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Recommended Citation

Mehler, Maren; Turan Akdag, Merve; and Zöll, Anne, "Exploring the Effect of National Culture on Emerging Technologies: A Glimpse into the Future" (2023). *PACIS 2023 Proceedings*. 12.

<https://aisel.aisnet.org/pacis2023/12>

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Exploring the Effect of National Culture on Emerging Technologies: A Glimpse into the Future

Completed Research Paper

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Abstract

As organizations become increasingly globalized, understanding the impact of national culture on the successful usage and adoption of emerging technologies is crucial. National culture influences the strategies of organizations, for instance how the employees successfully adopt and use emerging technologies. While the effect of national culture has been widely observed in information systems, it is still challenging to measure the influence of national culture on the usage and adoption of emerging technologies. To contribute to the existing body of knowledge, we conducted a structured literature review on how previous work measured national culture to provide a starting point for further theory development. For instance, our findings emphasize the need to measure culture at an individual level. Finally, we developed a research agenda to provide a starting point for developing theories to measure the influence of national culture on emerging technologies.

Keywords: National Culture, Emerging Technologies, Research Agenda, Cultural Theories

Introduction

In recent decades, economic interdependencies have increased sharply worldwide. The scarcity of resources during the pandemic exemplifies how strong the international interdependencies are (OECD, 2020). International stakeholders operate across national borders and rely on many different cultures working together to ensure the organization's success. Employees of various national cultures collaborate between different organizations. Expanding product and digital service offerings to an international market can greatly benefit organizations by increasing their potential sales market and enhancing overall organizational success (Wulf et al., 2017). At the same time, emerging technologies can support organizations in cross-border collaboration and sales. To effectively cater to customers from diverse cultural backgrounds, organizations must possess a comprehensive understanding of cultural differences (Moser & Deichmann, 2021). A deep cultural understanding plays a pivotal role in fostering teamwork for successful adoption of emerging technologies, as well as in retaining and attracting international customers, both of which are indispensable for organizational success (e.g., Fang et al., 2011).

The challenges that emerge when crossing cultural boundaries primarily pertain to the diminished effectiveness of management processes. This issue arises when a multinational organization disregards national cultural differences and attempts to apply management practices developed by subsidiaries in their own cultural context, which have already proven effective within that specific culture. Recognizing and comprehending cultural variations is critical and it must be acknowledged that due to these differences, there is no one-size-fits-all approach for running an organization and adopting emerging technologies to push innovation forward (Trompenaars & Woolliams, 2003). Over the past decades, there has been a growing interest in Information Systems (IS) research literature on the impact of national cultural differences in IS research field (Myers & Tan, 2002). Previous studies have investigated the characteristics of various cultures that might systematically influence whether and for what reasons nations adopt available emerging technologies (e.g., Kim et al., 2016; Sharma et al., 2022). In general, these studies agree that national culture is important as understanding culture and its impact can lead to a successful deployment of emerging technologies in a global environment (Ives & Jarvenpaa, 1991; Myers & Tan, 2002; Shore & Venkatachalam, 1996). To capture differences between national cultures, many authors have already investigated the effect of national culture and developed measurement instruments for national culture (e.g., Fukuyama, 1995; Hall & Hall, 1990; Hofstede, 2011). However, there is ongoing criticism regarding the application of Hofstede's dimensions at both the individual and organizational levels, as these dimensions primarily reflect country-level analysis and fail to fully explain individual behavior (Venaik & Brewer, 2013, Srite & Karahanna, 2006). Furthermore, Hofstede's concept of national culture assumes a correlation between cultural differences and the territorial boundaries of a nation, which seems unrealistic given that within a single nation or organization, many individuals from different national cultures work together (Myers & Tan, 2002). Moreover, the notion that each nation has its own national culture considered is inherently not correct, and nations continue to change in their form and makeup, which means national culture has a dynamic component (Myers & Tan, 2002). Thus, the call of researchers is related to developing new theories and measurements in the field of the effect of national culture on emerging technologies (Myers & Tan, 2002). To take the first steps in this direction, we examine how previous literature has defined and measured the impact of national culture, and we aim to answer the following research question (RQ): *How previous research has measured the influence of national culture on emerging technologies, and what promising avenues exist for future research in this field?*

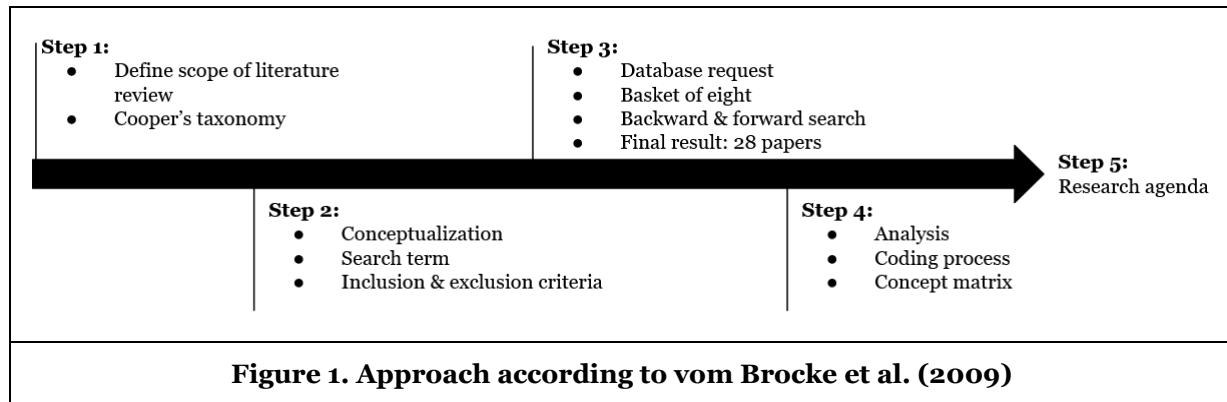
To answer this RQ, we conducted a structured literature review according to vom Brocke et al. (2009). This methodology allowed us to provide an overview of existing operationalization and to identify future research steps. To the best of our knowledge, Chu et al. (2019) are the only ones that dedicated their research on a structured literature review related to the measurement of national culture in IS. However, our study differs regarding three aspects: First, we considered recent work from the time period 2000-2022 (instead of 2006-2016). Second, we focused on the adoption and usage of emerging technologies in organizations, while Chu et al. (2019) examine general IS literature. Third, we focused on the effect of national culture and examined papers that adopted national culture as a moderator. Chu et al. (2019) also analyzed papers that address the influence of culture and considered national culture as an independent variable. However, according to Baron and Kenny (1986) the manipulation through personal or situational variables such as age or gender should be measured as moderators. Given that culture is inherently individualistic (Srite & Karahanna, 2006), our interest lies in comprehending the extent to which the connection between independent and dependent variables can be amplified or diminished by the moderating influence of culture.

