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Digital Adoption and Financial Sustainability in Tanzania's Water Sector: The Role of Effort Expectancy and Organizational Culture

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Abstract

The research investigates the effort expectancy (EE) of the Water Information System, referred to as MAJI Information System (MAJI IS) usage, and its impact on the financial performance (FP) of public water utilities in Tanzania. Financial performance (FP) is described by revenue collection (FPR), service level effectiveness (FPS), functionality (FPF) and non-revenue water (FPN). Specifically, the study examines the moderating role of organisational culture, focusing on leadership style (OCL) and technology readiness (OCT), in strengthening usage and performance relationships. Guided by the Unified Theory of Acceptance and Use of Technology (UTAUT), the study adopted a positivist philosophy, quantitative approach, and deductive design. Data were collected through structured questionnaires from 235 respondents across Tanzanian water utilities. Constructs included Effort Expectancy (EE) as a predictor of usage. Financial performance was assessed through Revenue Collection (FPR), Service Level Effectiveness (FPS), Functionality (FPF) and Non-Revenue Water (FPN). Data was analyzed using the analysis of moment structures - structural equation modelling (AMOS-SEM). Results indicated that Effort Expectancy (EE) exerts a limited and selective effect within the model. Although EE significantly influences system usage, several of its direct relationships with performance outcomes, specifically service level effectiveness and functionality, were not statistically significant. This indicates that ease of use alone may be insufficient to drive comprehensive performance improvements in

water utility operations. This study adopted one variable of UTAUT by integrating organisational culture as a moderator and linking MAJI IS usage to organisational level outcomes, particularly financial performance in water utilities. It provides empirical evidence from the Tanzanian water sector, offering theoretical and practical insights for improving water utility performance.

Keywords: Financial Performance, Revenue Collection, Service Level Effectiveness, Non-Revenue Water Reduction, Maji IS, Organisational Culture, Effort Expectancy, UTAUT.

Introduction

Water utilities worldwide face increasing pressure to deliver reliable, efficient, and financially sustainable services. Developed countries face several challenges in their water systems, including ageing infrastructure, contamination of water quality, and rising operation costs (Kovacic and Benini, 2022). Building on this, water utilities in developing countries, especially in sub-Saharan Africa, face challenges such as high non-revenue water (NRW), underinvestment, and weak governance (AbuEltayef et al., 2023). In contrast, over 40% of water in Tanzania is lost through leakages, theft, or faulty metering, double the recommended 20% threshold (Zahor and Mromba, 2022). Rural areas also suffer from poor digital infrastructure and inefficient billing systems (Twaambo and Phiri, 2021). Inefficiencies in water utilities' operations, such as high non-revenue water (NRW) and unreliable service delivery, highlight the need for effective digital tools like MAJI IS.

The MAJI Information System (MAJI IS) is a digital management platform used by water utilities in Tanzania to support operational and financial functions, including customer registration, billing, meter reading, revenue collection, reporting, and monitoring of water service delivery indicators such as non-revenue water (NRW). MAJI Information System (MAJI IS) was introduced in Tanzania for billing, asset management, and performance monitoring (Kwikima et al., 2024) to address those inefficiencies. Furthermore, the financial impact remains under-researched. Studies from Kenya and South Africa suggested digital tools have succeeded when supported by strong institutional frameworks (Moghayedi, 2024). Research shows that digital success in the public sector is largely dependent on internal factors, such as leadership, culture, and staff engagement (Komakech et al., 2020). The current study addresses a critical gap by examining the determinant of MAJI IS usage and its financial impact using the UTAUT framework, focusing on effort expectancy (Mahara et al., 2021). Organisational culture, through leadership style and technology readiness, was introduced as a moderating factor (Hassaan and Yaseen, 2024).

Unlike studies that treat culture as a monolith or focus on external pressures, this research explores internal dynamics shaping digital effectiveness. By integrating effort expectancy extracted from UTAUT and organisational culture from institutional

theory, it links system use to financial performance, offering both theoretical and practical insights for improving digital governance in Tanzania's water sector.

LITERATURE REVIEW/THEORETICAL UNDERPINNING

Theoretical Literature Review

Deliberately, the study makes contribution by extending the Unified Theory of Acceptance and Use of Technology (UTAUT) beyond its focus on traditional individual-level. While primarily UTAUT explains technology acceptance through individual perceptions such as Effort Expectancy, Performance Expectancy, and Social Influence, this study advances the framework by examining how these constructs of individual-level translate into organizational-level financial performance outcomes within water utilities.

The extension is theoretically justified through the integration of Socio-Technical Systems Theory and the Resource-Based View (RBV). From a socio-technical perspective, individual interactions with information systems collectively shape organizational processes, such as revenue tracking, billing accuracy, and data management. From an RBV perspective, consistent and effective system usage constitutes an organizational capability that can generate measurable performance advantages when properly embedded into operational routines (Taher, 2011).

Accordingly, Effort Expectancy is not treated as an isolated psychological perception, but as a stimulus for efficiency of system utilization, which, when aggregated across users, contributes to improved organizational performance outcomes. This multi-level interpretation provides a more realistic explanation of how digital systems generate value in public sector organizations, particularly in resource-constrained environments such as Tanzanian water utilities (Madaki et al., 2024).

Effort Expectancy

Aligned with UTAUT, effort expectancy reflects users' belief that MAJI IS improves job performance (Venkatesh *et al.,* 2016). While most studies focus on system usage, few examine how such usage contributes to improved billing accuracy, customer management, service delivery, and non-revenue water reduction, factors that collectively enhance revenue collection and operational efficiency, as key dimensions of financial performance. Effort expectancy (EE) is also known as the degree to which an individual's use will result in performance gain or perceived usefulness (Twaambo and Phiri, 2022).

Within the adapted UTAUT framework, Effort Expectancy (EE) is posited to influence financial performance through its effect on system usage and process efficiency. A system perceived as easy to use is more likely to be consistently and correctly utilized by staff, leading to improved execution of critical in relation to revenue functions such as timely invoicing, billing accuracy, and effective tracking of customer payments. These operational improvements are expected to cumulatively enhance revenue collection and reduce non-revenue water (NRW), consequently linking EE to higher-level financial outcomes.

Some studies aligned institutional theory on dimensions of organisational culture, encompassing leadership, adaptability, technology readiness, and employee engagement, to shape decision-making and operations (Madi *et al*., 2023). This study focused on organisational culture as a moderating variable rather than all institutional factors. Grecksch (2021) defined shared values influencing technology usage and performance as crucial in water management and MAJI IS usage. The study was guided by leadership style and technology readiness as a moderating role under the organisational culture.

While Effort Expectancy (EE) is envisioned at the individual level within the UTAUT framework, this study theorizes that, when aggregated across users within an organization, EE reflects a collective ease-of-use conditions that shapes utilization of system patterns and operational efficiency. These effects of organizational level provide the mechanism through which EE influences financial performance. Within UTAUT, Effort Expectancy influences behavioral intention and system usage, particularly in early stages of adoption (Khan et al., 2022).

Drawing on Socio-Technical Systems Theory, performance of organisation emerges from the alignment between human actors and technological systems. A system observed as easy to use enhances user interaction, reduces resistance, and improves task execution. When such interactions are reproduced across users, they produce system-wide improvements in operational processes such as billing accuracy, data entry reliability, and reporting efficiency. From a Resource-Based View (RBV) perspective, effective utilization of information systems constitutes an intangible organizational capability (Mehmood et al., 2023). When employees collectively perceive a system as easy to use, the organization is better able to leverage that system to enhance operational routines (Thomas, 2024). These improved routines, such as timely billing, accurate meter data capture, and reduced revenue leakages, produce enhancements financial performance outcomes.

