Linking Technology Acceptance (TAM3) and Institutional Readiness (TOE) in Digital Public Fund Disbursement: Evidence from Indonesia's Makan Bergizi Gratis (MBG) Program

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Abstract

Makan Bergizi Gratis (MBG) is an Indonesian government program to reduce stunting rates and strengthen nutritional quality. *Badan Gizi Nasional* (BGN) implemented technology adoption in the form of a *Bank Rakyat Indonesia's* (BRI) Virtual Account (VA) to save time and increase transparency in fund distribution. The purpose of this study is to quantify, identify factors, and assess the contribution of the VA dashboard. This study introduces the TAM-TOE model approach as a theoretical model in the study of technology adoption. The Technology Acceptance Model (TAM3) focuses on a survey of perceived usefulness, ease of use, and behavioral intentions of SPGG officers and is analyzed using the SEM-PLS method. The Technology–Organization–Environment (TOE) study focused on technology adoption through interviews with BGN officials and analyzed using descriptive methods. The results showed that Virtual Accounts were proven to increase disbursement speed, reduce reconciliation errors, and strengthen audit accountability. SPPG officers reported increased confidence in managing daily transactions, in line with survey results showing positive perceptions regarding the benefits and ease of using VA. This is consistent with the SEM-PLS results showing that Behavioral Intention is significantly influenced by Perceived Usefulness (P-value = 0.000) and Perceived Ease to Use (P-value = 0.032). From an institutional perspective, BGN emphasized that the dashboard strengthens financial oversight and enhances accountability.

Keywords: *Entrepreneurship and Technology Management, Strategic Management, Public Financial Governance, Digital Banking Transformation*

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INTRODUCTION

Makan Bergizi Gratis (MBG) was a program aimed at reducing stunting and improving the nutrition of human resources in Indonesia. This program strengthens poor families' access to healthy food for children vulnerable to chronic malnutrition. From March to May 2025, the average budget absorption increased to around IDR 1 trillion per month. In fact, budget absorption (as of June 12, 2025) increased rapidly to around IDR 1.1 trillion, from the previous IDR 3.3 trillion. This program has reached

4.89 million beneficiaries served through 1,716 *Satuan Pelayanan Pemenuhan Gizi* (SPPG) or operating public kitchens. This significant increase is based on President Prabowo Subianto's directive, which targets beneficiary coverage of up to 82.9 million people and is supported by 32,000 SPPGs. To ensure that budget absorption is on target, monitoring of fund distribution needs to be carried out and updated.
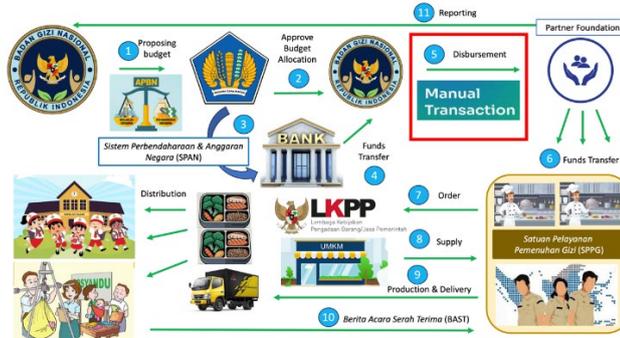

Figure 1. Badan Gizi Nasional (BGN) Operational Framework

Burge (2015) explains that a rich picture is a free-form diagram used to capture multiple perspectives in real-world situations. The Rich Picture visually illustrates the current disbursement process of the MBG Program. The disbursement of funds for the *Makan Bergizi Gratis* (MBG) program is still handled through manual transactions. The Ministry of Finance allocates the budget for the *Badan Gizi Nasional* (BGN) expenditure through transactions made via the *Sistem Perbendaharaan dan Anggaran Negara* (SPAN), which are then transferred to the partner foundations.

BGN stated that the distribution of funds using the manual process (reimbursement system) was not working well because if the partner disburses the funds first, control rests with the partner and not with BGN. In the current operational setup, the disbursement of funds to participating kitchens relies heavily on a manual payment process. Each payment requires a series of sequential steps: document verification, approval sign-offs, and bank transfer initiation, that often depend on physical paperwork and multiple layers of human intervention. While this method may appear straightforward on paper, in practice it creates significant friction. Any delay in one step, whether due to incomplete document, backlogged approvals, or reconciliation errors, can cascade through the process, pushing the actual transfer of funds well past the agreed schedule. This process relies heavily on manual reporting and reconciliation, which often creates long lead times, high administrative workload, and a greater risk of human error.

Because of these delays, the kitchens or SPPGs face a working capital gap that disrupts their cash flow. In some cases, this may even push them toward insolvency. The disruption also affects their suppliers, particularly local MSMEs, leading to price increases and shortages of raw materials. As a result, the kitchens are forced to reduce meal quality and struggle with delivery delays. Orders begin to decline, delivery times become longer, and ultimately the service to school children is affected. This not only compromises the consistency of the program but also undermines its purpose of improving children's nutrition.

Public financial management reforms increasingly emphasize transparency and efficiency in social spending. Indonesia's *Makan Bergizi Gratis* (MBG) initiative represents a large-scale nutrition program requiring precise, traceable fund disbursement. Therefore, in May 2025, BGN replaced all transactions with partners

using digital payment methods or virtual accounts (VA). The partner fund disbursement scheme through VA facilitates monitoring of cash flow and inflows. Furthermore, this scheme makes it easier for the Ministry of Finance to view all transactions occurring at each SPPG. Bank Rakyat Indonesia (BRI) plays a key banking partner, enabling all program transactions to be conducted digitally, reducing the risk of misuse and accelerating fund disbursement to beneficiaries.

BRI introduced a VA model integrated with the Cash Management System (CMS), enabling real-time monitoring and automated matching. By deploying a VA–based disbursement system, we can automate fund release upon proof of delivery, reduce administrative lags, and ensure kitchens receive timely liquidity to continue serving students without interruption. Unlike manual methods, the VA solution offered by Bank BRI is designed not only for foundations but also for SPPG partners. Through an integrated VA dashboard, transactions carried out by SPPGs can be monitored directly by the foundations, which remain responsible for reporting to BGN. At the same time, BGN itself can access the dashboard to track the actual use of allocated funds and ensure transparency in disbursement.

The purpose of this VA initiative is to assess whether a Virtual Account (VA)–based disbursement model is effective in improving reconciliation efforts and user satisfaction, both before and after it is implemented. The aim is to translate the pilot results into practical decision rules through direct testing and measurement. In this way, BRI can make informed, data-driven decisions and enhance the flow of MBG funds with greater confidence. After the implementation of the VA system, the Ministry of Finance recorded budget absorption (as of October 3, 2025) of IDR 20.6 trillion, equivalent to 29% of the IDR 71 trillion ceiling. Deputy Minister of Finance Suahasil Nazara stated that of this absorption, the number of recipients reached 31.2 million and was distributed throughout Indonesia.