We contribute to research by providing a starting point for developing new theories in the field of national culture by first presenting a concept matrix of how the effect of national culture has been measured in IS research. In this matrix, we highlight which theories have been used in national cultural research. Second, we present a research agenda aimed at advancing the understanding of the influence of national culture on emerging technologies, thus paving the way for future research in this domain.

The rest of this paper is structured as follows: Section 2 outlines the methodology chapter. We present the methodology early in the paper since the different identified theories in the structured literature review are also part of the results. In the third chapter, we describe the theoretical background. After outlining the most commonly used theories, we show the findings of our structured literature research in chapter four. Subsequently, we present the research agenda and conclude the paper with the contribution, limitations, and future research.

Methodology

To answer the RQ on how the effect of national culture was measured in IS research and influenced the adoption of emerging technologies, we conducted a structured literature review according to the approach of vom Brocke et al. (2009). As shown in Figure 1, this framework suggests five steps: 1) definition of review scope, 2) conceptualization of the topic, 3) literature search, 4) analysis and synthesis, and 5) research agenda.



In **step 1**, we defined the scope and set up goals according to Cooper's taxonomy, as shown in Table 1 (Cooper, 1988). The taxonomy consists of six characteristics that provide researchers with general guidance for a successful structured literature review. The categories comprise focus, goal, organization, perspective, audience, and coverage. We discussed the *focus* at the beginning of the research project, which primarily examines the effect of national culture on the adoption and usage of emerging technologies. In particular, we decided to concentrate on papers which used national culture as a moderator as culture is an individual trade (Srite & Karahanna, 2006) influencing existing relationships between independent and decanted variables, which should be measured as a moderator according to Baron and Kenny (1986). Therefore, out of scope are papers that consider culture as, e.g., an independent variable. The *goal* of this structured literature review is to develop a research agenda and pave the way for further research. Our paper is *organized* conceptually since we aim to develop a concept matrix that structures the previous literature according to the recommendation of vom Brocke et al. (2009). In general, we took a neutral *perspective*. The *audience* is either general researchers or scholars specializing in the impact of national culture on the adoption and usage of emerging technologies. Finally, we chose a representative *coverage*, i.e., we provide individual examples from literature to represent a larger amount of topics.

Characteristics	Categories			
Focus	Research outcome	Research methods	Theories	Applications
Goal	Integration	Criticism	Central issues	
Organization	Historical	Conceptual	Methodological	
Perspective	Neutral representation		Espousal of position	
Audience	Specialized scholars	General scholars	Practitioners	General public
Coverage	Exhaustive	Exhaustive/selective	Representative	Central/pivotal

Table 1. Taxonomy according to Cooper (1988)

In **step 2**, we conceptualized the literature review. Since our aim was to provide broad coverage of the previous literature on how the influence of national culture on emerging technologies is measured, we agreed on the general search term "culture" OR "cultural". Since we focused on measuring the effect of culture on emerging technologies, we defined the following inclusion criteria: i) The paper examined

national culture in organizations, ii) the paper compared different countries concerning their effect of national cultures on the adoption and usage of emerging technologies, iii) national culture was designed as a moderator, and iv) to ensure representative coverage of high-quality papers, we considered papers of the basket of eight journals. In addition, we defined the following exclusion criteria: i) We do not consider papers published before 2000 to focus on the more recent literature, ii) we do not consider papers where culture was designed as an independent variable, and iii) we exclude papers with a focus on organizational culture since our research subject concentrate on national culture.

In **step 3**, we queried the databases Web of Science and specifically considered the basket of eight journals: European Journal of Information Systems, Information Systems Journal, Information Systems Research, Journal of the Association for Information Systems, Journal of Information Technology, Journal of Management Information Systems, Journal of Strategic Information Systems, and MIS Quarterly. The request revealed 279 results. We scanned the titles and abstracts of the papers and applied the inclusion and exclusion criteria. As a result, a total number of 72 papers remained. Afterward, we read these papers carefully and applied the inclusion and exclusion criteria once again. In this step, we focused particularly on the papers in which the national culture was considered as a moderator variable, of which 24 papers remained. Backward and forward search were then carried out. The backward search revealed no relevant paper. However, the forward search identified four more papers which fulfilled the inclusion and exclusion criteria. The final selection consists of 28 papers which serve as the basis for further analysis.

In **step 4**, we analyzed the papers and identified the used measurements for national culture. In particular, we classified the papers related to the following dimensions: application scenarios, culture-related theories and frameworks, data collection, data analysis, and the level of measuring culture. Concerning the research topic, we used VOSviewer to identify the relevant research contexts. VOSviewer is a tool to visualize the network of keywords based on bibliographic data (VOSviewer, 2023). We excluded keywords on national cultural differences such as “national culture”, “united-stated”, or “uncertainty avoidance” as those focus on the overall area of our literature review.

In general, we coded the papers based on these dimensions and subordinary topics according to the recommendations of Schryen (2015). In particular, we followed the approach of vom Brocke et al. (2009) and developed a concept matrix considering these extracted dimensions. In this vein, we identified embedded national cultural theories that measure national culture. The three main theories are Hofstede’s Cultural Dimensions Theory, Fukuyama’s Theory of Trust and Social Capital, and Hall’s Context Theory (Fukuyama, 1995; Hall, 1976; Hofstede, 1980). Based on these theories, we developed a research agenda in **step 5**.

Theoretical Foundation and Cultural Theories

After outlining our methodology, we present the theoretical foundation on emerging technologies and especially on the measurement of national culture, which is also part of our concept matrix.

Emerging Technologies

Emerging technologies encompass technologies that are presently undergoing development or reaching a stage of maturation (Wheatley & Wilemon, 1999). As this definition is contingent upon the specific time period being considered, it will encompass distinct technologies accordingly. For instance, artificial intelligence (AI), particularly ChatGPT and the metaverse, are presently regarded as emerging technologies (Gartner, 2022). In recent years, notable examples of emerging technologies include autonomous driving, the Internet of Things, and wearables (Gartner, 2015). To gain a competitive edge, organizations must invest in these novel technologies and effectively harness their potential. In the literature, the term “emerging technologies” is frequently utilized; however, it is seldom defined. For example, Conger et al. (2013) examined the impact of emerging technologies on privacy, and Bhattacharjee (1998) addressed the management of emerging technologies. Teams explore the potential of emerging technologies by developing proofs-of-concept and proof-of-value prototypes (Nunamaker et al., 2015). In doing so, they try to identify promising use cases for emerging technologies. Many organizations become successful by selling their products and services internationally. The products and services can be emerging technologies, but also products and services that have been manufactured using these technologies.