Accordingly, this study visualizing a multi-level pathway in which Effort Expectancy (EE), though measured at the individual level, exerts its influence at the organizational level through aggregated usage behaviours and process efficiencies. Specifically, higher perceived ease of use enhances consistent and accurate system utilization, which improves operational processes such as billing, loss control and revenue tracking. These process improvements, in turn, lead to enhanced financial performance indicators like revenue collection and non-revenue water (NRW) reduction.

This multi-faceted explanation is critically important considering that not all direct effects of effort expectancy on financial performance were statistically significant in the structural model. This implies that EE does not directly drive financial outcomes on the contrary operates through indirect and emphasizes creating systems that balance technical, organizational, and social needs and capability-based viewpoints. The direct paths allow testing whether EE exerts residual organizational effects beyond moderated pathways.

Leadership Style

Leadership style is the pattern of actions and decisions leaders use to motivate, manage, and engage employees to achieve collective outcomes (Dulewicz and Higgs, 2005). Leadership style is the approach leaders use to build trust, encourage innovation, reward performance, and involve employees in achieving organisational goals (Raveendran and Balakrishnan, 2021). The current study adopts Raveendran and Balakrishnan (2021) as it aligns with the employees' performance.

Technology Readiness

Technology readiness refers to an organization's preparedness to embrace and effectively utilize new technologies, which directly influences the success of information system adoption. Parasuraman (2000) conceptualized technology readiness as comprising optimism, innovativeness, discomfort, and insecurity, highlighting both enabling and inhibiting beliefs toward technology use. Further, it can be stated as "the preparedness of organisations and individuals to integrate new information technologies into processes" (Aboelmaged, 2014). In organisational culture, high technology readiness fosters acceptance of systems like MAJI IS by reducing resistance, enhancing perceived ease of use, and increasing performance expectations.

The technology-readiness construct refers to people's propensity to embrace and use new technologies to accomplish goals in home life and at work and is viewed as the overall state of mind resulting from a gestalt of mental enablers and inhibitors that collectively determine a person's predisposition to use new technologies (Parasuraman, 2000). The study adopts Parasuraman (2000) due to its embrace and use of new technologies for accomplishing goals.

Empirical Literature Review

Relationship between Effort Expectancy of MAJI IS Usage and Financial Performance of Water Management Systems

While numerous studies affirm that technology usage supports financial sustainability, few directly link effort expectancy (EE) to economic outcomes. For instance, Okoli (2023) highlighted cost as a key factor in smart water meter adoption in South Africa but did not explore EE's influence on financial performance. Similarly, De Camargo et al. (2023) evaluated a low-cost IoT monitoring system using statistical indicators such as RMSE and R^2 but omitted any analysis of EE. Komakech et al. (2020) showed that cost management enhances financial sustainability in Tanzania using MANOVA, yet they neither studied MAJI IS nor PE specifically.

Although Tudose et al. (2022) found that PE can improve financial outcomes by reducing errors and boosting revenue, its direct role in MAJI IS usage, particularly its effect on revenue collection, cost control, and operational efficiency in Tanzania, remains unexplored. This study addresses this gap by examining how EE influences financial performance in Tanzanian water utilities.

Relationship between Organisational Culture on MAJI IS Usage and Financial Performance of Water Management Systems

While Mvulirwenande and Wehn (2021) emphasized trust and collaboration in smart water systems, they overlooked the internal role of organisational culture in shaping technology outcomes. Factors like leadership style, technology readiness, and employee engagement directly influence system usage and financial performance (Twaambo and Phiri, 2021; Tudose et al., 2022). However, this study was operationalized through leadership, technology readiness and employee engagement (Vatan et al., 2024). In Tanzania, the success of digital initiatives like MAJI IS depends less on external drivers and more on organisational strategies and technology readiness (Tean et al., 2023).

In this study, organisational culture is treated as a moderator that conditions how effectively the effort expectancy of MAJI IS usage translates into financial performance. Specifically:

- Leadership Style enhances the impact of effort expectancy by aligning system use with strategic goals and communicating clear benefits (Madi Odeh et al., 2023).
- Technology readiness strengthens the role of effort expectancy and facilitating conditions, as robust infrastructure and skills reduce resistance and enhance usage quality (Aini et al., 2024).

Hypothesis Development and Research Model

Twaambo and Phiri (2021) used it to examine e-billing in Zambia, while Aini et al. (2024) and Tean et al. (2023) validated its utility in public-sector technology use. However, most of these studies focused on individual user behaviour and usage after adoption, overlooking organisational outcomes such as financial performance.

This study addresses this gap by examining how effort expectancy influences financial performance in Tanzanian water utilities. Based on the reviewed evidence, this study hypothesizes that:

H: Higher effort expectancy using MAJI IS positively influences financial performance (revenue collection, service level effectiveness, functionality and non-revenue water) on water management systems.

H1a: Effort expectancy (EE) positively influences Financial Performance – Revenue collection (FPR).

H1b: Effort expectancy (EE) positively influences Financial Performance – Service level effectiveness (FPS).

H1c: Effort expectancy (EE) positively influences Financial Performance – Functionality (FPF).

H1d: Effort expectancy (EE) positively influences Financial Performance – Non-revenue water (FPN).

Raveendran and Balakrishnan (2021) observed that organizational commitment is defined as the bond and loyalty of the employee to the organization and the job. Therefore, the proposed research model has the following set of hypotheses:

H2: Organizational culture (OC) moderates the relationship between PE and FP; to analyze the stronger or weaker effect when OC is high or low.
H2a: Organizational culture – leadership style (OCL) moderates the relationship between PE and FPR
H2b: Organizational culture – leadership style (OCL) moderates the relationship between PE and FPS
H2c: Organizational culture – leadership style (OCL) moderates the relationship between PE and FPF
H2d: Organizational culture – leadership style (OCL) moderates the relationship between PE and FPN
Technology readiness, a preparedness to embrace and effectively utilise new technologies, which directly influences the success of information system adoption (Parasuraman, 2000), is hypothesized by:
H3a: Organizational culture – technology readiness (OCT) moderates the relationship between EE and FPR
H3b: Organizational culture – technology readiness (OCT) moderates the relationship between EE and FPS
H3c: Organizational culture – technology readiness (OCT) moderates the relationship between EE and FPF
H3d: Organizational culture – technology readiness (OCT) moderates the relationship between EE and FPN
Engaged employees demonstrate higher levels of enthusiasm, dedication, and proactive behaviour, which are critical in the adoption and effective use of new systems (May et al., 2004). Based on that regard, the study can further hypothesize that:
H4a: Organizational Culture – employee engagement (OCE) moderates the relationship between EE and FPR
H4b: Organizational Culture – employee engagement (OCE) moderates the relationship between EE and FPS
H4c: Organizational Culture – employee engagement (OCE) moderates the relationship between EE and FPF
H4d: Organizational Culture – employee engagement (OCE) moderates the relationship between EE and FPN