Baccarin (2022) highlights that digital transformation in government fund transfers (as observed in Brazil and India) certainly requires technological advancements, institutional readiness for adaptation, and a willingness to engage in collaborative learning. Digital transformation in public finance has become a national priority in Indonesia, where government-to-people (G2P) programs aim to increase transparency and accountability in fund distribution. The introduction of the VA system by BRI for the Free Nutritional Meals (MBG) program exemplifies the shift toward data-driven governance and digital disbursement mechanisms. The VA system enables real-time, trackable transactions, ensuring that beneficiaries receive funds efficiently while enhancing institutional oversight.
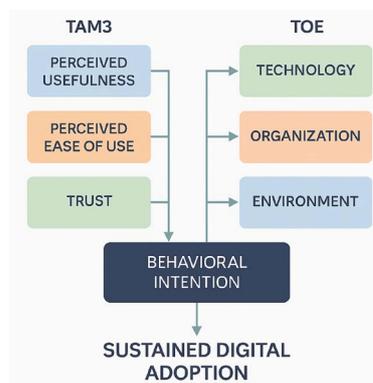

Figure 2. Integrated TAM3–TOE Model for MBG Virtual Account Disbursement

However, the adoption of digital financial systems in public institutions remains a challenge, influenced by both user perceptions and organizational readiness. Previous research has widely applied the Technology Acceptance Model (TAM) and its later extensions to explain individual behavioral intention in adopting technology (Davis, 1989; Venkatesh & Bala, 2008). This framework is "robust, powerful, and parsimonious," making it useful for investigating how individual technology adoption can be determined in various research contexts (Lai, 2017; Venkatesh & Davis, 2000). However, most research focuses solely on technology acceptance factors related to the usefulness and ease of use of technology from user perceptions. This presents a gap in examining how technology adoption behavioral interact with institutional factors—such as technology infrastructure, leadership support, and regulatory frameworks—that shape sustainable adoption in the public sector, a niche that has not been explored in many other studies.

This study addresses a significant gap in the digital public finance literature by integrating the Technology Acceptance Model 3 (TAM3) and the Technology–Organization–Environment (TOE) framework to examine the institutional adoption of a Virtual Account (VA) system within Indonesia's Makan Bergizi Gratis (MBG) program. While previous research has predominantly focused on retail banking or consumer adoption, this study uniquely explores VA implementation at an institutional level, linking individual behavioral intentions with organizational readiness and regulatory alignment. By applying this hybrid TAM-TOE framework to the public sector—a phenomenon rarely studied globally—the research provides new insights into how user acceptance and institutional governance jointly determine the sustainability of digital transformation in public fund disbursement.

The research is critically timely, as 2025 marks the first year of full MBG operations with a substantial national budget allocation under the BGN agency. A fast and auditable payment rail is essential to meet coverage targets and safeguard public funds. Although a VA-based model promises instant posting and automated reconciliation, scaling its use requires empirical evidence. To this end, the study is guided by three research questions: how individual perceptions influence behavioral intention to adopt the VA system; what organizational and environmental factors shape institutional readiness; and how the integration of TAM3 and TOE explains sustainable digital public fund governance.

The theoretical integration offers a comprehensive approach, where TAM3 explains the micro-level "why" of user acceptance through constructs like perceived usefulness and ease of use, while the TOE framework addresses the macro-level "how" of institutional implementation through technological, organizational, and environmental factors. The three research questions are operationalized into testable hypotheses within the TAM3 structure, employing key constructs such as Perceived Usefulness, Trust, and Behavioral Intention, along with antecedents like Job Relevance and Self-Efficacy. This model captures the multidimensional relationship between user perception, organizational context, and the sustainable adoption of digital systems in government-to-people programs.

Table 1. Quantitative hypotheses tested under the TAM3 framework

No	Hypothesis	Theoretical Rationale (TAM3 Basis)	Related RQ
H1	Job Relevance → PU	If the system is relevant to users' tasks, it is	RQ1–

		perceived as useful.	RQ2
H2	Computer Anxiety → PEOU	Higher anxiety decreases perceived ease of use.	RQ1
H3	Computer Self-Efficacy → PEOU	Confidence improves perceived ease of use.	RQ1
H4	PEOU → PU	Systems that are easier to use are perceived as more useful.	RQ1–RQ2
H5	PEOU → BI	Ease of use increases the intention to continue using the system.	RQ1–RQ3
H6	PU → BI	Usefulness is the primary determinant of behavioral intention and long-term sustainability.	RQ1–RQ3

These six hypotheses reflect how the three research questions are empirically tested within the quantitative TAM3 model. Each hypothesis not only examines user perception but also connects individual behavior to organizational readiness and sustainability dimensions identified in the TOE framework.

LITERATURE REVIEW

1. Public Fund Accountability and Digital Transformation

This literature review establishes the critical importance of efficient digital disbursement for public programs. Digital mechanisms are proven to enhance traceability, reduce fraud, and support efficient resource allocation (Purwowidhu, 2025; World Bank, 2020), addressing the delays and trust issues inherent in manual systems like the pre-digital MBG program (ANTARA, 2024). This is especially vital for supporting small and medium enterprises (SMEs), such as program caterers, which are highly vulnerable to cash flow disruptions from late payments. Evidence shows payment delays of 60–90 days can threaten SME sustainability, with a cascading "domino effect" throughout supply chains (Miller & Wongsaroj, 2017). Therefore, digital systems that ensure timely disbursement, as argued by Kaya (2024) and (Baccarin, 2009), are foundational for operational stability and financial inclusion.

The adoption of such systems is explained through complementary theoretical lenses. At the individual user level, the Technology Acceptance Model (TAM) and its evolution to TAM3 (Davis, 1989; Venkatesh & Bala, 2008) identify perceived usefulness and ease of use as key behavioral drivers, a finding supported in financial contexts from China to Indonesia (Desiani & Hutajulu, 2025; Liao et al., 1999). However, for institutional adoption in public programs, the Technology-Organization-Environment (TOE) framework (Tornatzky et al., 1990) is essential for understanding the broader context. This framework highlights how technological capability, organizational support—such as leadership readiness and inter-agency coordination (Bany et al., 2022; Shabirah & Aldianto, 2014)—and environmental factors like regulation jointly determine successful implementation, as seen in comparative studies of school feeding programs in Brazil, Scotland, and other nations (Compton & Hart, 2019; Sonnino et al., 2014).

Synthesizing these strands, a clear research gap exists: prior studies on virtual accounts and digital finance often focus on consumer banking or private firms (Gabriella & Khairudin, 2025), lacking an integrated analysis of institutional public-sector disbursement. This study fills that gap by combining the micro-level behavioral insights of TAM3 with the macro-level structural analysis of the TOE framework. This

integrated approach is applied to Indonesia's MBG program, a high-priority national initiative aimed at reducing stunting (World Bank, 2020), to comprehensively explain how user acceptance and institutional readiness jointly determine the sustainability of digital transformation in government-to-people fund governance.

