IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

BRIDGING THE DIGITAL DIVIDE IN EMERGING ECONOMIES: ASSESSING THE RELEVANCE AND EFFECTIVENESS OF VARIOUS TECHNOLOGY ADOPTION MODELS

Dr. Harpreet Kaur
Assistant Professor
Khalsa College Garhdiwala

ABSTRACT

In the present era of huge technological transformation, which has embedded benefits of efficiency, competitiveness and profits, its adoption is still very low in emerging nations as various factors like individual perceptions, social influences, infrastructure, economic constraints, government policies, etc., create hindrance in the way of accepting it wholeheartedly. While there are already well-established models of technology adoption like the Theory of Planned Behavior, Technology Acceptance Model, Diffusion of Innovations, but these models are framed taking into account the situations of developed economies and cannot fully address the issues faced in emerging nations. This paper reviews these renowned models, analyzes their limitations in the context of emerging economies and proposes a hybrid model that can be applied in such regions. The hybrid model combines individual-level factors (Technology Acceptance Model, Theory of Planned Behaviour), social and community-level influences (Diffusion of Innovation, Unified Theory of Acceptance and Use of Technology, task-specific needs (Task-Technology Fit) and environmental and institutional factors (Technological-Organizational-Environmental Model) to increase its acceptability in such regions. This hybrid model will also help in providing a valuable tool for researchers, policymakers, and organizations aiming to drive digital transformation in these areas.

KEYWORDS: *Diffusion of Innovation, Developing Countries, Emerging Nations, Hybrid Model, Technology Adoption, Technology Adoption Model.*

INTRODUCTION

The digital revolution has brought new opportunities of efficiency, growth and profit in the economies worldwide. Several success stories in the developed economies using technology have proved that the integration of technology into organizational workflows and daily life can act as a catalyst for rapid development, bridging performance gaps and fostering economic development (Al-Tit, 2020; Villa et al., 2018). However, it is seen that the technology gets easily accepted in the developed economies whereas the emerging and developing nations show some hesitation to adopt it. The reason being that various renowned models of technology adoption have been framed taking into consideration the situations prevalent in developed nations. These models are successful in these economies but they fail in emerging nations as the circumstances and factors are in sharp contrast in these regions as compared to the developed ones (Ramdansyah & Taufik, 2017). Various issues like poor infrastructure, high digital illiteracy, financial constraints and lack of government support often hinder the widespread and effective use of technology (Govinage & Sachitra, 2019; Angro-Lopez et al., 2024). This huge digital divide has created huge economic and social disparities amongst nations (World Bank, 2022; UN-DESA, 2020).

This paper aims to critically review the famous technology adoption models to assess their strengths and weaknesses in the context of emerging economies and propose a hybrid model that can be applied in such nations. The goal is to provide a comprehensive approach to understand and promote technology adoption so as to boost the development in these regions.

REVIEW OF LITERATURE

Overview of Technology Adoption Models

There has been extensive research on technology adoption. Various theories have been framed from time to time and based on these, various models have been developed. These models help in analyzing the factors that influence the adoption and use of new technologies. The most influential models have been analyzed below based on their relevance for emerging economies.

Diffusion of Innovations (DOI)

Rogers in 1962 introduced the theory named as The Diffusion of Innovations. It gives the basis to understand how new technologies and ideas spread and get adopted within societies. He stated the five categories of adopters: innovators, early adopters, early majority, late majority, and laggards. Each of these categories have different propensities to embrace innovation (Rogers, 2010). The adoption process proceeds through various stages like: knowledge, persuasion, decision, implementation, and confirmation. As per this theory these five factors directly influence the rate of technology adoption.

Although DOI is widely applied across several disciplines yet it has its limitations, particularly in small and medium enterprises of emerging economies, in addressing the contextual factors such as resource constraints and organizational dynamics (Idris et al., 2017). Moreover, the model has its focus on the diffusion process rather than predicting the individual behavior (Al-Mamary et al., 2016).

Theory of Reasoned Action (TRA) and Theory of Planned Behavior (TPB)

Fishbein and Ajzen in 1975 gave the theory of Reasoned Action which explains that the human behavior is a function of behavioral intention. The subjective norms and attitudes influence this behavioral intention. Subjective norms show perceived social pressures whereas attitude is formed by a positive or negative evaluation of performing a behavior by an individual (Fishbein and Ajzen, 1975).