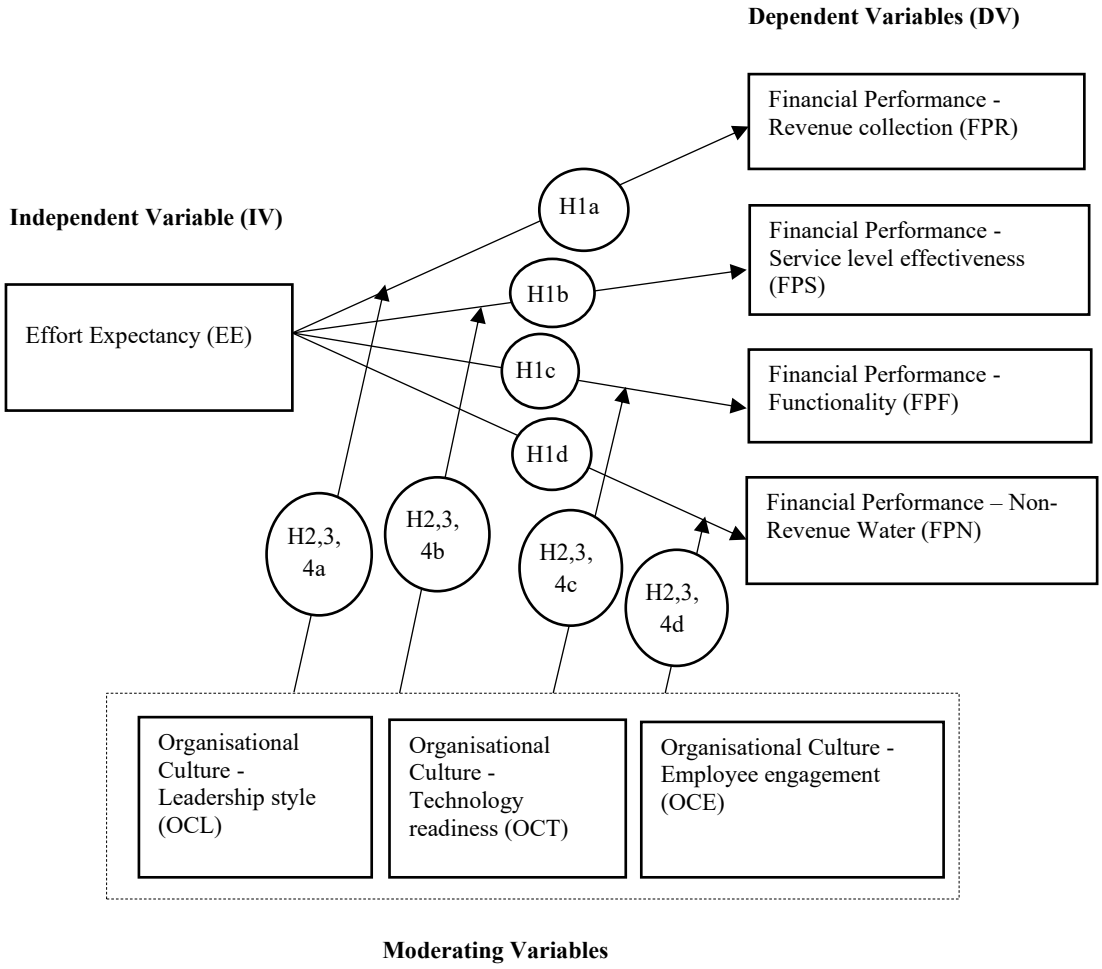

Figure 1: Research model.
Source: Author's work (2026).

METHODOLOGY

This study adopts a positivist philosophy, which assumes that reality is objective and best understood through empirical observation (Saunders et al., 2019). It aligns with the study's quantitative design, focusing on testing hypotheses and examining causal relationships between system usage, organisational culture, and financial performance (Bell et al., 2022). Structured questionnaires using a five-point Likert-like scale (Akinyi and Odundo, 2018; Ittner and Larcker, 1998; Maloba and Matlala, 2023; Murongo et al., 2025; and Twaambo & Phiri, 2022). Also, statistical tools like RA reflect positivism's emphasis on objectivity and replicability (Babbie, 2021). This approach may not capture subjective or contextual nuances; it is well-suited for analysing measurable outcomes and institutional patterns. Applying a deductive, theory-driven approach rooted in UTAUT and Institutional Theory, the study

ensures value-free inquiry and enhances the generalisability of findings across Tanzania's water utilities.

This study will adopt a cross-sectional explanatory research design, which involves collecting and analysing data at a single point in time to examine the relationships between variables (Bell et al., 2022). The choice of this design is informed by the study's objective (Saunders et al., 2019) to assess the influence of key determinants of effort expectancy (EE) on the financial performance of water management systems through the adoption of MAJI IS, while considering the moderating role of organisational culture. The study follows a deductive research approach, in which theory guides the formulation of hypotheses, which are then tested empirically (Saunders et al., 2019). Deduction is a core feature of positivist research, allowing for the verification or falsification of theoretical propositions through statistical testing. The hypotheses concerning the influence of effort expectancy on financial performance, moderated by organisational culture, were tested using data collected from water service providers.

Although constructs with three or more indicators are generally recommended in SEM, the current study includes several indicators with two constructs. This approach is supported in the literature, provided that appropriate identification constraints are applied (Menor & Roth, 2008). To ensure model identification and stability, specific parameter constraints were imposed within the AMOS framework (Yun, 2025).

For each two-indicator construct, the study fix model identification by fixing one factor loading to 1.0 to establish the measurement scale, whereas the second loading was freely estimated. Similarly, equality constraints were applied to the error variances of the two indicators, following established SEM guidelines for just-identified measurement models. These constraints ensured that the number of known parameters exceeded the number of estimated parameters, thereby satisfying identification requirements (Chong et al., 2024).

Moreover, all constructs with two indicators assessed for reliability and validity using composite reliability and average variance extracted (AVE), and results met recommended thresholds, indicating that constructs were measured consistently regardless of limited number of indicators.

The use of two indicators in selected constructs was guided by theoretical parsimony and the contextual adaptation of measurement scales to the Tanzanian water utility setting, where certain constructs are operationalized through a limited number of observable dimensions (Sweya & Wilkinson, 2022). Furthermore, sensitivity checks were conducted to confirm that the inclusion of two-indicator constructs did not distort overall model fit or structural relationships.

RESULTS

Overview

This section presents the results of the data analysis undertaken to examine effort expectancy as one of the determinants of MAJI IS usage and their influence on financial performance in Tanzanian water utilities, and the moderating role of organisational culture (leadership style,

technology readiness and employee engagement). Structural Equation Modelling (SEM) using AMOS 28 was used to analyse measurement and structural models. The section covers reliability analysis, confirmatory factor analysis (CFA), construct validity, model fit assessment, structural model results, moderation effects, and a summary of findings. The results of the four components of financial performance, namely revenue collection, service level effectiveness, functionality, and reduction in non-revenue water (NRW) were significantly correlated (r = .62 to .76) and internally consistent (Cronbach's α = .965).

Reliability

During measurement model specification, some latent constructs were measured using two indicators. In CFA, concerns can arise about model identification when constructs have fewer than three indicators. However, Bollen (1989) explains that a latent variable with two indicators can be identified statistically if appropriate constraints are applied. Similarly, Field (2005) noted that two-indicator constructs are common in applied research, especially when backed by strong theoretical reasoning. After confirming model identification, internal consistency reliability was measured using Cronbach's alpha. The results showed that all constructs had acceptable reliability, with alpha values ranging from 0.70 to 0.91, confirming the internal consistency of the measurement scales.