However, there are also challenges concerning the usage and adoption of emerging technologies across different cultures. The acceptance of technologies and management or leadership approaches can vary across different countries due to cultural differences, socioeconomic factors, and regulatory environments (Chang et al., 2014; Srite & Karahanna, 2006). Each country has its own unique cultural norms, values, and beliefs that shape people's attitudes and preferences towards technology. As a result, it cannot be assumed that high acceptability in one country translates to high acceptability in another. Socioeconomic factors, such as income levels, education, and infrastructure, significantly influence technology acceptance. Countries with higher levels of development and greater access to resources generally exhibit higher rates of acceptance and adoption compared to countries facing limited resources or infrastructure challenges. Additionally, the regulatory environment plays a crucial role in shaping the adoption of emerging technologies. For example, European countries have distinct data protection rules compared to the United States, which leads to different initial conditions. Consequently, the field of IS has developed a keen interest in measuring the impact of national culture to address these challenges (Myers & Tan, 2002).

The rapid advancement of AI represents an excellent example that brings forth challenges in understanding the cultural implications related to the implementation and adoption of self-learning algorithms. Awad et al. (2018) introduced an online experimental platform called Moral Machine. In this study, cross-cultural differences have been observed regarding ethical preferences. Particularly when AI algorithms are trained on a database from one specific culture and subsequently applied in a different culture, it can result in decision support that is incompatible with the target culture. To identify such disparities and cultural nuances, cultural studies play a vital role. These findings emphasize the importance for AI developers to pay attention to the general ethical preferences in different countries.

National Culture

Several studies emphasize the effect of national cultural dynamics in the organizational context. These studies reveal that various nations manage their organization differently (Trompenaars & Hampden-Turner, 1997). Even though scholars agree on the relevance of national culture in organizational research, there is still no clear consensus on which cultural theory is superior (Hofstede, 2001; Javidan et al., 2006; Venaik & Brewer, 2013). In the following, we present an overview of the identified theories in Table 2.

Theories	Hofstede's Cultural Dimensions Theory	Fukuyama's Theory of Trust and Social Capital	Hall's Context Theory
Overview	Defines culture as "the collective programming of the mind that distinguishes members of one group [...] from another."	Focuses on the influence of social capital on economic and social development, which overall includes trust.	Context dimension explains behavior in intercultural communication.
Dimensions	Four original dimensions: Power Distance, Uncertainty Avoidance, Individualism vs. Collectivism, Masculinity vs. Femininity. Additional dimensions: Long Term Orientation, Indulgence vs. (Self-)Restraint	One dimension: High trust culture (larger organizations can exist) vs. Low trust culture (family is essential)	One dimension: High context (implicit information and personal relationships) vs. Low context (communication is explicit, and context is less important)

Table 2. Cultural-related theories

Hofstede's Cultural Dimensions Theory

One of the best-known theories of culture was developed by Geert Hofstede. From 1967 to 1973, Hofstede created his "cultural dimensions" theory based on an empirical study with more than 110,000 IBM employees using factor analysis (Hofstede, 2011). He defines culture as "the collective programming of the mind that distinguishes members of one group or category of people from another" (Hofstede, 1991, p. 5). His theory explains culture on a national level and thus looks at cultural differences between different nations (Hofstede, 1980). The dimensions are measurable aspects of culture that can be compared across

nations. The scores normally range from 0 to 100. However, later-added nations can also exceed the score of 100. The scores represent a relative and not an absolute position, meaning they are only measures of differences (Hofstede, 2001).

The first version of Hofstede's Cultural Dimensions Theory, published in 1980, consists of four cultural dimensions: "Power Distance Index (PDI)", "Uncertainty Avoidance Index (UAI)", "Individualism vs. Collectivism (IDV)", and "Masculinity vs. Femininity (MAS)" (Hofstede, 1980). The *Power Distance (PDI)* dimension provides information about the degree of inequality in power relations between superiors and subordinates. It indicates the extent to which the less powerful expect power to be distributed unequally. People from cultures with higher power distance expect some degree of inequality in terms of power and wealth. The lower a nation's scores on the scale, the more stable the cultural environment is expected to be and the higher the expected cooperative interaction between different power levels. At high power distance, hierarchy is tolerated and seen as legitimate. Low power distance indicates a desire for equality and justification (Hofstede, 1980). *Uncertainty Avoidance Index (UAI)* explains whether an uncertain future is generally seen as negative with a desire for more rules and security (high value) or whether it is relatively quickly accepted and thus increases the willingness to take risks. This dimension is related to the need for security. People from nations with high uncertainty avoidance try to avoid new and unknown situations (Hofstede, 1980, 2011). Another dimension, *Individualism vs. Collectivism (IDV)*, defines to what extent individual self-determination or collectivistic integration is more critical. Nations that score high on this dimension are individualistically oriented. This means that people are self-oriented, constantly seek their own advantage, and put their needs above those of the group. In contrast, collectivist-oriented people pay more attention to the wishes of the group and the opinions of other group members (Hofstede, 1991). They consider it very important to help and share within the group (Hofstede, 1980). Finally, a distinction is made between *Masculinity and Femininity (MAS)*, which should not be confused with gender, as only the characteristics assigned to men or women are meant. Nations that achieve a high score in this dimension have more masculine characteristics. This means that people focus on work and favor earnings and promotion. On the other hand, people from feminine cultures value caring and personal goals, such as a friendly environment (Hofstede, 1991). The fifth cultural dimension, *Long Term Orientation (LTO)*, was added to Hofstede's Cultural Dimensions Theory in 1991 (Hofstede, 2011). This dimension refers to the extent to which societies are geared towards focusing more on short-term success or long-term solutions. In long-term cultures, the focus is on building long-term personal relationships or relationship networks. Furthermore, great respect is shown for persons of higher rank and older people and traditions. Contrary, short-term cultures prefer short-term wins and have guidelines about what is good and bad (Hofstede, 2001). The sixth cultural dimension of Hofstede, which was added to the theory in 2010, is *Indulgence vs. (Self-)Restraint (IVR)* and is based on the research of Michael Minkov (Hofstede, 2011). Nations in the upper score attach great importance to joie de vivre and fun, i.e., enjoying life. They allow an instant satisfaction of basic human needs. Self-restraint means that the satisfaction of people's needs is controlled by society and regulated by strict norms (Hofstede, 2011).

Fukuyama's Theory of Trust and Social Capital

Another national culture theory came from Francis Fukuyama in 1995, who considered cultural differences on a national level. Fukuyama studied the influence of a society's social capital on the development of its economy. Social capital includes different characteristics of a society that improve its efficiency by facilitating collaboration. Above all, this contains mutual trust. Trust arises when people share the same moral values. It is the basis for a society's economic and social development. In organizations, there are so-called transaction costs between organizations. According to Fukuyama, organizations with a high level of trust can work together more efficiently because, for example, transaction costs are low since economic actors trust each other and do not need detailed contracts. On the other hand, a low level of trust in a society makes market activities more difficult because transaction costs increase. Therefore, trust and social capital are essential prerequisites for a functioning economy and ensure social cohesion. In his theory, Fukuyama divided the nations into "high trust" and "low trust" groups. According to his assessment, family is essential in "low-trust cultures" as people can only trust their family and have a low level of trust towards others. Therefore, family organizations are predominant in low-trust cultures. In "high-trust cultures", on the other hand, larger organizations exist. Fukuyama justifies this with his concept of spontaneous sociability, which is based on trust between people and means organizations can grow beyond the family (Fukuyama, 1995).