2. Virtual account (VA) and Cash Management System (CMS)

The Virtual Account concept as defined by Bank Indonesia (2025)) describes a payment mechanism in which each payer or payee is assigned a unique account number under a main bank account, enabling automated reconciliation and transaction tracking. This directly addresses the operational bottlenecks of MBG's current disbursement process, which relies heavily on manual verification. Supporting this, the automated reconciliation concept explains how system-based payment matching reduces human error and processing delays, creating a faster and more reliable payment flow.

The implementation of Virtual Account (VA) systems in public sector disbursement programs represents an evolution in institutional cash flow control and accountability. A Virtual Account is a non-physical sub-account that enables automated fund allocation, reconciliation, and real-time monitoring, without the need to open multiple physical bank accounts. It is commonly integrated within a broader Cash Management System (CMS), which optimizes liquidity by enabling centralized control over cash inflows and outflows (Baccarin, 2009). The CMS framework, especially when supported by VA structures, allows organizations to manage multiple transactions from various sources efficiently while maintaining transparency and reducing operational risks.

The theoretical foundation for adopting VA within a CMS is aligned with the optimal impulse control approach articulated by (Baccarin, 2009), who emphasizes that real-time control systems reduce idle liquidity and transaction costs. By modeling a multidimensional CMS with generalized cost functions, his framework highlights the strategic benefit of centralized liquidity pooling and cost-effective transaction timing—a principle that underpins BRI's pilot disbursement model.

Liao et al. (1999) demonstrate that user trust and perceived control are significant predictors of virtual banking adoption. These findings reinforce the importance of clear user interfaces and robust backend systems, such as VA and CMS, in fostering institutional acceptance. Complementarily, Thetlek and Kraiwanit (2024) note that successful implementation of digital banking strategies in the public sector hinges on seamless integration with existing financial infrastructures and attention to regulatory and behavioral adoption challenges.

3. Technology Acceptance Model (TAM3)

The Technology Acceptance Model (TAM), introduced by Davis (1989), is one of the most widely used frameworks for understanding why individuals and organizations adopt or reject new technologies. TAM highlights two main factors that shape Behavioral Intention (BI): Perceived Usefulness (PU), which reflects whether users believe a system improves their work performance, and Perceived Ease of Use (PEOU), which refers to the extent users find the system simple and manageable. These constructs have been extensively validated in information systems and financial technology research, making TAM a suitable basis for analyzing adoption decisions in banking innovations (Venkatesh & Davis, 2000).

In the context of BRI's Virtual Account (VA) Disbursement Model, integrated with a Cash Management System (CMS), TAM provides a practical lens for evaluating both decision-making and stakeholder alignment. PU relates to how stakeholders perceive the VA-CMS system as enhancing fund disbursement efficiency, improving transparency, and reducing reconciliation delays. PEOU concerns whether users, including government agencies and program administrators, find the VA Dashboard intuitive, easy to navigate, and compatible with their existing workflows. When both conditions are met, the likelihood of adoption increases, aligning institutional decisions with stakeholder expectations.

TAM offers isolates core usability and benefit perceptions, which are often the most critical drivers in enterprise financial systems. This simplicity makes it especially useful for strategic evaluation of digital banking solutions like VA, where decision-making involves balancing system effectiveness, stakeholder trust, and regulatory compliance.

Empirical studies confirm the importance of these factors. Liao et al. (1999) found that trust and perceived control significantly influence virtual banking adoption, while Thetlek and Kraiwanit (2024) emphasized that successful digital banking strategies in the public sector depend on seamless integration with existing financial infrastructures and regulatory alignment. These findings suggest that adoption decisions are not purely technical, but also strategic, requiring stakeholder confidence and institutional readiness.

By applying TAM to the VA-CMS initiative at BRI, this study focuses on identifying the determinants of acceptance that shape decision-making and stakeholder alignment in the MBG program. The model helps explain why stakeholders may embrace or resist the system and provides insights for designing interventions (such as training, communication, or interface improvements) that can strengthen adoption, enhance transparency, and improve the effectiveness of disbursement strategies.
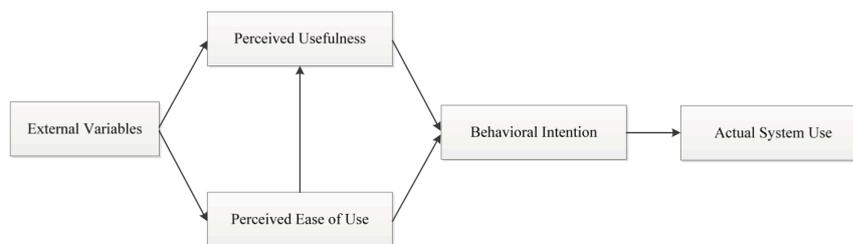

Figure 3. TAM model by Venkatesh & Davis (1996)

Ahmad (2018) emphasizes that while TAM provides a solid theoretical foundation, its predictive capacity in the banking sector is strengthened when extended with variables such as trust, security, and regulatory compliance, given the high sensitivity of financial transactions. These insights are directly applicable to the evaluation of BRI's Virtual Account (VA) Disbursement Model within the MBG program, where stakeholder adoption depends not only on usability and efficiency but also on the system's ability to ensure transparency, security, and conformity with public sector regulations.
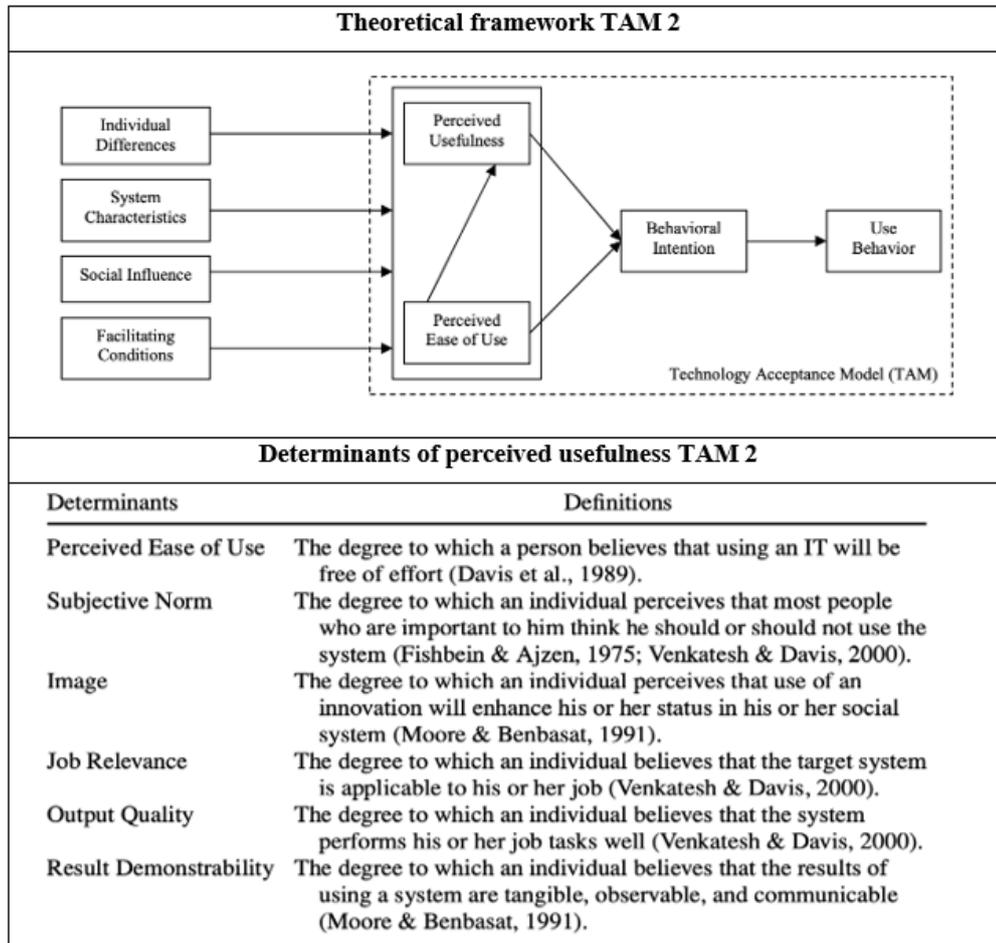
Theoretical framework TAM 2