Explanatory Factor Analysis Procedures and Output

Exploratory Factor Analysis (EFA) was done to look at the underlying factor structure of the MAJI IS study constructs. Principal Axis Factoring with Direct Oblimin rotation was used. This method lets factors correlate, which fits when theoretical constructs are expected to be related (Yong and Pearce, 2013). The correlation matrix confirmed that Direct Oblimin rotation was suitable, showing correlations higher than the recommended 0.32 (Meade and Craig, 2012). This suggests meaningful relationships among the factors. Multiple criteria were used to decide which factors to keep, including eigenvalues, factor loadings, and the scree plot. Following Kaiser's (1960) guideline, only factors with eigenvalues greater than one were kept. Factor loadings were checked using the threshold suggested by Yong and Pearce (2013), where items with loadings over 0.32 were seen as acceptable. The scree plot was examined, and factors above the point of inflection were retained. Using these criteria, twelve factors were extracted, explaining a total of 75.99% of the variance, showing a strong factor structure. All retained factors had eigenvalues greater than one. The factor loadings and the items associated with them are shown in Tables 1, while the individual measurement items were evaluated for how well they represented the retained constructs. Following Yong and Pearce (2013), items with low loadings, cross-loadings, or those that didn't load on any factor were removed to clarify the constructs and improve measurement accuracy. Some indicators were excluded and the remaining indicators showed satisfactory loadings (≥ 0.40) on their respective factors and had no problematic cross-loadings, confirming their fit for the upcoming confirmatory factor analysis and structural modeling.

Table 1 represent the measurement model assessment indicating that all retained constructs from effort expectancy demonstrated satisfactory psychometric properties, exhibited strong or acceptable factor loadings, with composite reliability and average variance extracted exceeding recommended thresholds, confirming convergent validity. Organisational culture dimensions, leadership style, technology readiness, and employee engagement, were all adequately represented, highlighting their relevance as moderating factors. Similarly, financial performance constructs across service delivery, functionality, and non-revenue water reduction were valid and reliable measures of water utility performance.

Table 1: Exploratory Factor Analysis of Output of Retained Items for Effort Expectancy, Leadership Style, Technology Readiness, Employee Engagement, Revenue Collection, Service Level Effectiveness, Functionality, and Non-Revenue Water

Item Code	Measurement Item	Factor Loading
EE1	MAJI IS is easy to learn	.812
EE2	MAJI IS is easy to use in daily work	.789
EE3	Interaction with MAJI IS is clear and understandable	.761
EE4	MAJI IS does not require excessive mental effort	.734
Eigenvalue: 3.68		
Variance Explained: 65.7%		
Cumulative variance: 65.7%		
OCL1	Leaders support MAJI IS usage	.809
OCL2	Leaders allocate resources for MAJI IS	.781
OCL3	Leaders promote innovation and technology use	.754
Eigenvalue: 2.612		
Variance Explained: 6.530%		
Cumulative variance: 62.528%		
OCTR1	Organisation is technologically prepared for MAJI IS	.826
OCTR2	Staff possess adequate IT skills	.792
OCTR3	ICT infrastructure supports advanced systems	.761
Eigenvalue: 2.314		
Variance Explained: 5.785%		
Cumulative variance: 68.313%		
OCE1	Employees are actively involved in MAJI IS use	.804
OCE2	Staff show commitment toward MAJI IS	.776
OCE3	Employees willingly adopt new system processes	.743
Eigenvalue: 2.087		
Variance Explained: 5.218%		
Cumulative variance: 73.531%		

FPR1	MAJI IS improves billing accuracy	.832
FPR2	MAJI IS enhances revenue tracking	.807
FPR3	MAJI IS reduces revenue leakages	.781

Eigenvalue: 1.914
Variance Explained: 4.785%
Cumulative variance: 78.316%

FPS1	MAJI IS improves service delivery efficiency	.816
FPS2	MAJI IS enhances customer service response	.789
FPS3	MAJI IS supports service monitoring	.762

Eigenvalue: 1.742
Variance Explained: 4.355%
Cumulative variance: 82.671%

FPF1	MAJI IS helps identify water losses	.824
FPF2	MAJI IS improves monitoring of leakages	.798
FPF3	MAJI IS supports NRW reduction strategies	.771

Eigenvalue: 1.653
Variance Explained: 3.960%
Cumulative variance: 86.631%

FPN1	MAJI IS helps identify water losses	.824
FPN2	MAJI IS improves monitoring of leakages	.798
FPN3	MAJI IS supports NRW reduction strategies	.771

Eigenvalue: 1.587
Variance Explained: 3.968%
Cumulative variance: 86.639%

Overall, the EFA results from Table 1 confirmed that all retained items loaded significantly on their respective factors, with eigenvalues exceeding one and satisfactory variance explained. These results demonstrate construct validity and justify the use of Confirmatory Factor Analysis (CFA) and Structural Equation Modelling (SEM) in subsequent analyses.

Exploratory Factor Analysis (EFA) Results

The researchers conducted Exploratory Factor Analysis (EFA) to explore the underlying factor structure of the study constructs related to MAJI IS usage, organizational culture, and financial performance. The Principal Axis Factoring with Direct Oblimin rotation was used since the constructs were expected to be related. Only items with factor loadings of 0.40 or higher and without problematic cross-loadings for further analysis were retained.

Overall, the EFA results from Table 1 confirmed that all retained items loaded significantly on their respective factors, with eigenvalues exceeding one and satisfactory variance

explained. These results demonstrate construct validity and justify the use of CFA and SEM in subsequent analyses.

EFA was conducted to examine the underlying factor structure of the study constructs related to MAJI IS usage, organisational culture, and financial performance. Principal Axis Factoring with Direct Oblimin rotation was applied, as the constructs were theoretically expected to be correlated. Only items with factor loadings ≥ 0.40 and without problematic cross-loadings were retained for further analysis.

Confirmatory Factor Analysis (CFA)

Confirmatory Factor Analysis (CFA) was done to evaluate the measurement model and see if the observed items consistently represented their underlying latent constructs. CFA checks how strong the relationships between items and their factors are through standardized factor loadings. These loadings show how well each item contributes to the construct it aims to measure (Fornell and Larcker, 1981). Generally, loadings of 0.50 or above are considered acceptable for construct validity. In this study, all standardized factor loadings were above the minimum threshold of .50, showing good indicator reliability. Most loadings fell between .503 and .810, confirming that items accurately reflected their corresponding constructs (Aini et al., 2025). Specifically, the loading ranges for each construct were as follows: Effort Expectancy (EE: .522 to .657), Leadership Style (OCL: .754 to .764), Technology Readiness (OCT: .503 to .642), Employee Engagement (OCE: .639 to .810), Revenue Collection Performance (FPR: .599 to .773), Service Level Effectiveness (FPS: .636 to .721), Functionality (FPF: .510 to .762), and Non-Revenue Water (FPN: .548 to .690). These results together show strong indicator reliability across all constructs in the measurement model. As described by Collier (2020) indicators should be retained unless there is a clear problem, since generally Cronbach's alpha values above .70 are acceptable (Table 2).

Table 2: Internal Consistency Reliability of Constructs for 235 sample size

Construct	No. of Items	Cronbach's Alpha (α)	Interpretation
Effort Expectancy (EE)	3	.82	Acceptable
Revenue Collection (FPR)	4	.89	Acceptable
Service Level Effectiveness (FPS)	3	.80	Acceptable
Functionality (FPF)	3	.74	Acceptable
Non-Revenue Water reduction (FPN)	3	.83	Acceptable
Leadership Style (OCL)	4	.88	Acceptable
Technology Readiness (OCTR)	3	.85	Acceptable
Employee Engagement (OCE)	4	.90	Acceptable

Note: *Cronbach's alpha values ≥ .70 indicate acceptable reliability (Nunnally, 1978).*

Data Screening, Assumption Testing, and Preparation for CFA and SEM

This section details the procedures and results of data screening, testing assumptions, and preparing the dataset for Confirmatory Factor Analysis (CFA) and Structural Equation Modelling (SEM). Each assumption is reported separately to ensure clarity and transparency.