Hall's Context Theory

The context dimension in Edward T. Hall's Context Theory from 1976 is often used to explain behavior in intercultural communication (Hall & Hall, 1990). Like Hofstede and Fukuyama, Hall's Context Theory describes the culture on a national level (Hall, 1976). The context dimension represents the information surrounding an event or conversation that is important to the meaning of that event (Hall & Hall, 1990). The term "context culture" describes how people in a culture treat each other or, for example, interact with each other in a conversation (Lee et al., 2007). Hall differentiated between "high context" and "low context" and classified the nations based on his criteria. In a "high-context culture", there is little explicit information in a conversation since most of the relevant information is in the context of the conversation or has already been internalized by the people. This makes the communication more personal, as the conversations are kept very simple but often have more profound, implicit meanings. Close personal relationships are essential in this culture. In a "low-context culture", on the other hand, the information is explicitly communicated in a conversation. People are not closely related, and communication is more impersonal (Hall, 1976). Thus, people need to pay attention to the context of a conversation to understand the message. This is not the case in a low-context culture because the exchange of information is explicit. For this reason, people in a "high-context culture" do not expect any background information as they are always informed, especially about the people who are important to them in life. On the other hand, people from a "low-context culture" need this background information to understand what is happening. Since "high-context cultures" feel irritated by too much information and "low-context cultures" are at a loss when they do not get enough information, it makes intercultural communication challenging (Hall & Hall, 1990).

Findings of the Structured Literature Review

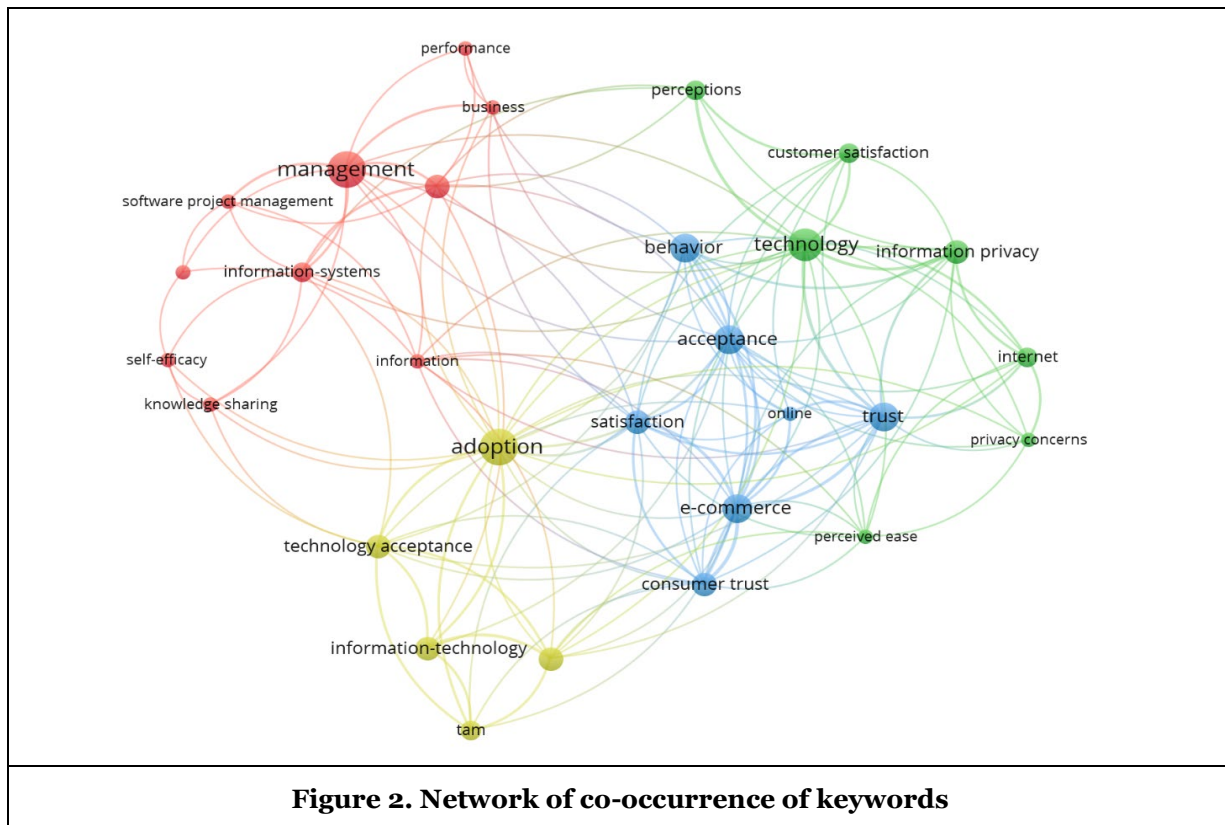
The 28 papers from the structured literature review, that measure the effect of national culture in IS research, are shown in Table 4. These are analyzed in more detail in this section by providing a context matrix consisting of their topics, culture-related theories, data collection, data analysis, and the level of measuring culture. Additionally, the papers provide details on the nations compared, along with the publication years and journals in which they were published. Interestingly, every paper except Zhang et al. (2013) found national cultural differences.

Applications scenarios: Due to the heterogeneity of the papers, we used VOSviewer to extract the application scenarios. Figure 2 illustrates four categories regarding "application scenarios": Management of organizational processes, privacy, technology adoption, and e-commerce (colors correspond to the papers in Table 4).

- **Management of organizational process:** We identified twelve papers focusing on managing processes, including keywords such as software project management, knowledge sharing, or decision-making. Emerging technologies within this category are either used in organizational processes to improve or implement them. The effect of national culture is examined, for example, by Keil et al. (2000) on the influence of sunk costs on the decision to continue software projects. The findings indicate that individuals within a culture characterized by a low uncertainty avoidance score exhibit a higher tendency to persist with a project. In addition, scholars identified a difference between Chinese and American employees regarding the motivation for knowledge sharing (Chang et al., 2014). In contrast to American employees, Chinese employees can be motivated by rewards. Zhang et al. (2013) investigated the effect of culture on the use of IT capability – including emerging technologies – on export performance and found no difference between Chinese and American "born-global" organizations.
- **Privacy:** The privacy category includes five papers that have a common focus on privacy, in particular on the Internet, information privacy, and technology. On the one hand, various emerging technologies must fulfill privacy requirements (Conger et al., 2013). On the other hand, a diverse array of emerging technologies is employed to attain privacy. For example, Dinev et al. (2009) examined the national cultural difference in user attitudes and behavior toward technologies that are supposed to protect individuals against attacks. They find a difference between the US and South Korea, recommending that such emerging technologies should be designed depending on the national culture. Kim et al. (2016) investigated the impact of web assurance seal services on trust in e-commerce and, in particular, found an effect of these services in the US but not in South Korea.