Determinants of perceived usefulness TAM 2

Determinants	Definitions
Perceived Ease of Use	The degree to which a person believes that using an IT will be free of effort (Davis et al., 1989).
Subjective Norm	The degree to which an individual perceives that most people who are important to him think he should or should not use the system (Fishbein & Ajzen, 1975; Venkatesh & Davis, 2000).
Image	The degree to which an individual perceives that use of an innovation will enhance his or her status in his or her social system (Moore & Benbasat, 1991).
Job Relevance	The degree to which an individual believes that the target system is applicable to his or her job (Venkatesh & Davis, 2000).
Output Quality	The degree to which an individual believes that the system performs his or her job tasks well (Venkatesh & Davis, 2000).
Result Demonstrability	The degree to which an individual believes that the results of using a system are tangible, observable, and communicable (Moore & Benbasat, 1991).

Figure 4. TAM model by Venkatesh and Davis (2000)

The Technology Acceptance Model 2 (TAM2) was developed by Venkatesh and Davis (2000) as an extension of the original TAM framework Davis (1989). While TAM focuses on two central beliefs, Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), TAM2 expands this model by Social Influence Processes to adopt or reject a new system: subjective norm, voluntariness, and image.

First we need to determine the most appropriate theoretical framework for evaluating the acceptance of BRI's Virtual Account (VA) system in the MBG program, it is essential to compare various generations of the Technology Acceptance Model (TAM). Over the years, TAM has evolved through multiple extensions, each version introducing new variables to explain user behavior in different technological and institutional contexts.

DEVELOPMENT OF TAM 3	
Addition : Determinants of perceived ease of use.	
Determinants	Definitions
Computer Self-Efficacy	The degree to which an individual believes that he or she has the ability to perform a specific task/job using the computer (Compeau & Higgins, 1995a, 1995b).
Perception of External Control	The degree to which an individual believes that organizational and technical resources exist to support the use of the system (Venkatesh et al., 2003).
Computer Anxiety	The degree of "an individual's apprehension, or even fear, when she/he is faced with the possibility of using computers" (Venkatesh, 2000, p. 349).
Computer Playfulness	". . .the degree of cognitive spontaneity in microcomputer interactions" (Webster & Martocchio, 1992, p. 204).
Perceived Enjoyment	The extent to which "the activity of using a specific system is perceived to be enjoyable in its own right, aside from any performance consequences resulting from system use" (Venkatesh, 2000, p. 351).
Objective Usability	A "comparison of systems based on the actual level (rather than perceptions) of effort required to completing specific tasks" (Venkatesh, 2000, pp. 350–351).

Figure 5. TAM 3 model by (Venkatesh & Bala, 2008)

Venkatesh and Bala combine TAM2 Venkatesh and Davis (2000) and add the model of the determinants of perceived ease of use to develop an integrated model of technology acceptance—TAM3. TAM 3 introduces several novel relationships that extend prior models of technology acceptance by incorporating user experience as a moderating factor. Specifically, Venkatesh and Bala (2008) propose that the influence of perceived ease of use on perceived usefulness, computer anxiety on perceived ease of use, and perceived ease of use on behavioral intention are all moderated by the user's level of experience with the system. These relationships were not empirically examined in earlier studies by Venkatesh and Davis (2000) or Venkatesh and Bala (2008), making TAM 3 a more refined and adaptive framework for analyzing technology adoption, particularly in complex or institutional settings where user familiarity may vary significantly.
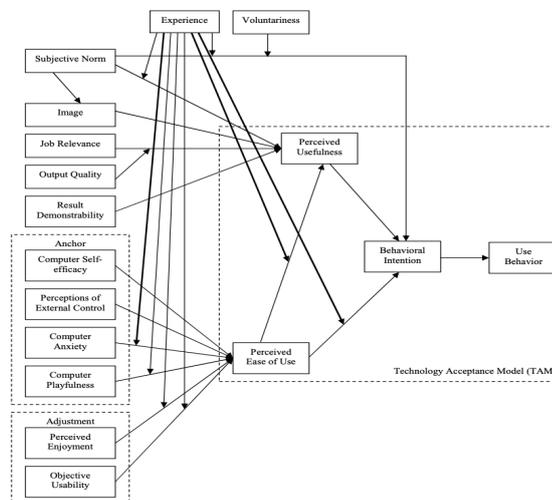

Figure 6. Technology acceptance model 3 (Venkatesh & Bala, 2008)

Tabel 2. Comparison with TAM Theory Research

Aspect	TAM 1	TAM 2	TAM 3
Main Focus	Basic user acceptance of technology	Adds social influence and cognitive factors	Focuses on determinants of perceived usefulness, integrating prior experience and environment
Key Constructs	Perceived Usefulness (PU), Perceived Ease of Use (PEOU)	Adding social factors (subjective norm, image, voluntariness) and cognitive factors (job relevance, output quality, result demonstrability), which influence Perceived Usefulness and ultimately shape intention and actual system use.	Adds Trust, Result Demonstrability, and moderating effects of experience and voluntariness
Strength	Simple and foundational	Includes external social/cognitive influences	Explains **why** users find tech useful and easy, more comprehensive
Weakness	Too basic for multi-stakeholder or institutional systems	Less suited for complex institutional environments	Can be complex, requires clear construct operationalization
Context Suitability	Individual tech adoption (e.g., apps, tools)	Corporate environment (office tech)	**Institutional or organizational systems (e.g., public sector digital tools)**
Suitability for study	Too simple to explain the syudy	Doesn't focus on institutional trust or accountability	**System Experience** and trust already included. Suitable for research in this study

