identification and control requirements, and synchronism requirements tend to resist conducting a process virtually. For this reason, we also propose:

H3a. *The higher the perceived sensory requirements of a process, the higher is user resistance.*

H3b. *The higher the perceived relationship requirements of a process, the higher is user resistance.*

H3c. *The higher the perceived identification and control requirements of a process, the higher is user resistance.*

H3d. *The higher the perceived synchronism requirements of a process, the higher is user resistance.*

Furthermore, user resistance will have a negative effect on virtual process use (Bhattacherjee and Hikmet, 2007). This is because users will perceive that necessary haptic and interactive information are missing when a process is virtualized. Those information would be necessary for these users in order to still execute the same process. Therefore, the expected negative effect of resistance on virtual process use is formally hypothesized as:

H4. *The higher user resistance of a virtual process, the less is the virtual process use.*

RESEARCH METHODOLOGY

Data Collection

Due to the fact that studies of PVT are scarce to date and empirical testing of PVT is nascent (Overby, 2012), our strategy was to study one specific process in depth, which exists in both physical and virtual versions. We chose the *"online banking" process*, which is designed for conducting monetary transactions via the Internet, as a scenario for a pretest survey and collected data from students in Germany who use (or do not use) the online banking process for monetary transactions. We chose the "online banking" process for two reasons. First, this option allows analyzing the process characteristics for different variants of the same process. Second, online banking is one of the most widely applied forms of monetary transactions. This makes online banking a particularly interesting context for the current study. The students attended an undergraduate information systems course during the winter term 2012. In total, we collected 203 responses and 190 were answered completely. The resulting distribution of survey respondents ranged from 18 to 40 years of age with 53% male compared to 47% female respondents.

Measurement

Based on the theoretical foundations, we used a questionnaire-based survey design to test our research model. For the process characteristics, we used and adapted items from existing studies that have already developed scales for testing PVT (cf. Table 1). We followed the guidelines of Moore and Benbasat (1991) to adjust the wording to our setting and to assess content validity. According to Overby (2012), process virtualizability can be measured either as adoption/use of a virtual process or as the quality of the outcomes of the virtual process – which is what we propose to do in this study (Overby, 2008, p. 279). Our items for the perceived process virtualizability construct therefore include statements that grasp the overall usability or benefits of the virtual process, for example, if the process conveys the feeling of control or provides time savings or other benefits. All items were operationalized on 7-point Likert scales, with answer choices ranging from "strongly disagree" (1) to "strongly agree" (7).

Table 1 summarizes our measurement instruments, including key references. We used PLS to assess the properties of our scales and to test our research model (Hair, Ringle and Sarstedt, 2011). Internal consistency and convergent validity were examined by assessing item loadings, composite reliability, and average variance extracted (AVE). All factor loadings are significant (Table 1) and lie above the recommended threshold of 0.7 (Hair et al., 2011). Composite reliabilities (CR) are above 0.8 and each AVE is above 0.50 (Table 2), indicating that the measurements are reliable and the latent construct can account for at least 50 percent of the variance in the items. Discriminant validity was also achieved since the correlations between each pair of latent variables are less than the square root of AVE (Fornell and Larcker, 1981).

In order to check for common method bias, we conducted a Harman's One Factor Test (Podsakoff and Organ, 1986). The results show that the largest factor did not account for the majority of the variance in the variables (46%). This reduces the likelihood that method bias significantly affects the study results (Podsakoff, MacKenzie and Podsakoff, 2003).