TRA assumes that the decision-making and volitional control are rational and this assumption may not hold good in contexts with systemic constraints (Al-Mamary et al., 2016). The model also ignores cultural norms and the influence of prior behavior (Conner & Norman, 2015; Elliott & Ainsworth, 2012).

Ajzen in 1991 gave the theory of Planned Behavior which is actually an extension of original TRA. It has an additional element of perceived behavioral control which says that an individual's belief system affects his behavior. TPB is more effective in predicting behavior in situations where individuals face constraints (Parker & Castleman, 2009). However, it focuses mainly on rational behavior and does not take into account emotional influences or repetitive actions (Ajzen & Fishbein, 1980).

Technology Acceptance Model (TAM) and Extensions

Davis in 1989 introduced the Technology Acceptance Model which is most commonly used models in information systems research (Davis, 1989). TAM focuses on two main determinants: perceived ease of use (the belief that

using the technology will be easy and effortless and perceived usefulness (the belief that using the technology will improve job performance) and TAM was later extended to include additional factors such as subjective norms, image, job relevance, output quality, and experience (Venkatesh et al, 2003). But still, TAM does not take into consideration contextual and social factors, particularly in SMEs and emerging economies (Parker & Castleman, 2009; Djatikusumo, 2014).

Unified Theory of Acceptance and Use of Technology (UTAUT)

Venkatesh et al in 2003 introduced the Unified Theory of Acceptance and Use of Technology model which integrates elements from several models like: including effort expectancy, social influence, performance expectancy and facilitating conditions. UTAUT also considers moderators such as gender, experience, age and voluntariness (Venkatesh et.al, 2003). While UTAUT covers huge number of factors but still this model has been criticized as the numerous factors included in the model have made it more complex. Moreover, it has also failed to consider cultural and external stimuli (Djatikusumo, 2014).

Technology-Organization-Environment (TOE) Model

Tornatzky and Fleischer in the year 1990 framed the Technology-Organization-Environment model which explains that the technology adoption is a function of three interrelated factors: technological, organizational, and environmental (Tornatzky and Fleischer, 1990). The TOE model has been widely used in both developed and developing countries and it is considered a robust model for studying innovation adoption (Ibrahim & Stevens, 2014; Zhu & Kraemer, 2006).

Task-Technology Fit Model

The Task-Technology Fit model (Goodhue & Thompson, 1995) focuses on the relation between technology and the tasks it is intended to support. A good fit leads to higher adoption and better performance whereas a poor fit may result in resistance or rejection.

OBJECTIVES OF THE STUDY

The paper intends to achieve the following objectives

1. To critically analyze the existing models of technology adoption
2. To understand their relevance in emerging economies
3. To derive a hybrid model to fit to the needs of emerging nations

4. To suggest ways to help the application of the hybrid model
5. To address practical implications and recommendations

CRITICAL ANALYSIS OF EXISTING MODELS IN EMERGING ECONOMIES

Contextual Relevance

Many technology adoption models were developed in advanced economies. These developed nations already have huge infrastructure, high digital literacy, and robust financial resources. In emerging economies, organizations and individuals often have to face significant barriers such as unreliable electricity, limited internet access, and low digital literacy (Govinage & Sachitra, 2019). These contextual challenges are not properly explored by existing models which has led to a contrast between theory and practice.

Overemphasis on Individual and Rational Factors

Models such as TAM and TPB have their mainly focus on individual perceptions and rational decision-making. No doubt, these factors are important but they cannot fully depict the influence of other important factors that influence the adoption of technology in emerging economies like: social norms, community framework, and institutional environments (Parker & Castleman, 2009).

Neglect of Environmental and Institutional Factors

The TOE model includes only environmental and organizational factors, but this model may not fully integrate the complex inter-connection between technology, organizations, and broader societal structures. In emerging economies, government policies, regulatory frameworks, and market conditions can have a major impact on technology adoption (Ibrahim & Stevens, 2014).

Lack of Multi-Level Integration

Most models focus on a single level of analysis like: individual, organizational, or environmental. They don't consider multiple levels of complex and multi-stakeholder environments. This limitation makes them incapable of use in emerging nations.