Venkatesh and Bala (2008) expanded TAM by including determinants such as trust, self-efficacy, and experience. In the MBG case, Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) positively influence Behavioral Intention (BI) among users adopting BRI's VA dashboard. Comparative frameworks such as UTAUT3 Desiani and Hutajulu (2025) show that perceived relevance and trust remain key drivers in technology adoption.
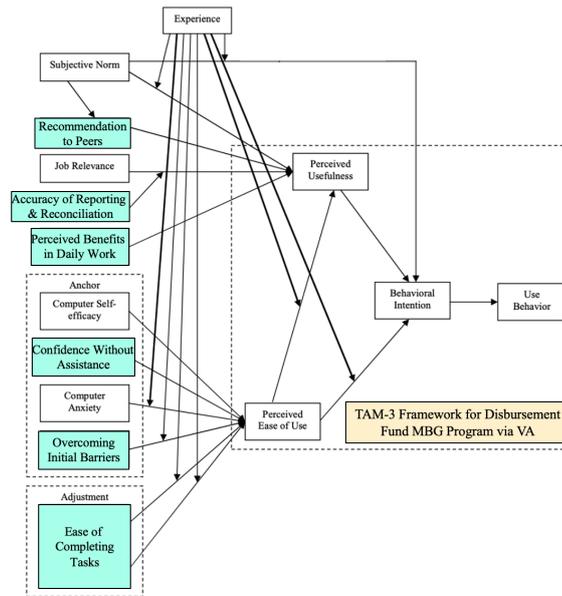
Figure 7. Adaptation TAM 3 to MBG (Author, 2025)

The diagram above illustrates a customized adaptation of the Technology Acceptance Model 3 (TAM3), originally developed by Venkatesh and Bala (2008), tailored to the implementation of the Virtual Account (VA) disbursement system within Indonesia's Makan Bergizi Gratis (MBG) program.

Tabel 3. Adjustment Explanation TAM 3 Adoption to MBG (Author, 2025)

TAM3 Construct -Excluded	Justification Excluded	Re-mapped Variable	Corresponding Question/Item
Image	Less relevant in mandatory-use institutional context	*Recommendation to Peers*	"I would recommend the use of the VA system to other SPPG units."
Output Quality	Not directly measured; VA system focus is efficiency not quality perceptions	*Accuracy of Reporting & Reconciliation (PU)*	"The VA system improves the accuracy of reporting and reconciliation."
Result Demonstra-bility	Difficult to operationalize in this context; excluded for parsimony	*Perceived Benefits in Daily Work (PU)*	"Overall, the VA system is useful in my daily responsibilities."
Perceptions of External Control	No items included; external support assumed but not measured	*Confidence Without Assistance (Self-Efficacy extension)*	"I feel confident in using the VA system without assistance."
Computer Playfulness	Not applicable; VA use is task-driven, not playfulness-driven	*Overcoming Initial Barriers (Experience)*	Open-ended: "I was confused at first, especially with login steps."
Perceived Enjoyment	Not applicable; VA system not designed for enjoyment	*Ease of Completing Tasks (PEOU)*	"I can complete tasks with the VA system without much effort."
Objective Usability	Not part of survey design		
Voluntariness	Since the use of the VA by SPPG could become top-down instruction rather than optional, Voluntariness does not need to be included in the framework. What is more relevant is Experience, as actual user experience strongly influences both perceived ease of use and perceived usefulness.		

By structuring the evaluation around TAM3, the study enables both quantitative analysis of adoption patterns and targeted policy recommendations for rollout, onboarding, and support strategies within the MBG program.

4. Technology–Organization–Environment (TOE)

To investigate the adoption of Virtual Account technology for program fund disbursement at Bank Rakyat Indonesia (BRI), the Technology–Organization–Environment (TOE) framework serves as a structured analytical foundation. This framework, originally introduced by Tornatzky et al. (1990), used to examine how internal and external contextual factors shape organizational technology adoption decisions. A relevant and recent application of TOE in the banking sector is presented by Bany et al. (2022), who applied it to analyze Business Intelligence and Analytics (BIA) usage in Middle Eastern banks.
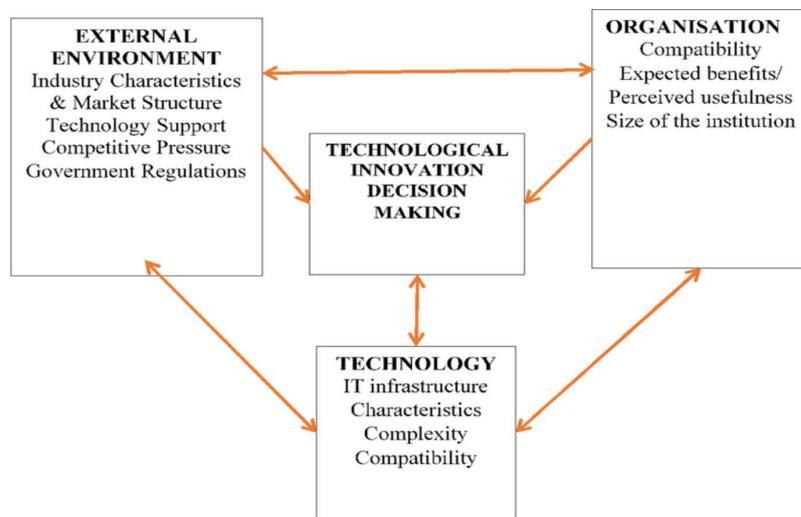

Figure 8. The TOE Framework (Tornatzky et al., 1990)

The Technology–Organization–Environment (TOE) framework offers a structured basis for exploring the adoption of Virtual Account systems within the MBG program. Its relevance lies in capturing a holistic view of decision-making by considering not only technical capabilities but also organizational readiness and environmental pressures. By applying the TOE framework in qualitative data collection, this study ensures that interviews with BGN officials reflect a balanced analysis of internal capabilities, system compatibility, stakeholder coordination, and external policy influence. This approach allows for nuanced insights into the institutional conditions that shape technology adoption beyond surface-level operational issues, making TOE a suitable lens for investigating complex public-sector implementations.

While TAM captures adoption at the individual level, the TOE framework Tornatzky et al. (1990) is used to analyze the broader institutional context in which VA is adopted. TOE highlights three dimensions:
- Technology: The technical readiness of the VA system, including dashboard functions, reliability, and compatibility with existing payment systems.
- Organization: The internal capabilities of BRI and BGN, such as resources, skills, and processes required to scale up the VA model effectively.
- Environment: External factors including regulatory demands, audit requirements, and pressure from stakeholders to ensure transparency and accountability.

