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Digital Transformation Strategy: Behavioral Change Approach in Increasing Technology Adaptation in the Corporate Environment: Case Study of PT Hutama Karya (Persero)

Audy Adityananda* , Achmad Ghazali
Institut Teknologi Bandung, Indonesia
Email: audy_adityananda@sbm-itb.ac.id*

ABSTRACT

The rapid advancement of digital technologies has driven state-owned enterprises (SOEs) in Indonesia to adopt transformasi digital strategies. PT Hutama Karya (Persero), despite investing billions of Rupiah annually in digital initiatives, continues to face delays and underutilization of tools such as BIM, PMIS, and CDE. This study investigates the root causes of these inefficiencies, arguing that misalignment between strategi digital and behavioral adoption at the project level is the core issue. Using a qualitative case study approach, data were collected from internal documents, interviews, questionnaires, and group discussions. Analysis revealed that resistance to change, lack of practical training, and weak cultural reinforcement are key inhibitors. The study integrates Kotter's 8-Step Model, ADKAR, and the Theory of Planned Behavior to develop a behavioral-driven transformation framework. Findings highlight high employee motivation but moderate support in process and technology readiness. Business solutions include digital champions, targeted training, broader tool access, and performance-based reinforcement. A phased roadmap (Transform–Sustain–Strive) aligned with RJPP 2025–2029 was proposed, along with a risk mitigation plan. This research contributes to transformasi digital literature by emphasizing behavioral change and offering a replicable framework for SOEs in construction and infrastructure sectors.

KEYWORDS *Behavioral Change, Digital Readiness, Digital Transformation, Organizational Transformation, Technology Adoption*

INTRODUCTION

The global business landscape has been fundamentally reshaped by digital disruption, with organizations across industries facing unprecedented pressure to adapt or risk obsolescence (Behie et al., 2023; Brenner, 2018; Nosike et al., 2024; Zaslavska & Zaslavska, 2024). According to recent estimates, approximately 70% of digital transformation initiatives fail to achieve their intended objectives, primarily due to organizational resistance and inadequate change management rather than technological limitations (Gupta, 2018; Koczerga, 2024). This global challenge is particularly acute in traditional industries such as construction, where digital adoption rates remain significantly lower compared to other sectors despite the proven benefits of technologies like Building Information Modeling (BIM), Internet of Things (IoT), and data analytics platforms.

The rapid advancement of digital technologies such as artificial intelligence (AI), cloud computing, the Internet of Things (IoT), and data analytics has compelled organizations worldwide to reconfigure their operations, strategies, and cultures (Alqahtani et al., 2024; Van

Hoang, 2024). In response to this global digital disruption, digital transformation has emerged as a critical pathway for organizations to sustain competitiveness and enhance operational resilience (Chavarnakul et al., 2025; Nkomo & Kalisz, 2023). Within this context, digital transformation is no longer a matter of IT implementation alone but a comprehensive, enterprise-wide shift that requires technological, organizational, and behavioral alignment (Korhonen & Halén, 2017; Pancote et al., 2025).

In the construction industry, the adoption of digital technologies remains uneven despite their proven potential to improve productivity, reduce waste, and enhance collaboration (Li et al., 2022; Talla & McIlwaine, 2024; Wang et al., 2020). This is particularly evident in emerging economies such as Indonesia, where traditional construction practices and fragmented workflows continue to dominate. State-owned enterprises (SOEs) like PT Hutama Karya (Persero), tasked with major infrastructure development such as the Trans-Sumatra Toll Road, have committed significant investments in digital construction tools estimated at nearly IDR 40 billion annually. These tools include Building Information Modeling (BIM), Project Management Information Systems (PMIS), and Common Data Environments (CDE). However, inconsistencies in project performance and the limited adoption of standardized digital workflows persist across projects (Temitope, 2020; Tran & Nguyen, 2024; Uddin, 2025).