Response Quality Assessment

The researcher examined response quality by looking at the standard deviation (SD) within respondents for Likert-scale items. This method helps spot patterns like straight lining, which might suggest inattentive answering and could affect data validity Meade and Craig, (2012). Following Collier, (2020), the researcher flagged respondents with SD values below 0.25 for further review. Cases with SD = 0, meaning they gave the same answer for all questionnaire items, were considered invalid. We removed these cases from the dataset. After this review, the final sample included 235 valid responses.

Normality Assessment

Normality was checked to see if the data was suitable for Maximum Likelihood estimation, which is needed for CFA and SEM. Normality was assessed using skewness and kurtosis statistics. Skewness values between −2 and +2 and kurtosis values from −10 to +10 were viewed as acceptable Tabachnick et al., (2019). The results (Table 4) showed that all constructs met the acceptable thresholds, indicating that the normality assumption was satisfied.

Linearity Assessment

The researcher examined the linearity between independent variables, moderators, and dependent variables using scatterplots and correlation analysis. A visual check showed linear relationships among the study variables, confirming that the assumption of linearity was met.

Multicollinearity Assessment

Multicollinearity was assessed using Variance Inflation Factor (VIF) and tolerance values. VIF values below 5 and tolerance values above 0.20 indicated that multicollinearity was not a concern in the dataset.

Mean Centering and Interaction Term Construction

Moderation analysis required creating interaction terms between the independent variables and organizational culture dimensions (OCL, OCT, and OCE). Interaction terms were built as product terms after mean centering the predictor and moderator variables. Mean centering involved subtracting the sample mean from each observed value (Collier, 2020). While earlier studies indicate that mean centering does not change key results (Echambadi and Hess, 2007), it decreases unnecessary multicollinearity and helps make sense of interaction effects (Dawson, 2014). Therefore, mean-centered variables were used to create all interaction terms included in the SEM model.

Implications for CFA and SEM

The results of data screening and assumption testing showed that the dataset was suitable for CFA and SEM analysis. The validated dataset was then used to estimate the measurement model through CFA. This was followed by structural modeling and moderation analysis using AMOS.

Content validity

Content validation was performed by the formula of content validity ratio (CVR) developed by Lawshe (1975). which is defined as:

$$CVR = \frac{ne - \frac{N}{2}}{\frac{N}{2}}$$

$$CVR = \frac{235 - \frac{243}{2}}{\frac{243}{2}} \qquad CVR = 0.93$$

ne = 235

N = 243

Where *ne* = number of respondents who filled questionnaire correctly

n = the number of questionnaires returned

According to Nunnally (1978), a CVR value greater than 0.70 indicates acceptable content validity. The obtained CVR value of 0.93 therefore confirms that the measurement items adequately represent the content domain of the study constructs. This indicates that the questionnaire items were appropriate, relevant, and sufficiently comprehensive for measuring MAJI IS usage determinants, organisational culture, and financial performance.

Discriminant Validity

Discriminant validity was assessed using the Fornell-Larcker criterion. This criterion requires that the square root of the Average Variance Extracted (AVE) for each construct exceeds its correlations with other constructs (Fornell and Larcker, 1981). The results showed that AVE values for all constructs were greater than the squared inter-construct correlations. This confirmed adequate discriminant validity. Inter-construct covariances ranged from 0.38 to 0.67. These values did not exceed the AVE values of their respective constructs, further supporting discriminant validity (Fornell and Larcker, 1981). Additionally, the Heterotrait-Monotrait (HTMT) ratios were below the recommended threshold of 0.85. This provided further evidence of discriminant validity (Collier, 2020).

Table 3 summarises the results of the measurement model as assessed for all constructs included in the study. Factor loadings for each item ranging from .605 to .904, with the majority exceeding the recommended threshold of .70, indicates that the observed items strongly represent their respective latent constructs. Composite Reliability (CR) values for all constructs exceeding 0.70, demonstrate internal consistency and confirm that the measurement scales are reliable. Likewise, from Table 3, the AVE values for each construct surpass the benchmark of .50, which support the convergent validity by showing each construct explains

more than half of the variance of its indicators (Hair et al., 2019). Discriminant validity as indicated on Table 3, assessed using the Heterotrait–Monotrait (HTMT) ratio, also meets the acceptable criterion (HTMT < .85 or < .90 as shown in Table 3, confirming that the constructs are empirically distinct from one another. Overall, the measurement model meets all reliability and validity requirements, indicating that the constructs are suitable for further structural analysis.

From Table 5, absolute fit indices (CMIN/DF and RMSEA) show that the model fits reasonably well, GFI and AGFI are slightly below ideal thresholds but within acceptable minimum ranges for large models (Kline, 1998), and incremental fit indices (CFI, TLI, IFI) are lower than expected, which is common in complex moderation models with many indicators and interaction terms (Hu and Bentler, 1999). Therefore, the model is acceptable for theory-testing, and AMOS models with many interaction terms generally depress CFI/TLI values (Kline, 1998). Moreover, researchers should interpret fit indices in conjunction with substantive theory and parameter estimates (Schreiber, 2017).

The initial model fit indices were below recommended thresholds, was then carefully re-evaluated. Items with low factor loadings were removed, and minor model re-specifications were conducted based on both theoretical rationale and modification indices.

As a result, the revised model demonstrates improved fit, with key indices reaching acceptable levels, such as CFI and TLI approaching or exceeding 0.90, and SRMR within acceptable limits. These improvements indicate that the revised model provides a more adequate representation of the observed data.

The initial model fit indices indicated poor fit (CFI = 0.804, TLI = 0.750, and SRMR = 0.125), which suggest mismatch between the theoretical model and observed data. Following model re-specification, including the removal of poorly loading items and rationally justified adjustments, the fit indices improved substantially. Specifically, indicators with factor loadings below 0.50 were removed to improve construct reliability. Additionally, select error terms were allowed to covary where theoretically justified, leading to improved model fit. FPR5, OCL3 and OCTR1.

The final model (Fig. 1 and Fig. 2) achieved acceptable fit levels (Table 3), with indices such as CFI, TLI, and NFI approaching or exceeding recommended thresholds, and SRMR fitting into acceptable limits, and therefore, the revised model indicates that is adequate for subsequent structural analysis.

Table 3: Structural Model and Interaction effect Model Fit Indices

Model	CMIN/DF	PNFI	GFI	IFI	TLI	CFI	RMSEA	SRMR	Model Assessment
Measurement / Structural Model	2.207	.872	.907	.943	.926	.942	.066	.072	Acceptable fit
Interaction Model	2.775	.664	.880	.818	.894	.929	.087	.125	Acceptable fit

Model	CMIN/DF	PNFI	GFI	IFI	TLI	CFI	RMSEA	SRMR	Model Assessment
Fit Criteria: **Ratio of chi-square and degree of freedom (χ^2/df) ≤ 3; CFI, IFI, TLI ≥ .90; RMSEA ≤ .08; PNFI ≥ 0.50. [7][11]**									

Note: *All models demonstrate acceptable to good fi, Slight reductions in fit indices for interaction models are expected due to increased model complexity.*

