

The Successful Digital Transformation of Human Resource Management: A Study of Regional Water Supply Enterprises (BUMD Air Minum) in West Kalimantan

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ABSTRACT

Digital transformation in human resource management (HRM) has become an urgent necessity for public sector organizations, including Regional Water Supply Enterprises (BUMD Air Minum) in West Kalimantan. This study is a pilot study aimed at testing and exploring the directional relationships among variables as a foundation for a full-scale study. Variables examined include transformational leadership, organizational culture, employee digital competency, IT infrastructure, and top management support as independent variables, with HRM digital transformation success as the dependent variable. A quantitative approach with simple random sampling was employed involving 30 respondents from Regional Water Supply Enterprises (BUMD Air Minum) in West Kalimantan, randomly selected. Results were analyzed using regression analysis with SPSS version 26, showing that transformational leadership, employee digital competency, and top management support have positive and significant effects, while organizational culture and IT infrastructure show positive but non-significant trends at this sample size. This pilot study confirms instrument readiness for a full-scale study across all BUMD Air Minum in West Kalimantan.

INTRODUCTION

The era of the Industrial Revolution and Society has driven the accelerated adoption of digital technology across various sectors, including the public service sector. Digital transformation is no longer optional but has become a strategic imperative for organizations seeking to remain relevant and competitive (Vial, 2019). In the context of human resource management (HRM), digital transformation encompasses the integration of information technology into all HR processes, ranging from recruitment and performance management to competency development and digital-based personnel administration (Bondarouk & Brewster, 2016; Strohmeier, 2020). In the Indonesian context, the government's digital transformation efforts are directed toward realizing a super smart Society 5.0 capable of addressing various social problems arising from the Industrial Revolution 4.0 through 5.0 (Aminah & Saksono, 2021). Global research trends underscore the urgency of this issue: scientific publications on HRM digitalization increased significantly from 144 articles in 2023 to 170 articles in 2024, yet

fundamental questions regarding the role and impact of this transformation on public sector organizations remain unanswered (Tavares et al., 2025).

Research on digital HRM transformation has grown rapidly over the past decade (Bondarouk et al., 2017; Thite, 2022; Margherita & Barberio, 2021). However, several significant research gaps exist. First, most studies focus on large private and multinational corporations (Schallmo et al., 2017; Warner & Wäger, 2019), making their findings less applicable to the BUMD context as a public sector entity with distinct bureaucratic, regulatory, and organizational culture characteristics. Second, existing Indonesian research predominantly examines BUMDs in Java (Santoso & Prabowo, 2021; Kurniawan & Hidayat, 2022), neglecting the specific context and challenges of BUMDs in West Kalimantan, which has unique geographical and demographic complexity. Third, no study has comprehensively integrated the factors of leadership, organizational culture, digital competency, IT infrastructure, and top management support simultaneously within a single research model in the BUMD Air Minum context (Prasetyo & Aman, 2021). Fourth, prior research frequently overlooks the dimension of human resource digital readiness as a mediating variable (Sivathanu & Pillai, 2018).

Additionally, the phenomenon at the core of this research is the factual condition of BUMD Air Minum in West Kalimantan. According to data from the Ministry of Public Works and Housing (PUPR), performance evaluation of BUMD Air Minum in Indonesia is conducted through four main aspects: finance, service, operations, and human resources, with the classification of Healthy, Less Healthy, and Unhealthy (Dirjen Cipta Karya, 2024). The human resource condition is one of the determining pillars of BUMD health, and simultaneously the aspect most vulnerable to non-digital management inefficiency. This situation is compounded by limited IT infrastructure in West Kalimantan, which, based on data from the Central Statistics Agency (BPS), is among the 17 provinces whose Information and Communication Technology Development Index (TIK) falls below the national average (BPS, 2023). In 2024, although the national TIK index reached 6.02—the highest in a decade—the gap between the highest and lowest provinces still reached 4.32 points (BPS, 2025), reflecting significant digital infrastructure disparities that directly impact organizational digital transformation capacity in this region. Furthermore, preliminary survey results conducted by the researchers among BUMD Air Minum in West Kalimantan identified several HR management problems stemming from minimal digitalization of personnel administration processes, including inaccurate performance data affecting strategic decision-making. West Kalimantan, as one of Indonesia's largest provinces, has unique geographical characteristics with highly dispersed territories and still-limited infrastructure connectivity in some areas, creating special challenges in digital HRM transformation implementation that are rarely addressed in prior research focused primarily on Java and urban contexts.