5. Integrating TAM–TOE Perspective

The combination of TAM3 and TOE frameworks offers an integrated analytical lens bridging individual perception and institutional capability. TAM3 explains user acceptance, while TOE clarifies contextual readiness, together providing a dual-level explanation, of digital transformation within public governance. This integrative view strengthens the argument that sustainable adoption requires both personal acceptance and organizational support.

To further position this study within the existing literature, Table summarizes key prior research on virtual banking and technology adoption, highlighting the objectives, methodologies, contributions, and relevance to the current study on Virtual Account (VA) implementation in Indonesia's MBG program.

RESEARCH METHODOLOGY

The study follows a mixed-method research design integrating quantitative and qualitative data collection (Creswell, 2018; Sekaran, 2016; Sugiyono, 2023). The quantitative procedure employs PLS-SEM using the guidelines of Hair et al. (2019) for model reliability and validity assessment. These methodological standards ensure alignment with established research protocols in social and management sciences. A mixed-methods approach was employed to examine both individual adoption behavior and institutional readiness in the MBG program. The quantitative component tested the TAM3 framework, while the qualitative component explored TOE dimensions.

Data Collection

Data for this study were collected from both primary and secondary sources to ensure triangulation and validity.

- *Quantitative Data*: A structured TAM3-based survey was distributed to 100 SPPG officers managing daily disbursement activities in the MBG program. Constructs measured include Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Trust, Behavioral Intention (BI), and antecedent variables such as Job Relevance, Computer Self-Efficacy, and Computer Anxiety. The instrument used a 4-point Likert scale (1 = Strongly Disagree to 4 = Strongly Agree). The minimum sample size (n = 92) was determined using Slovin's formula (N = 1,096, e = 0.10). The actual size collected n = 139. Reliability and validity were tested using Cronbach's Alpha and item-total correlation.
- *Qualitative Data*: Semi-structured interviews were conducted with decision-makers from the National Nutrition Agency (BGN) and institutional representatives from BRI. The interviews followed the TOE dimensions and were analyzed thematically to explore institutional readiness and policy alignment.
- *Secondary Data*: Supplementary documents, such as policy papers, financial reports, and transaction records, were reviewed to contextualize the primary findings and support cross-validation.

Quantitative Design

A structured survey was distributed to SPPG officers who actively used the Virtual Account (VA) dashboard for fund reconciliation. The instrument measured six constructs: Job Relevance, Computer Anxiety, Computer Self-Efficacy, Perceived Ease of Use (PEOU), Perceived Usefulness (PU), and Behavioral Intention (BI). All items

were rated on a four-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). The questionnaire items were adapted from Venkatesh and Bala (2008) and modified for the MBG context.

Table 4. List of Questionaire and Interview Respondents.

Stakeholder Group	Role in MBG Program	Data Collection Method	Purpose of Involvement
SPPG Officers	Manage day-to-day disbursement and reporting at the kitchen level	Structured questionnaire (TAM-based), user interviews	To assess perceived usefulness, ease of use, and behavioral intention toward the VA system
Decision Makers (BGN)	Set policy for VA system implementation and expansion	In-depth interviews	To capture insights on policy rationale, oversight needs, and long-term scalability of the VA model

This mixed-methods approach ensures comprehensive coverage of both behavioral and institutional dimensions, aligning with the study's aim of evaluating the VA disbursement model from decision-making and stakeholder perspectives. The data from primary sources is collected based on the question list. The questions are prepared to follow the theory: TAM and TOE Framework.

Data Analysis

The quantitative data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS version 4. This approach was chosen because it allows for analysis of complex relationships among latent variables with relatively small sample sizes and does not require normal data distribution. The PLS-SEM procedure included two stages: (1) assessment of the measurement model through reliability (Cronbach's alpha, composite reliability) and validity (average variance extracted/AVE); and (2) evaluation of the structural model to estimate path coefficients (β), t-values, and p-values using bootstrapping with 5,000 resamples. The model's explanatory power was examined using R^2 and Adjusted R^2 values.

As of July 30, 2025, the total number of SPPGs registered with BRI in relation to the MBG program amounted to 1,096. Since it is not feasible to survey the entire population, an appropriate sample size must be determined. In this study, Slovin's formula is applied to calculate the minimum representative sample size. To quantify, a list of questions will be distributed to all SPPGs are as follows:

Table 5. Questions related to TAM in a Likert scale (1-4)

Section A – Perceived Ease of Use (PEOU)
These items measure how easy the system is to learn and operate.
1. Learning to operate the VA system was easy for me.
2. I find the VA dashboard interface clear and user-friendly.
3. It is easy for me to become skillful at using the system.
4. I can complete tasks with the VA system without much effort.
Section B – Perceived Usefulness (PU)
These questions assess how much the system helps improve job performance.
1. Using the VA system enhances my efficiency in disbursing funds.
2. The VA system improves the accuracy of reporting and reconciliation.

3. The VA system enables me to complete tasks more quickly.	
4. Overall, the VA system is useful in my daily responsibilities.	
Section C – Behavioral Intention (BI)	
These questions reflect user willingness to continue using the system.	
1. I intend to keep using the VA system in future disbursement activities.	
2. I would recommend the use of the VA system to other SPPG units.	
3. I consider the VA system as part of my routine work process.	
Section D - External Factors (TAM3 Extensions)	
Addition based on deeper analysis needs.	
1. I feel confident in using the VA system without assistance. *(Computer Self-Efficacy)*	
2. I do not feel anxious when working with the VA system. *(Computer Anxiety – reverse coded)*	
3. The system is aligned with the tasks I am responsible for. *(Job Relevance)*	
Section D – Open-Ended (Qualitative Insights)	
1. In your opinion, what are the main benefits of the VA Dashboard for monitoring MBG disbursements?	
2. What challenges or limitations have you experienced in using the VA–CMS system?	
3. What improvements would you suggest to make the VA Dashboard more effective as a monitoring and reporting tool?	

Qualitative Design

Complementing the quantitative findings, semi-structured interviews were conducted with BGN directors and regional coordinators. The interviews focused on three TOE dimensions (technological readiness, organizational capacity, and environmental regulation) to explore institutional enablers and constraints. The TOE framework is particularly relevant for stakeholders at the institutional level (BGN) who play a strategic role in the implementation and oversight of the Virtual Account (VA) dashboard system.

Table 6. TOE Interview Questions to BGN Official

TOE Dimension	Interview Question
Technology	How effective do you find the VA dashboard in ensuring transparency and accountability in disbursement monitoring?
	What improvements or additional functionalities would make the system more valuable for BGN's oversight role?
Organization	How do existing workflows within BGN align with the use of the VA dashboard?
	What barriers (if any) within your organization affect the smooth adoption of digital monitoring tools?
Environment	To what extent does collaboration with BRI influence your adoption and effective use of the VA dashboard?
	How do external pressures (e.g., audit requirements, government directives, stakeholder scrutiny) shape your expectations of the system?