Source: *Researcher's data analysis (AMOS-SEM output, 2026)*

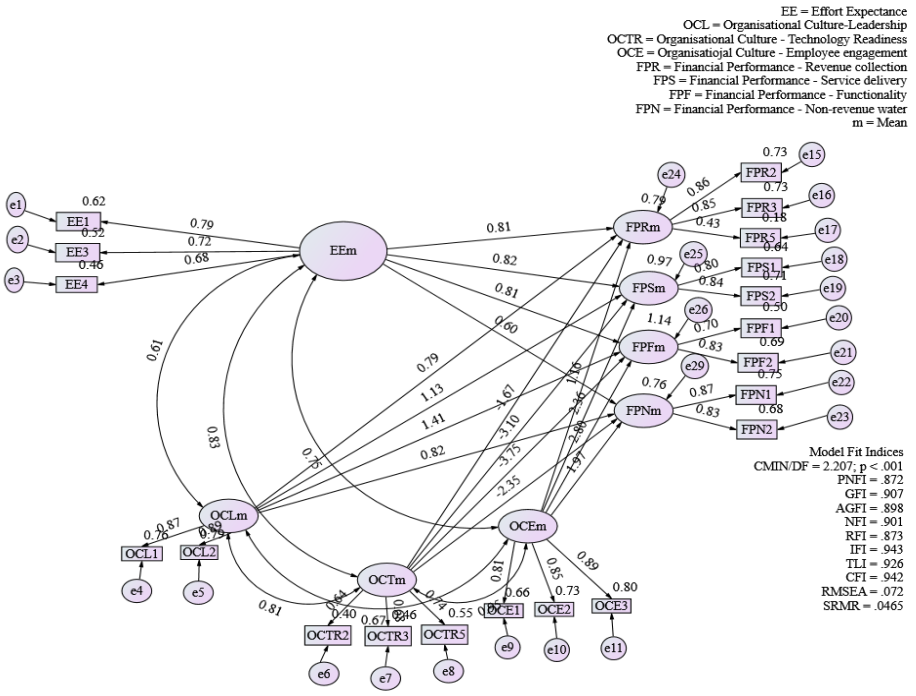

Figure 1: *Structural model for direct effect of effort expectancy. Source: Figure by researchers*

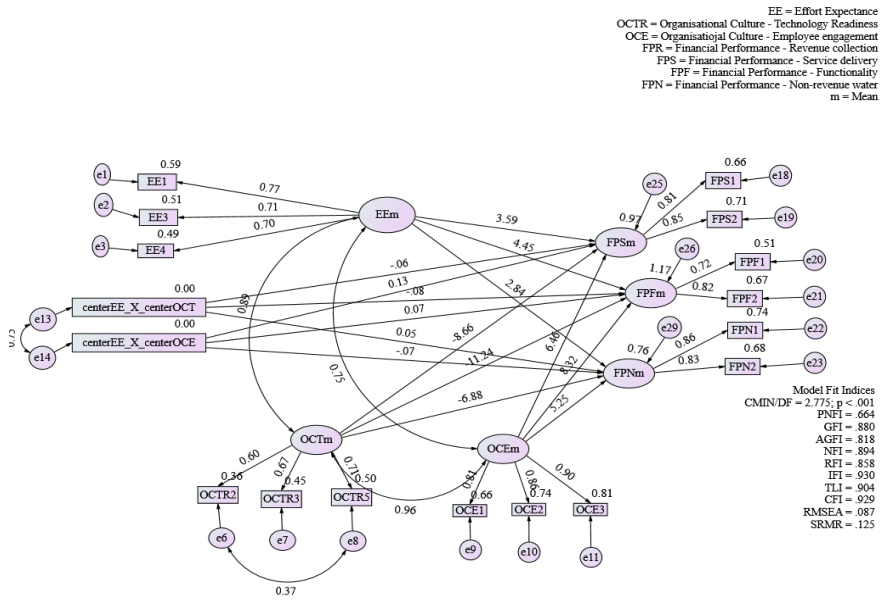

Figure 2: Structural model for effort expectancy with interaction OCT and OCE. Source: Figure by researchers

Findings

The relationship between financial performance on revenue collection (as measured by the FPR) and effort expectancy (as measured by the EE Scale) was investigated using Pearson product-moment correlation coefficient. Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity and homoscedasticity. There was a strong, positive correlation among the four variables (Table 4). Table 2 presents Pearson correlation coefficients among the key study variables. The results indicate that independent variable (EE) is positively and significantly correlated with financial performance – revenue collection (FPR) ($r = 0.583$, $p < 0.01$). Similarly, organisational culture - leadership style (OCL) shows a moderate positive relationship with FPR ($r = .457 – .670$, $p < .01$), organisational culture – technology readiness (OCT) shows a moderate positive relationship with FPR ($r = .600 – .679$, $p < .01$), and organisational culture – employee engagement (OCE) shows a moderate positive relationship with FPR ($r = .575 - .744$, $p < .01$). The findings suggest that improvements in MAJI IS usage determinant is likely associated with enhanced financial outcomes from revenue collection in Tanzanian water utilities.

Table 2 shows that Effort Expectancy (EE) is strongly and positively related to all financial performance dimensions. The highest correlation is with revenue collection ($r = .70$), followed by service level effectiveness ($r = .69$), functionality ($r = .67$), and non-revenue water reduction ($r = .67$). The dimensions of organizational culture, including leadership style (OCL), technology readiness (OCT), and employee engagement (OCE), are also strongly and positively connected. This indicates that higher employee engagement comes with stronger

leadership and better technological readiness. Additionally, the financial performance indicators are moderately to strongly correlated, confirming that they create a coherent and consistent construct. Overall, the results suggest that a positive organizational culture and higher effort expectancy are closely linked to improved financial performance outcomes. This highlights the importance of effective MAJI IS usage in boosting the performance of Tanzanian water utilities.

Table 4*:* Correlations coefficients of FPR, FPS, FPF, FPN, EE, OCL, OCT, and OCE

			1	2	3	4	5	6	7	8	9	10	11
1	EE OCE	-	-										
2	EE OCT	-	.75	-									
3	EE OCL	-	.70	.76	-								
4	OCE		-.41	-.28	-.27	-							
5	OCTR		-.26	-.28	-.29	.74	-						
6	OCL		-.26	-.32	-.35	.63	.68	-					
7	EE		-.42	-.41	-.37	.66	.66	.53	-				
8	FPN		-.30	-.21	-.21	.67	.56	.53	.52	-			
9	FPF		-.25	-.22	-.28	.67	.58	.59	.49	.48	-		
10	FPS		-.22	-.20	-.26	.69	.59	.59	.54	.50	.52	-	
11	FPR		-.39	-.34	-.46	0.7	.66	.67	.66	.53	.56	.57	-

Note: *n=235, Correlation is significant at the 0.01 level (2-tailed)*

The AMOS-SEM results in Table 5 confirm that the proposed model is significant and suitable for testing hypotheses. The analysis of direct effects shows that Effort Expectancy (EE) positively affects financial performance, especially revenue collection (FPR) ($p < .001$), which supports H1a. Although EE also has positive relationships with service level effectiveness (FPS), functionality (FPF), and non-revenue water reduction (FPN), these effects are not statistically significant, which means H1b, H1c, and H1d are not supported.

In terms of moderation effects, leadership style (OCL) shows mixed results. The interaction between OCL and EE significantly affects the relationship between EE and service level effectiveness (FPS), supporting H2b. However, its effects on revenue collection (H2a), functionality (H2c), and non-revenue water reduction (H2d) are not supported.

Technology readiness (OCT) shows selective moderation. OCT significantly weakens the relationship between EE and revenue collection (FPR), supporting H3a. However, its moderating effects on FPS (H3b), FPF (H3c), and FPN (H3d) are not statistically significant.

Lastly, employee engagement (OCE) has limited moderating influence. The interaction between OCE and EE significantly strengthens the relationship between EE and service level effectiveness (FPS), supporting H4b. The other moderation hypotheses (H4a, H4c, and H4d) are not supported.