- Technology adoption: The category technology adoption comprises four papers dealing with the adoption of emerging technologies that also relate to user acceptance. Both McCoy et al. (2007) and Srite and Karahanna (2006) found an effect of national culture on technology adoption using the Technology Acceptance Model.
- E-commerce: The last category deals with e-commerce, trust, and behavior. Cyr (2008) concluded that the design of websites is influenced by national culture. Sia et al. (2009) identified that depending on the national culture, different web strategies should be used to influence the buying behavior of customers.

Overall, an effect of national culture is demonstrated in the adoption, implementation, and use of emerging technologies in all four categories.



Culture-related theories: In the next part, we present the used “culture-related theories” which we already described in detail in the chapter theoretical foundations and cultural theories. Our first finding is that Hofstede’s Cultural Dimensions Theory is the most prominent in recent years. They are applied in 23 out of 28 papers. It is worth noting that despite the existence of six distinct dimensions in Hofstede’s Cultural Dimensions Theory we identified only one paper that incorporates all of them, including the sixth dimension of *Indulgence vs. Restraint* (Guan et al., 2022). Only three papers referred to Hofstede’s Cultural Dimensions Theory with six dimensions (Moser & Deichmann, 2021; Zhou et al., 2015; Guan et al., 2022). Twelve papers referenced Hofstede’s Cultural Dimensions Theory with five dimensions, and six of those included all five dimensions. Another nine papers quoted the theory with four dimensions and only four used all of them. Thus, only 11 out of 23 papers that applied Hofstede presented the effect of all cultural dimensions. The dimensions *Individualism vs. Collectivism* and *Uncertainty Avoidance* were used most frequently, a total of 21 and 18 times, respectively, and *Indulgence vs. Restraint* only twice. Hofstede’s Cultural Dimensions Theory offers several advantages: It is applicable at the national level, providing a framework to understand cultural differences across countries (Tuunanen & Kuo, 2015). Moreover, it considers multiple dimensions simultaneously, enabling a comprehensive analysis of cultural variations. However, there are significant disadvantages associated with applying Hofstede’s Cultural Dimensions Theory at the individual and organizational levels, as highlighted by Srite and Karahanna (2006). The theory overlooks the existence of cultural and ethnic groups that transcend national boundaries, failing to

account for diversity within nations. Additionally, the theory relies on the assumption that cultural differences align strictly with the territorial boundaries of nation-states, which becomes problematic as the concept of nation-states itself is a recent phenomenon. Finally, researchers have found that the relationship between national cultural values and work-related values and attitudes is intricate and not fully explained by Hofstede's model (Myers & Tan, 2002).

Several other theories were applied in the papers. Fang et al. (2011) employed the GLOBE extension proposed by House et al. (2004). In this theory, Hofstede's original dimensions are divided into nine dimensions *In-group Collectivism, Uncertainty Avoidance, Institutional Collectivism, Gender Egalitarianism, Humane Orientation, Power Distance, Performance Orientation, Future Orientation, and Assertiveness* by a collaboration of numerous researchers. The Globe study is an extension of Hofstede's original cultural dimensions framework. The advantages of the Globe study include the inclusion of perspectives from various researchers and companies, which increases its reliability. However, it is important to note that the Globe study is still fundamentally based on Hofstede's work, which means it shares both the advantages and disadvantages of his original framework.

Dinev et al. (2006) used Fukuyama's Theory of Trust and Social Capital, where nations are divided into "high-trust cultures" and "low-trust cultures", depending on the level of trust between humans outside of their own family (Fukuyama, 1995). Fukuyama's Theory of Trust and Social Capital highlights the significance of social capital for the effective functioning of modern economies and the stability of liberal democracies. Social capital serves as the cultural foundation of contemporary societies, contributing to various aspects of societal dynamics (Myers & Tan, 2002). However, a disadvantage of Fukuyama's Theory of Trust and Social Capital is its single-dimensional approach, which may constrain its ability to provide a comprehensive understanding of the intricate dynamics of trust and social capital (Myers & Tan, 2002).

Kim (2008) and Kim et al. (2016) both used the theory of context according to Hall (1976). Hall's Context Theory has both advantages and disadvantages in understanding cultural dynamics. One advantage of Hall's Context Theory is that it provides a theoretical foundation for researchers, as demonstrated by Afrouzi (2021) analyzing the influence of personal context culture on humanitarian behavior intention in different cultural contexts. However, a notable disadvantage of Hall's Context Theory is its classification of cultures based on a single dimension (Tuunanen & Kuo, 2015; Myers & Tan, 2002). This limited perspective may overlook the multidimensionality of cultures and the complexities involved. Furthermore, Hall's Context Theory is primarily applicable to specific domains, particularly in relation to the context surrounding events or conversations. This narrow focus restricts its broader applicability in understanding cultural variations across different aspects of society.

Last, Keil et al. (2007) included a Chinese concept dividing people into one of the two categories of "LIAN" and "MIANZI" which refers to face-saving. LIAN describes that a person is bound to rules of conduct and MIANZI that a person intends to keep a position in a social hierarchy (Earley, 1997). Also, some papers, such as Tuunanen and Kuo (2015) and Zhang et al. (2013) compared two or more nations with each other and used no theory at all. Interestingly, if two theories are considered, the Hofstede's Cultural Dimensions Theory is always used as a baseline theory.

Data collection: Furthermore, it is worth examining the methodologies used in the papers to understand what type of research has already been performed to measure the effect of national culture on emerging technologies. We generally identified the following data collection methods: Analysis of user-generated content, Delphi method, interviews, experiments, and surveys. Two papers derived insights from user-generated content (Guan et al., 2022; Yang et al., 2018) and one paper used a Delphi method (Schmidt et al., 2001). Two papers conducted interviews (Miltgen & Peyrat-Guillard, 2014; Tuunanen & Kuo, 2015), and overall, six experiments were carried out (e.g., Keil et al., 2000; Sia et al., 2009), including the two papers that also performed a survey (Cyr, 2008; Cyr et al., 2009). Most papers (19 out of 28) conducted a survey (e.g., Davison et al., 2009; Moser & Deichmann, 2021). In terms of survey participants, students were included as respondents in nine instances (e.g., Dinev et al., 2009; Kim et al., 2016). Furthermore, the surveys included a substantial number of individuals who are actively engaged in communities, such as social networks (e.g., Zhou et al., 2015). The third large group of participants is IT professionals or managers (e.g., Davison et al., 2009; Zhang et al., 2013). Overall, the diversity of data collection methods shows that the data to measure the influence of national culture varies. On one hand, this approach offers the advantage of providing a more thorough and comprehensive overview. On the other hand, it poses challenges in accurately measuring the impact of national culture, making it a complex and nontrivial task.