COMPARATIVE ANALYSIS OF MODELS

Model	Strengths	Weaknesses	Relevance to Emerging Economies
DOI	• Explains the diffusion process • Explains adopter categories	• Lacks focus on individual behavior • Ignores contextual factors	• Limited, unless combined with contextual factors
TRA/TPB	• Focuses on intention and social norms	• Assumes rationality • Ignores constraints	• Partial • Lacks contextual depth
TAM	• Simple • widely tested	• Ignores context and social influences	• Limited for SMEs and resource-constrained settings
UTAUT	• Comprehensive • Integrates multiple models	• Complex • Overlooks culture	• Useful if adapted for local context
TOE	• Considers organization and environment	• Lacks individual/social focus	• Strong for institutional analysis

Task-Tech Fit	• Focuses on alignment of tech and tasks	• Ignores broader context	• Useful for operational adoption

THE NEED FOR A HYBRID MODEL

As the famous theories and models of technology adoptions are not fit to use as such in emerging economies due to their limitations stated above, there is a clear need for a more comprehensive framework that takes into account various individual, social, task-specific, and environmental factors. Such a hybrid model would better present the realities of emerging economies and provide deep insights for stakeholders.

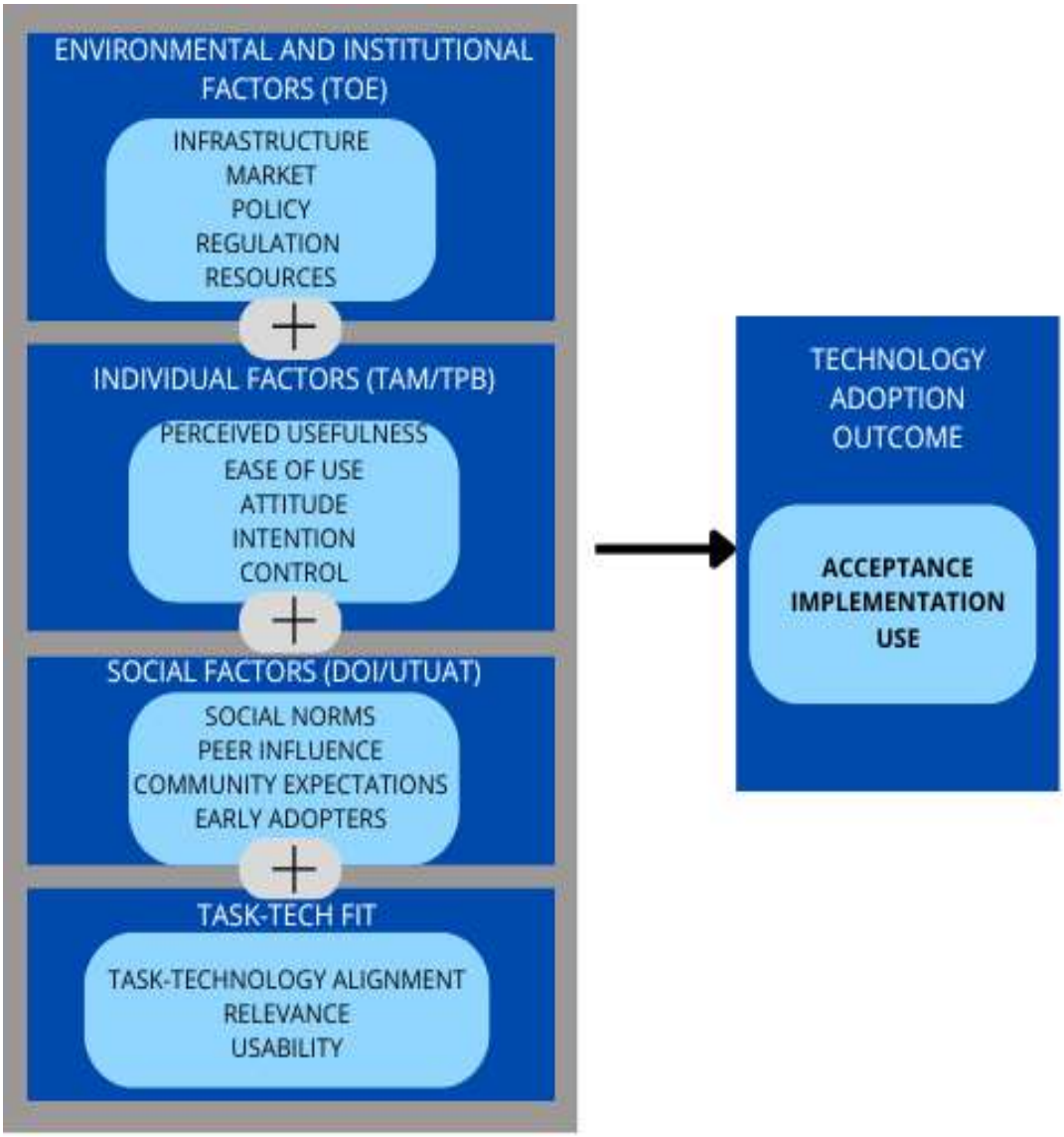
Key Components of the Proposed Hybrid Model