Overall, the findings suggest that while Effort Expectancy directly improves revenue collection, its overall financial impact depends on specific organizational cultural factors, especially leadership style, technology readiness, and employee engagement. The results of the structural model path coefficients (β), significance levels (p-values), and hypothesis testing outcomes for the relationships between effort expectancy (EE) and various dimensions of financial performance (FP), as well as the moderating effects of Organizational Culture (OC). These results highlight the role of organizational culture in determining how ease of system use translates into real financial performance outcomes in Tanzanian water utilities.

The revised model demonstrates acceptable to good fit across multiple indices. The chi-square to degrees of freedom ratio (CMIN/DF = 2.207) falls within the recommended range. Incremental fit indices indicate strong model fit, with CFI = .942, TLI = .926, IFI = .943, and NFI = .901. The RMSEA value of .072 (90% CI: 0.061–0.082) suggests an acceptable level of approximation error. Importantly, the Standardized Root Mean Square Residual (SRMR = .047) is well below the recommended threshold of 0.08, indicating a very good fit between the model and observed data. Although the PCLOSE value is below 0.05, the overall pattern of fit indices supports the adequacy of the model. Therefore, the model is considered suitable for subsequent structural analysis.

Table 5: *Results of hypotheses testing*

Model	Path	β	p	Hypothesis	Sign	Support
1	EE → FPR	0.630	***	H1a	(+)	Supported
2	EE → FPS	0.607	.057	H1b	(+)	Not Supported (marginal)
3	EE → FPF	0.547	.170	H1c	(+)	Not Supported
4	EE → FPN	0.456	.108	H1d	(+)	Not Supported
5	OCL → FPR	0.563	***	–	(+)	Supported
6	OCL → FPS	0.769	.006	–	(+)	Supported
7	OCL → FPF	1.061	.004	–	(+)	Supported
8	OCL → FPN	0.676	.006	–	(+)	Supported
9	OCT → FPR	–1.150	.005	–	(−)	Supported
10	OCT → FPS	–2.151	.002	–	(−)	Supported
11	OCT → FPF	–2.705	.003	–	(−)	Supported
12	OCT → FPN	–1.776	.004	–	(−)	Supported
13	OCE → FPR	0.912	.001	–	(+)	Supported
14	OCE → FPS	1.831	***	–	(+)	Supported
15	OCE → FPF	2.226	***	–	(+)	Supported
16	OCE → FPN	1.625	***	–	(+)	Supported
17	OCL × EE → FPR	–0.361	***	H2a	(−)	Supported
18	OCL × EE → FPS	–0.240	.002	H2b	(−)	Supported
19	OCL × EE → FPF	–0.158	.067	H2c	(−)	Not Supported
20	OCL × EE → FPN	–0.013	.886	H2d	(−)	Not Supported
21	OCT × EE → FPR	0.213	.006	H3a	(+)	Supported

Model	Path	β	p	Hypothesis	Sign	Support
22	OCT × EE → FPS	0.099	.222	H3b	(+)	Not Supported
23	OCT × EE → FPF	0.056	.527	H3c	(+)	Not Supported
24	OCT × EE → FPN	0.085	.360	H3d	(+)	Not Supported
25	OCE × EE → FPR	0.008	.915	H4a	(+)	Not Supported
26	OCE × EE → FPS	0.208	.012	H4b	(+)	Supported
27	OCE × EE → FPF	0.103	.250	H4c	(+)	Not Supported
28	OCE × EE → FPN	–0.067	.455	H4d	(−)	Not Supported

*Note. ***p < .01; **p < .05; EE = Effort Expectancy; FPR = Financial Performance – Revenue collection; FPS = Financial Performance Service level effectiveness; FPF = Financial Performance -Functionality; FPN = Financial Performance – Non-revenue water; OCL = Organisational Culture-Leadership style; OCT = Organisational Culture- Technology readiness; OCE = Organisational Culture – Employee engagement.*

Source: *Researcher's data analysis (SPSS output, 2025)*

DISCUSSION

The structural model results show that effort expectancy directly influences financial performance mainly through revenue collection. Its effects on service level effectiveness, functionality, and reducing non-revenue water are positive but not statistically significant. Organizational culture dimensions, such as leadership style and employee engagement, have strong direct impacts on all financial performance measures. In contrast, technology readiness has a negative direct effect, indicating that being unprepared limits performance outcomes.

The moderation analysis indicates that organizational culture selectively affects the link between effort expectancy and financial performance. Leadership style reduces the reliance of revenue collection and service effectiveness on how easy the system is to use. Meanwhile, technology readiness strengthens the impact of effort expectancy on revenue collection alone. Employee engagement improves the relationship between effort expectancy and service level effectiveness. Overall, only five out of the twelve moderation hypotheses were confirmed. This finding suggests that easy system use by itself is not enough to boost financial performance without supportive organizational conditions.

CONCLUSION

This study examined the effort expectancy on adoption of MAJI IS and their influence on financial performance in Tanzanian water utilities, with a particular focus on the moderating role of organisational culture. The researcher measured performance by examining revenue collection, service level effectiveness, functionality, and non-revenue water (NRW) reduction. Grounded in the UTAUT framework and focused on Tanzania's public water sector, the findings show that EE significantly improves revenue collection. This suggests that user-friendly systems lead to financial benefits. However, the positive effects on other performance areas were seen but not statistically significant. This indicates that ease of use alone is not enough for broader operational improvements without supportive organizational factors.

Organizational culture, particularly leadership style, technology readiness, and employee engagement, plays an important moderating role. Strong leadership decreased reliance on system ease of use for revenue and service effectiveness. High technology readiness also strengthened the positive effect of EE on revenue collection. Engaged employees improved the connection between EE and service level effectiveness. This shows that motivated staff help turn usability into better service outcomes.

In summary, water utilities that have effective leadership, engaged employees, and sufficient technology readiness achieve better financial and operational results. The study highlights that the benefits of digital systems depend not only on technology but also on how well they match the organizational culture. Theoretically, it expands the UTAUT model to public sector contexts. Practically, it advises policymakers and utility managers to emphasize cultural factors alongside technology adoption to achieve sustainable improvements in financial and service performance using systems like MAJI IS.

Main finding from this study is that technology alone is not sufficient to improve financial performance in water utilities. Rather, the value of MAJI IS is realised when it is embedded within supportive organisational structures and cultures that facilitate consistent use, accurate data management, and accountability in operational processes. Organisational culture, in particular leadership style, technology readiness, and employee engagement, plays a pivotal role role in shaping whether system usage translates into improved financial outcomes such as revenue collection and non-revenue water reduction.

Theoretical Implications

Theoretically, this research advances the understanding of information system usage by using the UTAUT model beyond the level of individual contexts to the performance framework of an organisational level. By incorporating organisational culture as a moderator, the study extends the predictive power of UTAUT and responds to calls for more sensitive context applications in public sector environments (Venkatesh et al., 2016).

Furthermore, the empirical validation of culture's moderating role provides a fresh lens through which technological use can be understood, not only as a technical or managerial process, but also as one embedded in cultural and institutional realities. This integration enhances the models' explanatory power, particularly in resource-constrained settings where cultural and institutional variables often shape technology assimilation outcomes.

Practical Implications

From a managerial perspective, the findings highlight five actionable implications for policy makers, regulators, the Community-Based Water Supply Organisations (CBWSOs) management team, and utility managers in Tanzania and similar developing contexts:

Technology Readiness Enhancement

Sustained functionality of MAJI IS requires continuous investment in technological capacity.