Integration Procedure

Quantitative (TAM3) and qualitative (TOE) results were integrated through triangulation. The integration compared behavioral determinants of technology acceptance with contextual factors affecting organizational implementation. This

approach enabled the study to explain both individual intention and institutional sustainability within a single hybrid framework.

RESULTS AND DISCUSSION

A. Result

1. Quantitative Findings (TAM3)

Partial Least Squares Structural Equation Modeling (PLS-SEM) was applied using SmartPLS 4 to test the TAM3 hypotheses. Before conducting PLS-SEM modeling, construct validity and reliability were first tested. According to Ghozali (2007), a construct or variable is considered reliable if it produces a Cronbach's alpha value > 0.60. The alpha value generally used as an indicator is 0.60. The results showed that all constructs met the reliability and validity thresholds: Cronbach's α > 0.8, Composite Reliability > 0.7, and AVE > 0.5, indicating strong internal consistency and convergent validity. This also indicates a valid and reliable research instrument, as shown in Figure 9 where the outer loading of the research instrument is > 0.7. Research instruments determine the quality of a study's data.
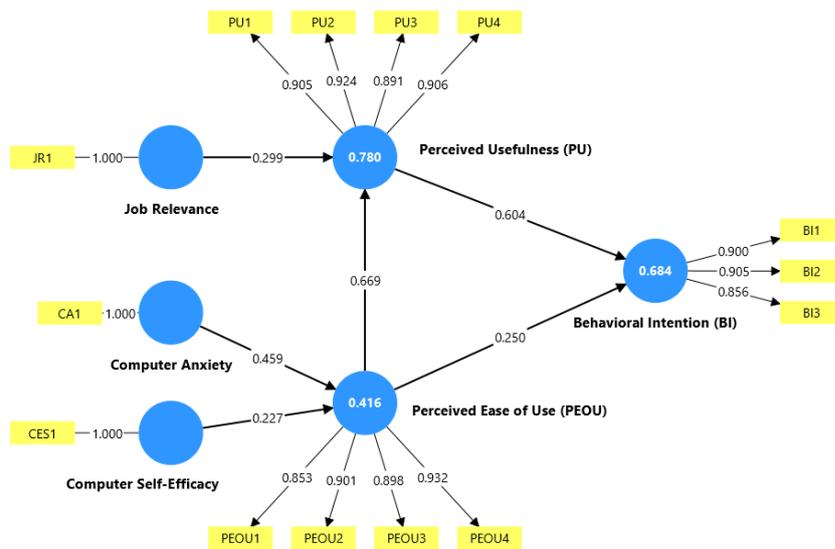
The structural model results were:

Figure 9. PLS-SEM Analysis Result (Source: SEM-PLS, 2025)

Hypothesis Testing Results

Hypothesis testing was conducted to determine the factors influencing behavioral intention. Hypothesis testing in PLS-SEM analysis was conducted by examining the results of the t-statistic test and the p-value. The hypothesis was accepted if the p-value was <0.05 (5% significance level) and the t-value was >t-table (1.96). The t-statistic test in PLS analysis was conducted using the bootstrapping method. The results of the hypothesis testing can be seen in Table 9.

Table 7. Hypothesis Testing Result

H	Path	β (Coefficient)	t-value	p-value	f² Effect Size	Result
H1	Job Relevance → Perceived Usefulness (PU)	0.299	3.580	0.000	0.18	Supported

H2	Computer Anxiety → Perceived Ease of Use (PEOU)	0.459	3.348	0.000	0.21	Supported
H3	Computer Self-Efficacy → PEOU	0.227	2.015	0.022	0.10	Supported
H4	PEOU → PU	0.669	8.747	0.000	0.35	Supported
H5	PEOU → Behavioral Intention (BI)	0.250	1.854	0.032	0.14	Supported
H6	PU → BI	0.604	4.777	0.000	0.29	Supported

Following Hair et al. (2019), f^2 effect size values above 0.15 indicate moderate influence and values above 0.35 indicate large effects. In this study, Perceived Ease of Use (PEOU) demonstrated the strongest impact on Perceived Usefulness (PU) with f^2 = 0.35, confirming its central role in shaping user perception within the TAM3 structure. The results reveal that Perceived Ease of Use (PEOU) has both a direct and indirect influence on Behavioral Intention (BI) through Perceived Usefulness (PU). Trust, though not a core TAM3 variable, was confirmed qualitatively as a mediating factor enhancing system credibility and user confidence.

The Effect of Perceived Ease of Use on Behavioral Intention

Based on Table 9, Perceived Ease of Use directly has a positive and significant effect on Behavioral Intention (H5: β=0.250, p<0.032). Furthermore, indirectly (through Perceived Usefulness), Perceived Ease of Use has a positive and significant effect on Behavioral Intention (H4: β=0.669, p<0.000). This means that Perceived Ease of Use directly and indirectly influences Behavioral Intention to use the VA system. This is in line with research by Sharma (2020); Rouibah (2021); Khiong (2022) showed that Perceived Ease of Use has a positive and significant effect on Behavioral Intention. This is consistent with statements by SPPG officers, "the system is smooth, but sometimes reports are late or payroll is not yet active."

The Effect of Perceived Usefulness on Behavioral Intention

Based on Table 9, Perceived Usefulness directly has a positive and significant influence on Behavioral Intention (H6: β=0.604, p<0.000). This means that Perceived Usefulness directly influences Behavioral Intention in using the VA system. In line with research by (Ahmed et al., 2024; Andika et al., 2025), the results showed that Perceived Usefulness has a positive and significant influence on Behavioral Intention. This is consistent with the statement of the SPPG officer, "Reports are now prepared faster, and supplier payments are now easier to reconcile."

Overall, the statistical outcomes show strong explanatory power for the model (R^2 PU = 0.416 / Adjusted R^2 > 0.67), proving that the VA system's usefulness, ease of use, and trustworthiness significantly drive users' willingness to continue its adoption in the MBG program. These quantitative findings align with the qualitative TOE analysis, confirming that technology acceptance is reinforced by institutional readiness and leadership support.

2. Qualitative Findings (TOE)

The qualitative results highlight three key dimensions under the TOE framework.

- *Technology*: The implementation of BRI's Virtual Account (VA) dashboard significantly improved the accuracy of disbursement data and enhanced real-time

fund traceability. Respondents emphasized that the integration of automated reporting tools reduced manual reconciliation errors and increased the efficiency of verification processes. BGN officers also highlighted the VA dashboard as the important technology that enable for facilitate the need for transparency and accountability.

- *Organization*: Although training gaps and variations in digital literacy persist among SPPG operators, strong leadership commitment from both BGN and BRI has been instrumental in accelerating adoption. Continuous communication, problem-solving support, and inter-departmental coordination were frequently cited as decisive organizational enablers. The deputy emphasized internal coordination already supported VA implementation across region and make it easier for adoption, but scalability was a concern. This indicates that organizational size, resources, and communication processes shape system adoption, consistency within TOE theory.