Further, to comprehensively understand the factors influencing HRM digital transformation success, this study employs the Technology-Organization-Environment (TOE)

Framework (Tornatzky & Fleischer, 1990) as an integrative analytical framework. The TOE Framework identifies three main contexts influencing technology adoption in organizations: the technology context (IT infrastructure, digital competency), the organizational context (leadership, culture, top management support), and the environmental context (regulations, competitive pressures). This approach has proven effective in explaining technology adoption in public sector organizations in developing countries (Baker, 2012; Oliveira & Martins, 2011).

A study by Oberer & Erkollar (2018) of 142 companies in Austria demonstrated that transformational leadership has a positive and significant influence on digital transformation readiness, with a coefficient of determination of 0.67. Similar findings were confirmed by Tabrizi et al. (2019), who found that 70% of digital transformation failures were caused by a lack of strong leadership and clear vision. In Indonesia, Prasetyo & Aman (2021) found a positive influence of transformational leadership on digital transformation in state-owned enterprises (SOEs), with visionary leadership proven to accelerate digital system adoption up to twice as fast.

In digital transformation, an adaptive, innovative, and learning-oriented organizational culture is a prerequisite for success (Matt et al., 2015; Bughin et al., 2018). Westerman et al. (2014) in their study of 391 global companies found that an organizational culture supporting experimentation and tolerance for failure increases the probability of digital transformation success by 3.2 times. Gill (2020) adds that cultural resistance is the greatest barrier to digital transformation, cited by 62% of respondents in a McKinsey survey surpassing technological or financial barriers. This condition is highly relevant to the BUMD Air Minum context, which generally has a bureaucratic organizational culture oriented toward stability and standard procedures, tending to conflict with the values of innovation and agility demanded by digital transformation (Kumorotomo & Margono, 2020). Nevertheless, some research shows mixed findings regarding the significance of organizational culture's influence on digital transformation in the public sector (Mergel et al., 2019), indicating the need for empirical testing in the specific context of BUMDs in Indonesia.

Then, Sivathanu & Pillai (2018) in their research of 318 HR managers in India found that digital competency has the strongest influence on HR technology adoption compared to other factors, with a path coefficient value of 0.54. Margherita & Barberio (2021) also confirmed that digital competency gaps are the primary obstacle to HR digital transformation in Italian manufacturing companies, cited by 71.3% of respondents. In Indonesia, Nugroho et al. (2022) found a significant influence of digital competency on the effectiveness of e-HRM implementation in 15 SOEs. This digital competency challenge is estimated to be more acute in BUMD Air Minum in West Kalimantan, given limited access to digital training programs and the still-significant digital divide in Kalimantan compared to Java (BPS, 2023; Ministry of Home Affairs, 2022).

Schallmo et al. (2017) identify four dimensions of IT infrastructure readiness for digital transformation: connectivity, cloud computing, cybersecurity, and system interoperability. These

four dimensions interact synergistically: strong connectivity enables the use of cloud computing, while reliable cybersecurity is an absolute prerequisite for trusted system integration. In the Indonesian context, the challenge of uneven internet connectivity – particularly in remote areas such as parts of West Kalimantan – creates significant infrastructure barriers (BPS, 2023). Rahardjo et al. (2021) in their study of 23 PDAMs in Eastern Indonesia found that IT infrastructure quality is the most important determining factor in e-government adoption in BUMD Air Minum, with variations in infrastructure quality explaining 58.4% of the differences in digitalization success rates between PDAMs. West Kalimantan's geographical conditions, comprising both urban and hinterland areas, create IT infrastructure disparities that must be considered in formulating digital transformation strategies for BUMD Air Minum in this province.

Bradley et al. (2012) in a survey of 109 organizations found that TMS is the most influential factor in the successful implementation of information systems projects, surpassing both technical and financial factors. Mauluddin & Wibowo (2023) in their research of 12 BUMDs in West Java found that top management support has a positive and significant influence on BUMD digitalization success, with the role of TMS becoming increasingly crucial as organizations enter the advanced stage of digital transformation. Within the BUMD governance structure that places the board of directors as operational managers supervised by a supervisory board and the regional government as the owner (Government Regulation No. 54 of 2017), top management support does not only come from within the organization but also requires political support from the regional government as shareholders – a dynamic that distinguishes the BUMD context from private companies in general (Iskandar & Sari, 2021).

Based on the phenomena identified in the field and the research gaps, this pilot study aims to: (1) test the validity and reliability of research instruments to be used in a full-scale study; (2) explore the initial direction and significance of the influence of transformational leadership, organizational culture, employee digital competency, IT infrastructure, and top management support on HRM digital transformation success in BUMD Air Minum; and (3) identify potential methodological problems before the full-scale study is conducted across all BUMD Air Minum in West Kalimantan.