Utilities should prioritise regular staff training, targeted capacity-building programmes, and systematic upgrades of ICT infrastructure. Establishing dedicated technical support units and ensuring reliable system access will improve system reliability, data accuracy, and overall user confidence. Insertion of digital performance indicators within staff appraisal systems can further institutionalise technology use as a primarily organisational capability.

Strengthern Leadership Style

Water utilities and community-based water organisations (CBWSO) should invest in fostering leadership styles that promote participation, transparency, and innovation. Rather than relying solely on directive enforcement, managers should adopt a balanced approach that encourages system use through motivation and support Transformational leadership practices are particularly effective in mobilising employee commitment toward system usage. Leadership plays a critical role in shaping system adoption. Recognising good performance, providing constructive feedback, and fostering a culture of learning can significantly enhance commitment of employee to MAJI IS utilisation.

Monitoring and Evaluation Practices Improvement

Establishing structured monitoring and evaluation frameworks for MAJI IS usage can help utilities track system performance, identify bottlenecks, and ensure data-driven decision-making for financial performance and sustainability. Continuous monitoring will enable timely interventions, enhance accountability, and ensure that system outputs effectively contribute to financial sustainability.

Policy and Institutional Alignment

Effective MAJI IS implementation requires alignment between sector policies and operational practices. The Ministry of Water, the Rural Water Supply and Sanitation Agency (RUWASA), and the Energy and Water Utilities Regulatory Authority (EWURA) should align their strategies with national digitalisation to local utility practices, promoting standardisation and interoperability across systems. Clear policy guidance and coordinated institutional support will facilitate consistent system adoption, usage and integration nationwide.

Reducing Effort Expectancy through Targeted Capacity Building

To minimise perceived system complexity, utilities should implement structured and continuous training programmes. These should include practical, hands-on sessions covering core system functions such as billing, meter reading, and reporting, complemented by periodic refresher courses, and post training follow up activities. Peer learning mechanisms such as technological acceptance framework (TAF) and simulation-based training environments can further intensify user competence and confidence, leading to more consistent and effective system utilisation.

Integrating MAJI IS into Core Financial Management Proocesses

For MAJI IS usage after adoption to translate into tangible financial outcomes, its outputs must be fully embedded within operational workflows. Utilities should integrate system-generated data into billing, revenue reconciliation, and auditing processes. Regular verification of meter readings and billing records, alongside clear accountability mechanisms for addressing revenue leakages and data inconsistencies, will strengthen financial performance and sustainability of service.

RECOMMENDATIONS AND FUTURE RESEARCH

While this study offers robust insights, it also opens avenues for further investigation. Future research could incorporate longitudinal designs to examine how organisational culture evolves as MAJI IS usage continues. Additionally, comparative studies across different regions or sectors in rural and urban utilities could reveal how contextual differences influence usage outcomes. Integrating other institutional or environmental moderators may further refine the model's explanatory power.

Practical Recommendations for Enhancing MAJI IS usage and Financial Performance

Based on the study findings, a set of strategic and operational recommendations is proposed to strengthen MAJI IS usage after adoption and improve financial performance in water utilities and Community-Based Water Supply Organisations (CBWSOs).

Enhancing Technological Capacity and Readiness

Sustained functionality of MAJI IS requires continuous investment in technological capacity. Utilities should prioritise regular staff training, systematic upgrades of ICT infrastructure, and targeted capacity-building programmes. Establishing dedicated technical support units and ensuring reliable system access will improve system reliability, data accuracy, and overall user confidence. Incorporating digital performance indicators within staff appraisal systems can further institutionalise the use of technology as a core organisational capability.

Promoting Transformational and Supportive Leadership

Leadership plays a urgent role in shaping system usage after adoption. CBWSOs and Water utilities should cultivate leadership approaches that emphasise transparency, participation, and innovation. Rather than relying exclusively on directive enforcement, managers should adopt a balanced approach to encourage system use through motivation and support. Recognising good performance, fostering a culture of learning, and providing constructive feedback, can significantly enhance employee commitment to utilisation of MAJI IS.

Strengthening Monitoring and Evaluation Systems

The establishment of structured monitoring and evaluation frameworks is essential for tracking performance of MAJI IS. Utilities should implement mechanisms to assess usage of

system regularly, identify operational bottlenecks, and support decision-making based on evidence. Continuous monitoring will enable timely interventions, enhance accountability, and ensure that system outputs effectively contribute to financial sustainability.

Aligning Policy and Institutional Frameworks

Effective MAJI IS implementation requires alignment between operational practices and sector policies. Key institutions, including the Ministry of Water, RUWASA, and EWURA, should harmonise digitalisation strategies to ensure standardisation and interoperability across water utilities and CBWSOs. Clear policy guidance and coordinated institutional support will facilitate consistent system usage after adoption and integration nationwide.

Reducing Effort Expectancy through Targeted Capacity Building

To minimise perceived system complexity, utilities and CBWSOs should implement structured and continuous training programmes. These should include practical, hands-on sessions covering core system functions such as billing, meter reading, and reporting, complemented by periodic refresher courses, and post-training follow up. Peer learning mechanisms, TAF and simulation-based training environments can further enhance user competence and confidence, leading to more consistent and effective system utilisation.

Integrating MAJI IS into Core Financial Management Processes

For MAJI IS usage after adoption to translate into tangible financial outcomes, its outputs must be fully embedded within operational workflows. Utilities and CBWSOs should integrate system-generated data into revenue reconciliation, billing, and auditing processes. Regular verification of meter readings and billing records, alongside clear accountability mechanisms for addressing data inconsistencies and, revenue leakages will strengthen financial performance and service sustainability.

Limitations of the Study (Limitation and future research)

This study has several limitations to consider when interpreting the findings. First, the data were collected from water utilities in the Dodoma and Katavi regions of Tanzania. While these areas offer some diversity in operations and institutions, the geographic coverage is still limited. Therefore, caution is needed when applying the findings to other regions or countries. Although cultural and administrative structures in Tanzania are similar across regions, future studies could include more areas or conduct cross-country comparisons to improve external validity. Second, the study looked closely at specific financial performance indicators, such as revenue collection, service level effectiveness, system functionality, and non-revenue water reduction. While these indicators are important for assessing utility performance, they do not cover all aspects of financial and operational services. Other financial services, including fund transfer mechanisms, digital payment integration, and micro-pension services, were not explored.

Future research could expand the performance measurement framework to include more financial and service-related indicators. Third, the study mainly focused on financial and operational outcomes and did not address non-financial organizational services like staff training, capacity-building efforts, or collaborative service mechanisms. These non-financial aspects could be crucial for long-term system sustainability and performance improvements.
Future studies might adopt a broader performance model that considers both financial and non-financial outcomes. Fourth, the study used a cross-sectional research design, which limits the ability to identify causal relationships over time. Longitudinal studies would enable researchers to investigate how the connections between effort expectancy, organizational culture, and financial performance change as digital systems develop. Finally, the study relied on self-reported survey data, which could introduce bias or subjectivity. Future research could use objective financial records or mixed-method approaches, including qualitative interviews, to gain deeper insights into the mechanisms behind the observed relationships. By addressing these limitations, future research can improve the understanding of how digital information systems create organizational value within public-sector utilities and similar settings.
Overall, the study demonstrates that improving financial performance in water utilities requires more than technological deployment. Sustainable benefits from usage of MAJI IS arise through the interaction between system usability, managerial practices, and organisational culture. Reinforcing these interrelationships, is essential for maximizing the value of digital transformation in the water sector.

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