Construct	Item (translated from German)		Factor Loadings	References
Perceived Sensory Requirements (SR)	SR1	While I am conducting the monetary transactions process, I like to be able to see and touch relevant documents.	0.89***	Based on (Barth and Veit, 2011; Overby and Konsynski, 2010)
	SR2	While I am conducting the monetary transactions process, I would like to personally see and ask the responsible bank personnel.	0.78***	
	SR3	I need to touch and verify relevant documents before I perform a monetary transaction.	0.70***	
Perceived Relationship Requirements (RR)	RR1	Personal contact and informal interaction with the responsible employees is important to me.	0.84***	Based on (Barth and Veit, 2011; Overby and Konsynski, 2010)
	RR2	It is important to me that I am advised personally by the responsible personnel.	0.88***	
	RR3	I visit the local branch office of my bank because I enjoy talking to the responsible employees who are present during the different processing steps of the monetary transaction process.	0.82***	
	RR4	I prefer to be advised in person by the responsible employees who are present during the different processing steps of the monetary transaction process.	0.85***	
Perceived Identification and Control Requirements (ICR)	ICR1	I have no control over my personal information and data while conducting online banking.	0.77***	Based on (Overby and Konsynski, 2010)
	ICR2	The personal identification mechanisms that are used in online banking are not safe.	0.89***	
Perceived Synchronism Requirements (SCR)	SCR1	It is important to me that my payment will be carried out as soon as possible.	0.75***	Based on (Barth and Veit, 2011; Overby and Konsynski, 2010)
	SCR2	I think that my payments are carried out faster using online banking.	0.89***	
User Resistance (UR) (to conducting a process virtually)	UR1	If I had a choice, I would prefer to carry out my payment and my monetary transactions on-site in a local branch office of my bank instead of using the online banking process.	0.86***	Based on (Barth and Veit, 2011)
	UR2	Instead of online banking, I prefer the personal advice by the responsible employees on-site in a local branch office.	0.84***	
	UR3	I would not carry out my payments and my monetary transactions online.	0.85***	
	UR4	I can well imagine that I will use online banking in the future. (reverse)	0.83***	
Perceived Process Virtualizability (PPV)	PPV1	Overall, online banking supports my needs to manage my payments.	0.89***	Self-developed
	PPV2	The use of online banking increases the control of my payments.	0.73***	
	PPV3	Online banking spares me the way of going to the bank.	0.77***	
	PPV4	Through online banking I save time to manage my payments.	0.83***	
	PPV5	Online banking completely replaced traditional payments.	0.75***	
	PPV6	Overall, online banking facilitates my payment transactions.	0.91***	
	PPV7	Through online banking I save time in payment transactions.	0.87***	
Virtual Process Use (PU)	PU1	I use online banking regularly.	0.97***	Based on (Kankanhalli, Tan and Wei, 2005; Lin and Huang, 2008)
	PU2	How often do you use online banking?	0.97***	
	PU3	I use online banking to the full extent.	0.92***	

Table 1: Measurement Scales (*p<0.001, **p<0.01, *p<0.05)**

Construct	Composite Reliabilities	AVE	ICR	UR	PU	PVA	RR	SCR	SR
ICR	0.82	0.69	0.83						
UR	0.91	0.71	0.52	0.84					
PU	0.97	0.91	-0.37	-0.74	0.95				
PPV	0.94	0.68	-0.42	-0.80	0.72	0.82			
RR	0.93	0.69	0.32	0.65	-0.43	-0.47	0.83		
SCR	0.81	0.68	0.25	0.48	-0.44	-0.65	0.32	0.82	
SR	0.83	0.63	0.40	0.66	-0.49	-0.55	0.67	0.29	0.79
Diagonal elements represent the square root of the AVE. Off diagonal elements are the correlations.									

Table 2: Reliabilities and Correlation Matrix

DATA ANALYSIS AND RESULTS

The structural model was assessed by examining significance levels of path coefficients. Figure 2 provides the R^2 and path coefficients along with their respective significance levels. We found that not all specified paths between constructs in our research model had significant path coefficients. The relationship between "perceived relationship requirements" and "perceived process virtualizability" is not significant (H1b). However, we found support for the other relationships between perceived sensory requirements, perceived identification and control requirements, perceived synchronism requirements, and process virtualizability. As for the links between the virtualization factors and user resistance, we found that all constructs positively affect user resistance. We also found support for the link between user resistance and virtual process use and for the relationship between process virtualizability and virtual process use.

R^2 values indicate the amount of variance in the construct that is explained by the path model. The results as shown in Figure 2 indicate that the model explained 63.5% of variance in user resistance and 58.5% in process virtualizability. Furthermore, 50% of variance in virtual process use could be explained by the model as well.