The proposed hybrid model derives the most relevant elements from the models analysed above:

1. **Individual-Level Factors:** Perceived ease of use, perceived usefulness, intentions, attitudes and perceived behavioral control. These elements are derived from TAM (Technology Acceptance Model) and TPB (Theory of Planned Behaviour).
2. **Social and Community-Level Influences:** Social norms, community expectations, and the role of early adopters. These factors are taken from DOI (Diffusion of Innovation) and UTAUT (Unified Theory of Acceptance and Use of Technology).
3. **Task-Specific Needs:** The alignment between specific tasks and technology (from Task-Technology Fit).
4. **Environmental and Institutional Factors:** Infrastructure, government policies, market conditions, and organizational resources (from TOE).

CONCEPTUAL FRAMEWORK

The hybrid model can be seen as an interconnected system where each component influences and is influenced by the others. For instance, individual perceptions are influenced by social norms and community expectations, which in turn are affected by organizational policies and environmental conditions. Task-specific needs ensure that technology solutions are relevant and practical, while environmental and institutional factors provide the necessary support for successful adoption. The hybrid model is as under:



Proposed Hybrid Model for Emerging Nations

APPLICATION OF THE HYBRID MODEL

Individual-Level Factors

In emerging economies, the ease of use and perception of usefulness is often influenced by the level of digital literacy, prior experience and the availability of training. To help the application of hybrid model there is a need for targeted educational programs and user-friendly technology design which can enhance adoption rates.

Social and Community-Level Influences

Social norms and community expectations play an important part in the decision to adopt technology. Initiatives that encourage local community leaders and peer networks can help facilitate positive responses and thus reduce resistance to change.

Task-Specific Needs

There is a need to ensure that the technology solutions are tailored to the specific needs and workflows of users to help promote their acceptance. For this, there is a need for a thorough understanding of local contexts and to actively engage with end-users during the design and implementation phases.

Environmental and Institutional Factors

For promoting technology adoption, there is a need for robust infrastructure, supportive government policies and access to financial resources.

POLICY AND PRACTICAL IMPLICATIONS

The hybrid model provides some important implications for policymakers, organizations, and researchers:

1. **Tailored to different contexts:** The model has taken into consideration multiple levels of influence so that it can address the specific barriers and enablers of technology adoption in different contexts.
2. **Capacity Building:** The model focuses on the benefit of building digital literacy and skills at the individual and organizational levels.
3. **Stakeholder Engagement:** The model emphasizes the need for collaboration among industry, government and society to create an enabling environment for digital transformation.
4. **Monitoring and Evaluation:** The model provides a framework for measuring the effectiveness of technology adoption initiatives and also identifying the areas for improvement.

RECOMMENDATIONS

1. **Invest in Digital Infrastructure:** Huge investment in reliable internet and affordable digital devices is required, especially in rural and underserved areas.
2. **Promote Digital Literacy:** There is a need to promote digital literacy programs focusing on individuals, businesses, and communities in emerging nations.
3. **Support Small and Medium Enterprises (SMEs):** Focus is needed on providing financial incentives, training, and technical assistance, which can boost SMEs to adopt and benefit from digital technologies.
4. **Promote Innovation:** To promote innovation in these regions, there is a need to encourage collaboration between universities, research institutions, and the private sector.

5. **Monitor and Evaluate:** There is a need to develop an effective monitoring and evaluation framework which can assist in measuring the impact of digital transformation initiatives and inform future policy decisions.

CHALLENGES AND FUTURE DIRECTIONS

Although there seems to be huge potential in the hybrid model but working on a new model is never without challenges. Implementation of this multi-level framework requires not only huge data collection and analysis but also coordination among diverse stakeholders. There is also a need for further research to validate the model in different contexts and to explore the interplay between its components.