Data analysis: Papers that adopted the Delphi method or interviews as methodology present national cultural differences individually for each nation. For example, Tuunanen and Kuo (2015) counts the codes extracted from the interviews and provides the frequency per nation descriptively.

The data analysis methods for surveys are more diverse. In general, we identified three approaches which are based on partial least square modeling (PLS) (e.g., Chang et al., 2014; Dinev et al., 2006; Kim et al., 2016). First, culture was multiplied by the respective variables as a moderator, resulting in an interaction term (e.g., Hoehle et al., 2015; Vance et al., 2008). Second, a multigroup analysis is performed to examine the significant difference between two or more national cultures (e.g., Kim, 2008; Kim et al., 2016; Sia et al., 2009). Third, they calculated the regression separately of the different national cultures and compared the results (e.g., the significances of the path coefficients) (e.g., Moser & Deichmann, 2021; Srite & Karahanna, 2006).

Level: We identified two different types of measuring culture. First, on a national level, and second on an individual level. Historically, the measurement of culture has evolved through the development of Hofstede’s dimensions, leading to a rating of each nation’s scores on the six dimensions of Hofstede. Scholars used these dimensions to prove national cultural differences in their models (e.g., Sia et al., 2009; Zhang et al., 2013). The responses from one nation were grouped and evaluated together and compared with those from the other nations. However, Srite and Karahanna (2006) questioned the measuring of the effect of national culture on the acceptance of emerging technologies on a national level, as adopting technology is a personal construct, and individuals might not identify with a given culture. Consequently, they adopted an individual-level measurement of the dimensions from Hofstede’s Cultural Dimensions Theory, marking the first instance of this approach. However, six papers have followed them (Chang et al., 2014; Chen & Zahedi, 2016; George et al., 2018; Hoehle et al., 2015; McCoy et al., 2007; Sharma et al., 2022). The majority continue to adopt culture as a national construct.

Additional findings: Due to space limitations, we did not present the following findings in the concept matrix. Thus, a review of the nations observed in the 28 papers reveals that, on the one hand, often two nations were compared with each other, and, on the other hand, the United States was the most frequently compared nation. We present these findings in more detail in Figures 3 and 4 such as other scholars (e.g., Chu et al. 2019). Figure 3 demonstrates that more than half of the papers compare two nations (e.g., Dinev et al., 2006; Keil et al., 2007). Six papers compared three nations (e.g., Cyr et al., 2009; Schmidt et al., 2001). One paper four nations (Hoehle et al., 2015) and the remaining four papers seven (Miltgen & Peyrat-Guillard, 2014), 24 (McCoy et al., 2007), 30 (Srite & Karahanna, 2006), 148 (Guan et al., 2022) and two papers did not specify the number of nations (Sharma et al., 2022; Zhou et al., 2015).

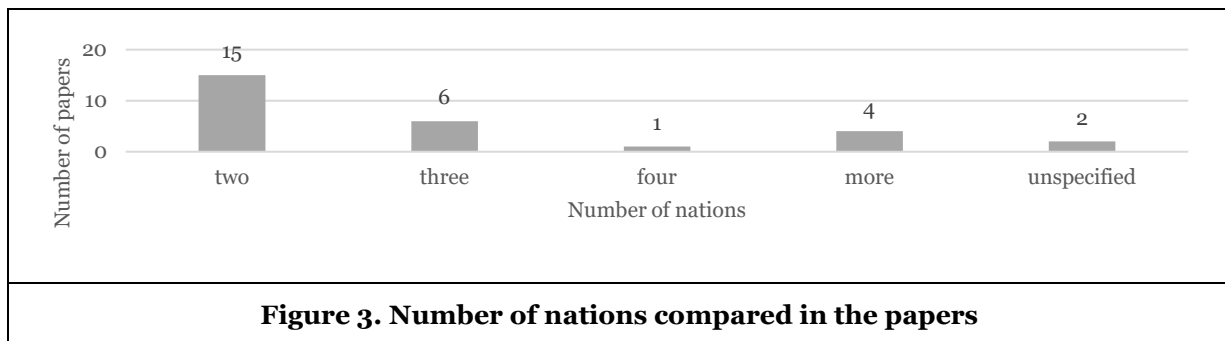
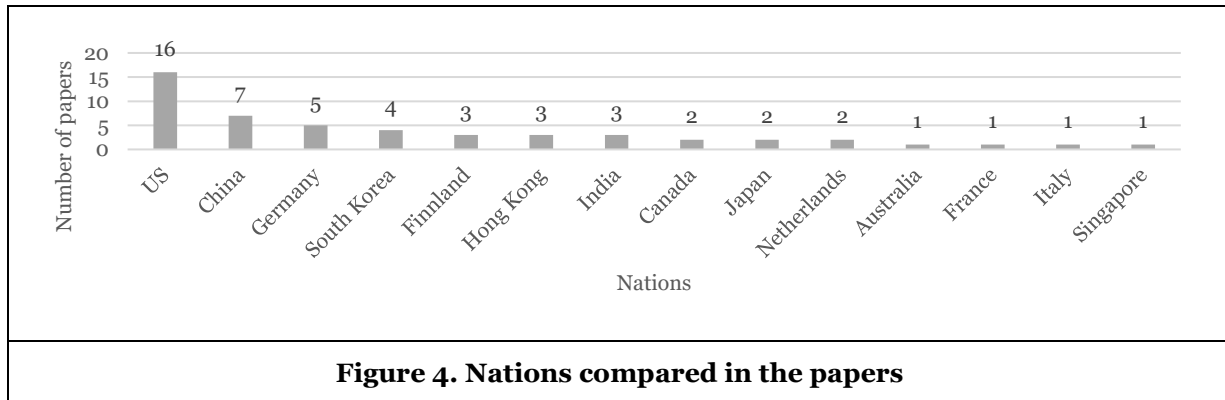


Figure 4 illustrates that next to the United States, China was the second most compared nation. In fact, the United States was often compared directly with China (e.g., Chang et al., 2014; Fang et al., 2011). In addition, the United States was also compared to South Korea four times (e.g., Dinev et al., 2009; Kim et al., 2016). The comparison between the United States and China or South Korea was usually based on the argument that the United States is very individualistic (91 on Hofstede’s scale) and China or South Korea are very collectivistic (20 and 18, respectively) (Hofstede Insights, 2010). Also, a comparison between the United States and European nations occurred several times (e.g., United States vs. Italy (Dinev et al., 2006) or United States vs. France (Vance et al., 2008)). A direct comparison between a European and an Asian nation only occurred in combination with a third or fourth nation – often North American (e.g., Canada vs. Germany vs. China (Cyr, 2008) or United States vs. Germany vs. China vs. India (Hoehle et al., 2015). Throughout all of these comparisons, the authors aimed to uncover significant cultural differences,

considering the distinct nature of the cultures under consideration. However, of equal interest are comparisons between two nations with very similar cultures (China vs. Japan or Germany vs. the Netherlands, e.g., by Davison et al. (2009) or Moser & Deichmann (2021), respectively). As similar countries probably also have a similar infrastructure of emerging technologies, small cultural differences can be found.