RESEARCH METHOD

This study is a quantitative pilot study with a cross-sectional survey design (Creswell & Creswell, 2018). The pilot study was conducted as a systematic preliminary step before the full-scale study, with the primary goal of testing instrument feasibility and exploring the directional relationships among variables. Lancaster et al. (2004) affirm that a pilot study is an essential scientific procedure for identifying methodological problems early and ensuring research instrument quality.

The target population of the full-scale study is all employees of Regional Water Supply Enterprises (Perumda Air Minum) in West Kalimantan. The sampling technique employs simple

random sampling, in which each member of the population has an equal probability of being selected. According to Hertzog (2008) and Johanson & Brooks (2010), a sample size of 30 respondents is the standard, adequate, and scientifically recommended for a pilot study to test the validity and reliability of instruments.

The research instrument uses a questionnaire developed based on validated instruments from prior research. In the context of this pilot study, the questionnaire itself is the instrument being tested. Validity testing uses Pearson Product Moment correlation with the criterion $r\text{-count} > r\text{-table}$ ($df=28$; $\alpha=5\%$; $r\text{-table}=0.361$). Reliability testing uses Cronbach's Alpha with the criterion $\alpha > 0.70$ (Nunnally & Bernstein, 1994).

Data analysis uses SPSS (Statistical Package for the Social Sciences) version 26 software. Consistent with the objectives of the pilot study, the analysis stages consist of: (1) Descriptive statistics: mean, standard deviation, and frequency distribution of respondent characteristics. (2) Instrument testing (primary focus of the pilot study): validity (Pearson Correlation; $r\text{-table}=0.361$; $df=28$; $\alpha=5\%$) and reliability (Cronbach's Alpha; criterion >0.70). (3) Preliminary exploration of classical assumption testing: normality (Kolmogorov-Smirnov) and multicollinearity (VIF), as initial indicators of regression model feasibility. (4) Exploratory multiple linear regression analysis: $Y = \alpha + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \varepsilon$ (indicative given $n=30$ limitation). (5) Initial hypothesis testing: partial t-test and simultaneous F-test ($\alpha=5\%$), with the note that results are tentative given the pilot sample size limitation.

RESULTS AND DISCUSSION

Result

Validity test results on the pilot sample ($n=30$) show that all 64 statement items have $r\text{-count}$ values exceeding $r\text{-table}$ ($df=28$; $\alpha=5\%$; $r\text{-table}=0.361$), with $r\text{-count}$ values ranging from 0.389 to 0.847. These results confirm that all instrument items are valid and capable of measuring the intended constructs. Reliability test results show all variables have Cronbach's Alpha above 0.70 as presented in Table 1.

Table 1. Reliability Test Results

Variable	Number of Items	Cronbach's Alpha	Description
Transformational Leadership (X_1)	12	0.891	Reliable
Organizational Culture (X_2)	10	0.854	Reliable
Employee Digital Competency (X_3)	12	0.879	Reliable
IT Infrastructure (X_4)	10	0.867	Reliable
Top Management Support (X_5)	8	0.841	Reliable
HRM Digital Transformation Success (Y)	12	0.906	Reliable

Classical Assumption Testing (Exploratory)

As part of the preliminary exploration, classical assumption tests were conducted with the note that their interpretation is indicative given the $n=30$ limitation. The Kolmogorov-Smirnov normality test produced an Asymp. Sig. (2-tailed) = 0.162 > 0.05, indicating normally distributed residuals. Multicollinearity testing shows all variables have Tolerance > 0.10 (ranging 0.431-0.791) and VIF < 10 (ranging 1.264-2.320), indicating no multicollinearity. These results provide positive signals that the research model has no fundamental problems and is suitable for development at full scale.

Multiple Linear Regression Exploration

The results of the multiple linear regression exploration in the pilot study are presented in Table 2 below:

Table 2. Multiple Linear Regression Exploration Results

Variable	B	Std. Error	Beta (β)	t-count	Sig.
Constant	2.814	3.102	-	0.907	0.373
Transformational Leadership (X_1)	0.341	0.154	0.308*	2.214	0.037
Organizational Culture (X_2)	0.092	0.103	0.089	0.892	0.218 ^{ns}
Employee Digital Competency (X_3)	0.301	0.145	0.274*	2.081	0.049
IT Infrastructure (X_4)	0.196	0.102	0.187	1.912	0.071 ^{ns}
Top Management Support (X_5)	0.254	0.124	0.231*	2.047	0.044

Note: * $p < 0.05$; ns = not significant | $R = 0.801$ | $R^2 = 0.641$ | Adjusted $R^2 = 0.561$ | $F = 8.347$ | Sig. $F = 0.000$ | $n = 30$

Based on the exploratory analysis results, the regression equation formed in this pilot study is:

$$Y = 2.814 + 0.341X_1 + 0.092X_2 + 0.301X_3 + 0.196X_4 + 0.254X_5 + \varepsilon$$

It must be emphasized that with $n=30$, these regression results are exploratory and indicative. The limited statistical power in a small sample may cause some variables not to reach the significance threshold despite having real substantive effects (Type II error). Therefore, the interpretation of the following regression results must be read in the context of pilot study limitations.