Research Agenda

1. **Empirical Validation:** There is a need to test the hybrid model in diverse settings to find out its applicability and effectiveness.
2. **Integration of Emerging Technologies:** Further, it is essential to see how the model can be adapted to address the acceptance of new technologies such as artificial blockchain, Internet of Things and artificial intelligence.
3. **Collaboration:** Collaboration among government, industry, and civil society can promote the digital revolution in emerging economies.

CONCLUSION

Technology adoption in emerging economies is a complex and difficult process. It is generally influenced by a wide range of individual, social, task-specific, and environmental factors. The existing models have been successful in developed nations but often fail to cater to the challenges faced by the emerging regions. The proposed hybrid model tries to integrate the most relevant elements from existing renowned theories so as to tailor a model that can support the unique challenges of emerging nations and promote technology adoption. By following a holistic approach, the hybrid model can help in bridging the digital divide and promote inclusive growth in emerging economies. It provides deep insights for researchers, policymakers and organizations that are working for a digitally empowered future.

REFERENCES

Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50(2), 179-211.

Al-Mamary, Y.H., Al-Nashmi, M., Hassan, Y.A.G., and Shamsuddin, A. (2016). A Critical review of Model and Theories in Field of Individual Acceptance of Technology. International Journal of Hybrid Information Technology, 9(6), 143-153

Al-Tit, A. A. (2020). The impact of digital transformation on organizational performance: Evidence from Saudi Arabia. Journal of Business and Management, 22(4), 45-56.

Angro-Lopez, M., et al. (2024). Navigating Digital Transformation and Technology Adoption: A Literature Review from Small and Medium-Sized Enterprises in Developing Countries. *Sustainability*, 16(14), Article 5946. https://doi.org/10.3390/su16145946

Conner, M., & Norman, P. (2015). Predicting and changing health behaviour: Research and practice with social cognition models. Open University Press.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319-340.

Djatikusumo, D. (2014). The role of perceived usefulness and perceived ease of use in technology acceptance: A review. International Journal of Business and Management, 9(8), 112-120.

Elliott, M. A., & Ainsworth, K. (2012). Predicting university students' intentions to use mobile devices as learning tools: An application and extension of the UTAUT model. Campus-Wide Information Systems, 29(4), 234-247.

Fishbein, M., & Ajzen, I. (1975). Belief, attitude, intention, and behavior: An introduction to theory and research. Addison-Wesley.

Goodhue, D. L., & Thompson, R. L. (1995). Task-technology fit and individual performance. MIS Quarterly, 19(2), 213-236.

Govinage, S., & Sachitra, K. M. V. (2019). Technology adoption in emerging economies: A review of challenges and opportunities. Journal of Small Business and Enterprise Development, 26(3), 456-470.

Ibrahim, M., & Stevens, J. (2014). The technology-organization-environment (TOE) model and its application to the adoption of e-commerce by SMEs. International Journal of Business and Management, 9(8), 112-120.

Idris, F., Sarwar, M., & Khan, S. (2017). Technology adoption in SMEs: A review of barriers and facilitators. International Journal of Entrepreneurship and Innovation, 18(4), 273-286.

Parker, C. M., & Castleman, T. (2009). New directions for research on SME-eBusiness: Insights from an analysis of journal articles. Journal of Information Systems and Small Business, 3(1-2), 21-40.

Ramdansyah, R., & Taufik, M. (2017). The role of technology adoption in economic development: Evidence from Indonesia. Journal of Developing Areas, 51(4), 415-426.

Rogers, E. M. (2010). Diffusion of innovations (5th ed.). Simon and Schuster.

Tornatzky, L. G., & Fleischer, M. (1990). The processes of technological innovation. Lexington Books.

UN-DESA. (2020). Digital transformation for sustainable development. United Nations Department of Economic and Social Affairs.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS Quarterly, 27(3), 425-478.

Villa, R., Ruiz, L., Valencia, A., & Picón, E. (2018). Digital transformation and the impact on business performance: The case of Latin America. Journal of Business Research, 93, 1-12.

World Bank. (2022). World development report 2022: Digital dividends. World Bank.

Zhu, K., & Kraemer, K. L. (2006). Post-adoption variations in usage and value of e-business by organizations: Cross-country evidence from the retail industry. Information Systems Research, 16(1), 61-84.