Next, we turn to the **years of publication** and an overview of the **journals** (see Table 3). We identified that many papers on the topic of national cultural differences were published between 2006 and 2009. Subsequently, further papers were published between 2013 and 2016. Since then, the number of publications has decreased. More recent papers were found primarily as a result of the forward search beyond the basket of eight. In general, it is visible that, especially in the *European Journal of Information Systems* and *MIS Quarterly*, many papers on cultural differences have been published.

Journal/ Year of publication	2000	2001	2002-05	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019-20	2021	2022	Total
European Journal of Information Systems				1	1				1			2	3	1				1		10
Information Systems Journal					1		1				1									3
Information Systems Research																				0
Journal of the Association for Information Systems							1													1
Journal of Information Technology																				0
Journal of Management Information Systems		1				3														4
Journal of Strategic Information Systems																				0
MIS Quarterly	1			1			2							1		1				6
Other																1		1	2	4
	1	1	0	2	2	3	4	0	1	0	1	2	3	2	0	2	0	2	2	28

Table 3. Matrix Journal vs. Year of Publication

Topic	Culture-related Theories						Data Collection				Data Analysis					Level		Authors		
	Hofstede						Survey	Experiment	Interview	Delphi Study	User content Analysis	SEM (PLS separately)	SEM (interaction term)	Regression	Multi-Group Analysis	Descriptive	Other		Individual	National
	IDV	MAS	PDI	UAI	LTO	IVR														
Managing Organizations	x						x					x						x	(Chang et al., 2014)	
	x		x				x							x				x	(Chen & Zahedi, 2016)	
								x						x				x	(Davison et al., 2009)	
		x					x											x	(Fang et al., 2011)	
	x		x		x				x									x	(George et al., 2018)	
									x			x				x			x	(Gu et al., 2021)
										x								x	x	(Keil et al., 2000)
	x		x							x									x	(Keil et al., 2007)
	x		x		x				x				x						x	(Moser & Deichmann, 2021)
	x		x								x								x	(Schmidt et al., 2001)
Privacy								x										x	(Tuunanen & Kuo, 2015)	
								x				x						x	(Zhang et al., 2013)	
	x		x		x			x				x						x	(Cyr, 2008)	
	x		x						x									x	(Cyr et al., 2009)	
	x			x	x			x						x				x	(Kim, 2008)	
									x						x				x	(Sia et al., 2009)
										x							x		x	(Vance et al., 2008)
Technology Acceptance											x							x	(Yang et al., 2018)	
	x					x		x				x						x	(Zhou et al., 2015)	
	x		x		x			x						x				x	(Dinev et al., 2006)	
	x		x		x			x						x				x	(Dinev et al., 2009)	
	x		x		x	x					x	x		x				x	(Guan et al., 2022)	
E-Com-merce								x										x	(Kim et al., 2016)	
									x								x	x	(Miltgen & Peyrat-Guillard, 2014)	
	x		x		x			x					x				x	x	(Hoehle et al., 2015)	
	x		x					x										x	(McCoy et al., 2007)	
								x										x	(Sharma et al., 2022)	
		x						x										x	(Srite & Karahanna, 2006)	

Table 4. Concept Matrix

Research Agenda

In the following, we present a research agenda guiding the way of future national culture research. We recommend extending the application scenarios, challenge culture-related theories, recommend different types of data collection and analysis, the level of measuring culture, and additional cultural research regarding more and previously barely considered nations.

Application scenarios: We identified four main literature streams concerning the effect of national culture on emerging technologies: Management of organizational processes, privacy, technology adoption, and e-commerce. But even beyond these four categories, several RQs remain unanswered. For instance, previous research identified different strategies for adopting emerging technologies and differences in managing organizational processes. Therefore, future research could investigate how to overcome national cultural differences in order to successfully implement emerging technologies (Fang et al., 2011). Especially with regard to the use of emerging technologies, such as virtual reality, a possible RQ could be how users

from different national cultures accept these emerging technologies. Moreover, the VOSviewer tool has proven to be very helpful in structuring the literature and identifying the contexts. Therefore, we propose to use it in further research projects as well. In addition, dealing with ethical issues is handled differently in various national cultures. For instance, Bellman et al. (2004) found a difference in privacy concerns related to cultural values which shape a nation's regulations. Therefore, a future RQ could be how to design emerging technologies that can be used across national borders, although different data protection laws are in place and ethical preferences (HIPAA vs. GDPR) (Awad et al., 2018; Beens, 2020).

Culture-related theories: Although many papers have adopted a similar approach by conducting a survey using Hofstede's dimensions, many papers omit specific dimensions of Hofstede. Thus, some dimensions of national culture are not taken into account (Hoehle et al., 2015). For example, Chang et al. (2014) measured individualism and uncertainty avoidance between the United States and China as these differ among the culture dimensions (91 to 20 and 40 to 80, respectively). However, there is also a large difference in long-term orientation (26 to 87) and indulgence (68 to 24) (Hofstede Insights, 2010), but using several dimensions in one study leads to a higher effort, especially for study participants. Thus, researchers should consider the exclusion of each dimension carefully and support their decision with literature. In this vein, conducting studies to determine which dimensions generally affect the adoption of emerging technologies might be interesting. In addition, it is worth noting that certain authors have raised critiques regarding the application of national culture theories, specifically Hofstede's dimensions, at the individual and organizational levels. These criticisms highlight the limitation of using country-level analysis to fully explain individual level analysis (Venaik & Brewer, 2013). To overcome the shortcomings of national culture theories, we recommend the following four approaches. 1) *Individual Level Analysis*: Build the theory at an individual level, recognizing that not everyone perfectly aligns with a specific culture. Considering individual variations within cultures can provide a more nuanced perspective on cultural differences and their impact on behavior and attitudes. We suggest to involve individuals such as end-users or at least including them in the process of developing cultural models. By excluding organizational culture and focusing on end-users, a more representative view of culture can be achieved. However, it is important to remain focused on cultural influences rather than delving too much into individual personality traits. 2) *Sub-Cultural Considerations*: By incorporating individual-level measurements, it is likely that sub-cultural variations will be adequately accounted for. This approach allows for a more nuanced understanding of cultural differences within a broader national or regional context. 3) *Dynamic Nature*: It is important to recognize that cultures evolve, and incorporating this temporal aspect into the theories. 4) *Balancing Complexity*: While it is important to capture the complexities of cultures, it is crucial to strike a balance to ensure that the theories remain measurable. Finding a middle ground between comprehensiveness and practicality is necessary to maintain the applicability of the models. In addition, validating the dimensions across different countries would enhance the robustness of the framework.