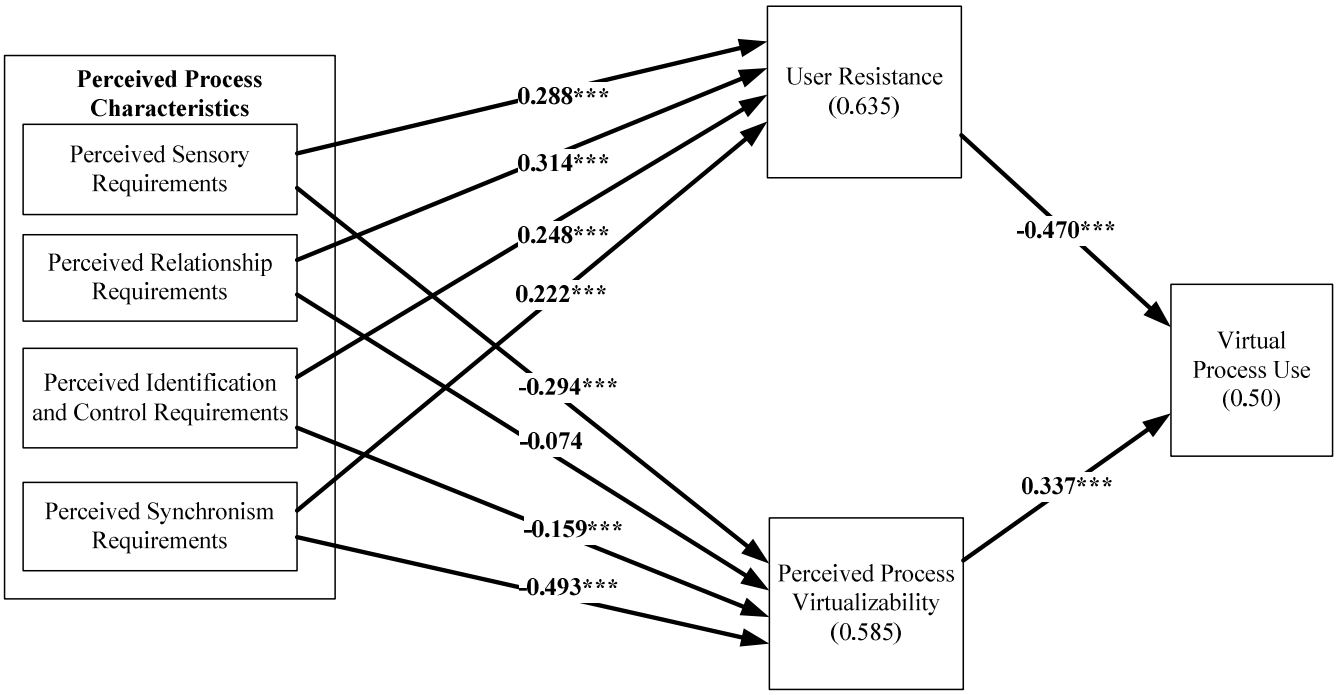

Figure 2: Summary of Model Results (R^2 are reported in parentheses, Path Significance: ***p<0.001, **p<0.01, *p<0.05)

DISCUSSION AND CONCLUSION

In this paper, we developed and tested a research model that is based on PVT. This paper is among the first attempts to test the key factors of PVT and their influence on the virtualizability or rejection of a virtual process. We presented a research model to assess perceived process characteristics from the user's perspective and demonstrate their influences on process virtualizability as well as on users' resistance to conduct a process virtually. We provided empirical evidence for the validity of PVT, and demonstrated that our model is statistically significant and well constructed.

We contributed to the knowledge of PVT by developing items for perceived process virtualizability. Our results showed that PPV is an important factor that does have an effect on virtual process use. Additionally, we also included the construct of perceived control and identification requirements and found some evidence that this construct impacts user resistance as well as process virtualizability. Our study therefore confirms and extends the results as introduced by Barth and Veit (2011).

An unexpected result is the lack of a direct relation between perceived relationship requirements and process virtualizability. This may indicate that our participants do not require any direct help for the banking processes, although we had expected a strong correlation. In contrast, the relation between perceived relationship requirements and user resistance is high and significant. In general, the more importance the participants put on the characteristics of the process, the less useful becomes a virtualization of the process.

The results of our pretest are a first step to provide significant and relevant contributions to both academia and practice. From an academic point of view, a major contribution of our research is a test of PVT to develop and to understand why people do or do not use a virtual process. From a practitioner point of view, the research model will help organizations to develop more effective IT strategies and better leverage technologies by identifying the right process characteristics to match certain processes that can be virtualized.

The conducted analysis in this research has several limitations that will serve as a springboard for our future research. First, the survey was only intended as a pretest and conducted in a short time, resulting in a single point study. Further research efforts with longitudinal studies (cohort studies) will give a clearer picture of how the users and the relationships among constructs change over time. Second, we collected our data only from students. About 99% of the respondents were young people under the age of 24, and thus the age distribution was not symmetric between men and women, young and older people, as well as families. Therefore, the results of the current empirical study might tend to model the specific behavior of young people, rather than general behavior of all users. Thus, there is a need to empirically test PVT with a sample that is

closer to the real population of online banking users. Hence, the generalizability of the study is limited. In a future study, we will conduct a larger cohort study in different contexts and evaluate the proposed model with wider and diverse populations across various cultures.

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