- *Environment*: Regulatory guidance from the Ministry of Finance and the accountability requirements embedded in the national budget (APBN) framework created external pressure that strengthened compliance. The alignment between government oversight and bank procedures promoted transparency and institutional trust. Collaboration with BRI was indeed viewed very positively, and environmental pressures reinforced the importance of system transparency. These insights explain why, even with strong user-level acceptance (TAM results) that already established by the study, system adoption also depends on policy and external legitimacy as we know it.

3. Integrated Analysis

To connect the quantitative findings from TAM3 with the qualitative insights of TOE, this section synthesizes how individual acceptance interacts with institutional readiness in sustaining system use. The integration of TAM3 and TOE findings demonstrates that institutional readiness amplifies the behavioral intention to continue using the VA system. Organizational capacity and policy support serve as reinforcing mechanisms that sustain digital adoption beyond the initial implementation phase. This synergy confirms the validity of the TAM3–TOE hybrid framework in explaining digital transformation within public financial governance. Perceived Usefulness (TAM) results align with Technology (TOE) where the VA dashboard is perceived as useful for increasing transparency and efficiency. Perceived Ease of Use (TAM) results align with Organization (TOE) where intuitive system use is supported by existing maker–approver workflows. Behavioral Intention (TAM) results are reinforced by Environment (TOE) where strong accountability and audit pressures encourage continued system use. Overall, the TAM3–TOE hybrid framework points in the same direction in increasing user confidence in using the VA system.

B. Discussion

The results reinforce the argument that technology acceptance and institutional readiness are interdependent drivers of successful public-sector innovation. The MBG case exemplifies how the effectiveness of digital systems depends not only on individual perceptions of usefulness and ease of use but also on structural enablers such as leadership coordination, cross-agency commitment, and regulatory

consistency. When these elements align, the adoption of technology becomes both technically feasible and institutionally sustainable. This dual emphasis on behavioral and organizational dimensions supports a holistic approach to digital transformation in government fund management. The findings are consistent with previous Indonesian studies on branchless banking adoption, which highlight that technological capacity and regulatory support are critical determinants of success in digital financial services (Shabirah & Aldianto, 2014).

Based on the TOE context (technology, organization, and environment), these factors align with respondents' positive perceptions of using the VA system (Perceived Usefulness). This relationship indicates that technological advances make technology more accessible and beneficial for users. Furthermore, organizational factors align with Perceived Ease of Use, which influences how users understand and accept the adoption of new technologies. The environment plays a crucial role in encouraging and facilitating the government's adoption of new technologies.

CONCLUSION AND IMPLICATIONS

This study examines the success of digital transformation by integrating the behavioral perspective of the Technology Acceptance Model (TAM3) with the institutional context of the Technology-Organization-Environment (TOE) framework. It finds that the implementation of the Virtual Account (VA) system within Indonesia's Makan Bergizi Gratis (MBG) program delivered core operational benefits, such as faster fund transfers, simplified reconciliation, and real-time traceability, thereby enhancing transparency and accountability. However, system delays during balance updates and slow bank statement downloads revealed stability issues that occasionally forced manual work, indicating room for improvement in technical performance.

User acceptance of the system was primarily driven by perceived usefulness and ease of use, as predicted by TAM3, with stakeholders valuing the simplified dashboard and automated tracking. Initial onboarding posed a significant learning curve, requiring direct bank assistance, while functional gaps — such as an inability to process utility payments or payroll — somewhat weakened perceived usefulness. This underscores that continuous user training and feature expansion are critical for maintaining digital confidence and satisfaction among stakeholders.

For financial oversight, the VA Dashboard significantly enhanced BGN's monitoring efficiency by providing real-time transaction visibility and reliable audit trails. Nonetheless, limitations were noted, including a lack of automated reporting, an inability to categorize expenditures, and potential scalability challenges in managing over 3,500 accounts. These findings suggest that further enhancements in automation and data processing are needed to fully realize the system's governance potential.

Ultimately, this research demonstrates that sustainable digital transformation in public finance requires more than positive user intention; it necessitates strong institutional alignment across technology, organizational capability, and regulatory support. The study therefore extends the application of TAM3 and TOE theory into the realm of government digitalization, offering policymakers practical insights into ensuring sustainable adoption through strengthened inter-agency coordination and targeted user training.
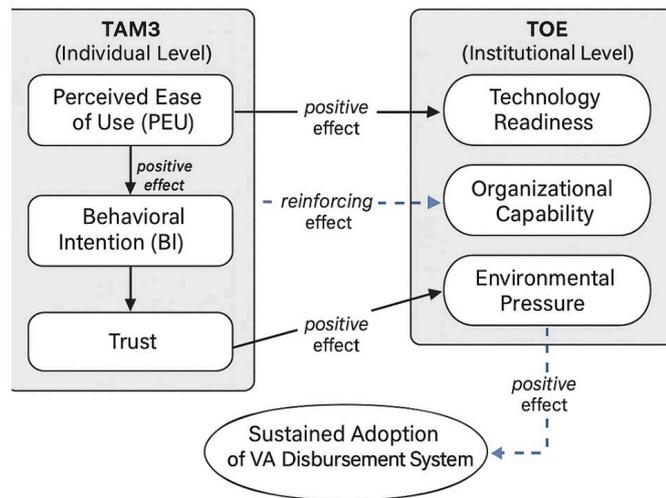
Figure 10. Integrated TAM-TOE Framework for Digital Public Fund Disbursement in MBG Case

By empirically linking behavioral acceptance with structural readiness, this study offers a novel theoretical pathway for understanding the dynamics of public-sector innovation. It also provides practical insights for policymakers and financial institutions aiming to enhance transparency, accountability, and efficiency in digital fund governance.

Managerial Implications:

The research findings indicate that the implementation of Virtual Accounts (VA) in the Free Nutritional Meal Program (MBG) is strategically relevant to Indonesia's national policy, particularly within the framework of digital reform of the country's financial system. From an institutional perspective, the research findings indicate that successful technology adoption is determined not only by perceived usefulness and ease of use (TAM3), but also by organizational readiness and regulatory pressure (TOE). This requires BRI to develop policies that strengthen the digital literacy of SPPG operators, improve the stability and features of the VA dashboard, and establish data governance policies that support real-time analytics and interoperability between government agencies.

Furthermore, the use of VA aligns with the principles of good governance and global digital G2P payment standards recommended by the World Bank and the IMF. This implementation aligns with food program governance models in Brazil, India, and several European countries that emphasize transparency and digital tracking of public fund flows. Therefore, the results of this study support Indonesia's position to adopt international digital payment standards and develop a more integrated and responsive Public Cash Management System.

Future Research:

Future research could expand the unit of analysis by including other units in the MBG implementation chain, such as beneficiaries, food suppliers (MSMEs), and local governments, to assess the socio-economic impacts and coordination dynamics not covered in this study. Furthermore, future research could develop the integration model by adding other variables such as cybersecurity, system quality, and operational risk as an extension of TAM3 and TOE.

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