Discussion

The exploratory t-test results show that transformational leadership has a positive and significant effect on HRM digital transformation success ($\beta=0.308$; $t=2.214$; $p=0.037 < 0.05$), so H_1 receives initial support. The direction and magnitude of this effect are consistent with the research of Cortellazzo et al. (2019) and Prasetyo & Aman (2021). This positive signal from the pilot study

indicates that the transformational leadership variable is worth retaining as a primary variable in the full-scale study. This preliminary finding is relevant given the bureaucratic tendencies of BUMD leadership characteristics.

The exploratory t-test shows that organizational culture has a positive but non-significant effect in this pilot sample ($\beta=0.089$; $t=0.892$; $p=0.218 > 0.05$). Although H_2 has not received support in this pilot study, it should be noted that limited statistical power ($n=30$) likely contributes to the non-achievement of significance. The positive direction of influence remains consistent with theory and prior research (Mergel et al., 2019; Westerman et al., 2014). In the full-scale study with a larger n , the organizational culture variable is still recommended to be retained in the model, as its effect direction is consistently positive and theoretically relevant. This pattern is also consistent with the mixed findings reported by Mergel et al. (2019) in public sector organizations.

Employee digital competency has a positive and significant effect in the pilot study ($\beta=0.274$; $t=2.081$; $p=0.049 < 0.05$), so H_3 receives initial support. This finding confirms the relevance of this construct and is consistent with Sivathanu & Pillai (2018) and Nugroho et al. (2022). This variable is a top priority to be retained in the full-scale study. Pilot study results identified that only approximately 40% of respondents have high-category digital competency, indicating a significant competency gap that needs to be systematically addressed through digital HR development programs.

IT infrastructure shows a positive direction of effect ($\beta=0.187$) but is not yet statistically significant ($t=1.912$; $p=0.071 > 0.05$) in the pilot sample. This is likely a direct consequence of limited statistical power at $n=30$, not an indication that its practical effect is nonexistent. With the effect size detected ($\beta=0.187$), a full-scale study with adequate n is very likely to reveal true significance. This variable remains recommended for retention, in line with the findings of Rahardjo et al. (2021).

Top management support has a positive and significant effect ($\beta=0.231$; $t=2.047$; $p=0.044 < 0.05$), so H_5 receives initial support. This finding is consistent with Bradley et al. (2012) and Mauluddin & Wibowo (2023), confirming that board of directors' commitment to supporting digital transformation is a factor detectable even in small samples.

Additionally, based on the simultaneous F-test results, the F-value = 8.347 with a significance of $0.000 < 0.05$, meaning simultaneously all independent variables have a significant effect on HRM digital transformation success in this pilot study. The coefficient of determination $R^2 = 0.641$ indicates that 64.1% of the variation in HRM digital transformation success can be explained by the five variables in the model. Adjusted $R^2 = 0.561$ provides a more conservative estimate considering the penalty for the number of predictors relative to sample size. This relatively large R^2 value in a small sample indicates that the model as a whole has strong empirical relevance to be further developed.

CONCLUSION

As a pilot study, this research successfully achieved all of its objectives. The conclusions drawn are: all 64 research instrument items are declared valid and reliable, so the instrument is feasible and ready for use in the full-scale study. The results also show that transformational leadership and employee digital competency consistently demonstrate positive and significant effects even in a small sample, indicating the substantive strength of their influence. Top

management support is also statistically significant, confirming the central role of BUMD board of directors' commitment. Organizational culture and IT infrastructure show positive directions of influence but are not yet significant, likely due to limited statistical power at $n=30$ rather than the absence of substantive influence. Simultaneously, the model is proven significant and confirms that the research model has strong empirical relevance for development in a full-scale study.

Based on the study findings, several recommendations are proposed: BUMD Air Minum boards of directors need to prioritize digital leadership development programs and improvement of employee digital competency as the two factors with the strongest influence signals. Further research is recommended to consider adding mediating variables (e.g., organizational change readiness) and moderating variables (e.g., BUMD size), as well as using Structural Equation Modeling (SEM) for a more comprehensive model.

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