Data collection: We identified that surveys are the most commonly used method to collect data. Although some studies acquire individuals or IT managers, we noticed that many studies question students. This can be problematic since students might adopt international preferences and not behave according to the national culture measured by Hofstede (Kim, 2008). This may affect the assumed influence of national culture. In addition, this can be similar in online environments where individuals might adopt other preferences than the anticipated national culture. Therefore, we briefly point out that it should be carefully considered which participants are questioned. Furthermore, as nearly all papers found national cultural differences, it would be interesting to use complementary research methods (Davison et al., 2009), for example, by conducting qualitative methods for finding reasons and solutions for problems such as misunderstandings generated from national cultural differences. Another data collection approach might be longitudinal approaches to identify the change of culture over time.

Data analysis: As evident from the findings, three approaches based on the PLS model are commonly employed. Based on this result, we recommend a multi-group analysis to determine the differences between the national cultures. While this is a valid approach for further cultural research, we also call for using additional analyses. One recommendation for a different analysis approach would be hierarchical linear modeling to examine the influence of different cultural groups on the adoption of emerging technologies (Keil et al., 2000). In addition, Srite and Karahanna (2006) suggest that measuring the influence of the Hofstede dimensions with each other could contribute to research. As the impact of national culture has been overlooked in recent years, it would be interesting to include national culture as a moderator for the

adoption of emerging technologies like artificial intelligence, virtual reality, and the metaverse since these technologies allow collaboration and working across borders.

Level: Myers and Tan (2002) have already noted that culture is not a straightforward concept. For instance, a nation might have more than one culture (e.g., India), and culture changes over time. Thus, they conclude that national culture cannot be treated as an equivalent to a nation (Myers & Tan, 2002). Thus, Srite and Karahanna (2006) suggested that the culture dimensions should not be defined at the national level using the nation as a proxy but rather measured at the individual level. This has the advantage that if individuals do not entirely identify with their given culture or are part of an ethnic subgroup, it can be captured as an influence. Hoehle et al. (2015) also highlighted the difference between those two types of measuring culture by testing both approaches and discovering the differences. Although some followed this direction (Chang et al., 2014; Chen & Zahedi, 2016; George et al., 2018; Hoehle et al., 2015; Sharma et al., 2022), we emphasize continuing this approach in future research. In addition, the influence of groups on emerging technologies could be interesting in the context of national cultural research, thus, the individual is neither solely questioned nor is a national culture assumed (Keil et al., 2007).

Additional Research Directions: In addition, comparing more than two nations could allow a more precise assessment of national cultural differences. Keil et al. (2000) provided a useful example in this context. They included Singapore (low uncertainty avoidance index), the Netherlands, and Finland (both medium UAI, according to Hofstede). An extension involving a nation characterized by a high uncertainty avoidance index could yield intriguing findings. Another comparison could be between similar nations that differ only in one dimension. This would replicate findings (Kim, 2008) and improve the quality of measuring all dimensions by keeping similar dimensions tight and only differences between the other dimensions become apparent. Furthermore, extending to rarely considered nations, such as the parts of Asia, Arab, or African region, could also provide further exciting details. Lastly, a quantitative analysis of the effect of culture on emerging technologies could reveal overarching findings (i.e., meta-analysis).

Limitations and Contributions

National culture is an important influencing factor on emerging technologies in managing organizations, privacy, technology adoption, and e-commerce. We identified several characteristics that are typical for the measurement of culture in IS literature which are presented in a concept matrix in Table 4. For example, the majority of the papers applied Hofstede's Cultural Dimensions Theory and used surveys in a similar way. In contrast, there are differences in the measurement of national culture, especially on the analysis level. Therefore, we attempt to decipher ways to measure the impact of national culture on emerging technologies. Finally, we present the results in form of a research agenda to guide future research to further topics, extending existing theories, and testing new data analysis methods.

Although we have taken great care in reviewing the literature, this paper is subject to some **limitations**. Since we examined the RQ qualitatively, our study is subject to certain restrictions. First, the literature review results are significantly influenced by the keywords chosen. We have taken meticulous care in selecting a comprehensive set of keywords that encompasses a wide range of potential papers. However, it is important to note that alternative keywords might yield diverse outcomes. Second, our structured literature review was primarily based on the top IS journals, commonly referred to as the 'basket of eight'. Nonetheless, it is worth considering the application of these keywords to other databases and across various disciplines in future research. Third, our particular focus was on measuring the impact of national culture as a moderator. However, it would be beneficial for future studies to broaden this scope and explore additional dimensions, such as investigating the measurement of national culture as an independent variable. Finally, although we used the VOSviewer tool to develop the categories in "application scenarios" (see Figure 2) to minimize the researcher's subjective influence in the selection, the identified categories of the concept matrix can, of course, be extended with other elements or categories in further studies.

Our **theoretical contribution** to IS research is providing an overarching IS-centric theory of how national culture influences the adoption of emerging technologies conceptualized by the concept matrix. This matrix offers comprehensive insights into the common utilization of culture-related IS theories, as well as the diverse research methods employed. Second, it also helps the IS research community to identify research gaps. Thus, we developed a research agenda to pave the way for further research. In this vein, we organize the previous literature and make implicit knowledge explicit. In particular, we highlighted

potential research streams in regard to the effect of national culture on emerging technologies, expanding the theories, and finally emphasized the community to use novel empirical methodologies (e.g., hierarchical linear modeling). In particular, we call for examining national cultural differences and similarities between cultures on an individual level since collaborations are becoming more important due to globalization and more opportunities to work across borders (e.g., emerging technologies such as metaverse and AI). From a **practical perspective**, we first contribute to highlight the importance of national cultural understanding. Organizations operating across national borders and serving customers from diverse cultural backgrounds need to comprehend national cultural differences to effectively meet their needs. Recognizing and comprehending national cultural variations is crucial for fostering teamwork, successfully adopting emerging technologies, and retaining and attracting international customers. Organizations benefit from the presented knowledge to perform their own analyses with respect to introducing emerging technologies, i.e., new sales markets in other cultures or nations. Second, since it is difficult to manage globalized organizations, we contribute to practice by presenting that difficulties can arise when multinational organizations ignore national cultural differences and try to apply management formulas developed in their own cultural context. Thus, there is no one-size-fits-all approach for running an organization and adopting emerging technologies, considering the impact of cultural differences. Third, the organizations can explore the collected literature for relevant application scenarios to identify what cultural influences have already been observed and what recommendations are made by the respective authors. Thus, they can tailor their plans and strategies according to the effect of national culture to maximize their competitive advantage.

Acknowledgements

This research and development project is/was funded by the German Federal Ministry of Education and Research (BMBF) within the “Innovations for Tomorrow’s Production, Services, and Work” Program (funding number 02L19C150) and implemented by the Project Management Agency Karlsruhe (PTKA). The authors are responsible for the content of this publication.

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