A comprehensive review of recent literature reveals critical gaps in understanding digital transformation failures in construction SOEs. Bosch-Sijtsema and Haapamäki (2014) demonstrated that successful BIM implementation requires not only technical infrastructure but also organizational culture change and user acceptance strategies. Similarly, Oraee et al. (2017) found that construction companies with strong change management frameworks achieved 2.5 times higher digital adoption rates compared to those focusing solely on technology deployment. Ahmed et al. (2018) further identified that employee resistance to new technologies stems primarily from inadequate training, fear of job displacement, and lack of management support—factors that technology-centric approaches fail to address. More recently, Matarneh et al. (2019) emphasized that cultural readiness and behavioral intention are stronger predictors of BIM adoption success than technological readiness alone. While previous studies emphasize technological and process readiness as enablers of digital transformation, emerging literature highlights the critical role of human factors such as leadership, digital literacy, and cultural adaptability (Jewapatarakul & Ueasangkomsate, 2024; Omowole et al., 2024; Trenerry et al., 2021). Organizational change models like ADKAR and Kotter's 8-Step Process underscore the importance of structured behavioral interventions, while the Theory of Planned Behavior (TPB) explains how individual intentions are shaped by attitudes, norms, and perceived control (Jimmieson et al., 2008). Yet, the integration of these models into practical digital transformation strategies remains limited, particularly in construction SOEs where project-based execution and resistance to change are deeply entrenched.

In light of this context, this study aims to explore the behavioral and organizational factors that hinder effective digital construction workflow adoption at PT Hutama Karya (Persero). The urgency of this research is underscored by several critical risks: first, the potential loss of approximately IDR 40 billion in annual digital investments if adoption rates do not improve significantly; second, the increasing competitive disadvantage as private

construction firms demonstrate higher digital maturity; third, the direct impact on national infrastructure acceleration targets, as digital inefficiencies contribute to project delays averaging 3–6 months across major toll road developments; and fourth, the widening gap between corporate digital strategy and field-level execution capability, which threatens organizational competitiveness in an increasingly digital construction landscape. By employing an integrative conceptual framework that synthesizes Kotter's model, ADKAR, and TPB, the research investigates how strategic alignment, individual readiness, and behavioral intention interact to influence technology adaptation outcomes.

This study aims to investigate the underlying behavioral and organizational factors that hinder the effective adoption of digital construction workflows at PT Hutama Karya (Persero). Specifically, the research seeks to: first, identify and analyze key behavioral, cultural, and managerial barriers that affect the implementation of digital technologies in construction projects; second, evaluate the organization's digital readiness across the dimensions of people, process, technology, and strategy; and third, develop a comprehensive behavioral change framework that integrates established change management theories to guide sustainable digital transformation.

The findings of this research offer both theoretical and practical contributions. Theoretically, this study advances digital transformation literature by demonstrating how behavioral change frameworks can be systematically integrated into technology adoption strategies within traditional industries. Practically, the proposed framework provides construction SOEs with actionable strategies for overcoming resistance to change, improving training effectiveness, and fostering a digital culture. The implications extend beyond PT Hutama Karya, offering a replicable model for other state-owned enterprises and construction organizations facing similar digital transformation challenges.

METHOD

This study adopted a qualitative case study approach to explore behavioral and organizational factors affecting digital transformation within PT Hutama Karya (Persero), a state-owned enterprise in the Indonesian construction sector. This approach enabled an in-depth understanding of real-world practices, allowing the researcher to capture complex relationships among strategic initiatives, individual behaviors, and technology adoption dynamics.

Data collection combined secondary and primary sources to ensure richness and reliability through methodological triangulation. Secondary data were gathered from internal corporate documents, including the Digital Transformation Guidebook, Digital Construction Workflow procedures, and project performance dashboards. These documents provided essential context on formal digital strategies, technology use expectations, and implementation gaps. This was followed by analysis of a leaderless group discussion (LGD) with project-level personnel to identify operational issues related to digital adoption. The absence of hierarchy in the discussion encouraged candid contributions and allowed shared experiences to surface naturally.

Primary data were collected through semi-structured interviews with ten informants, including senior management, digital transformation officers, and field-level engineers. The interview guide was developed based on the ADKAR model, Kotter’s 8-Step Change Model, and the Theory of Planned Behavior (TPB), ensuring questions addressed relevant behavioral

and organizational factors. Additionally, a structured questionnaire was distributed to 71 respondents across various divisions of PT Hutama Karya (Persero). The questionnaire used a 5-point Likert scale to capture perceptions across seven dimensions: awareness, desire, knowledge, ability, reinforcement, social influence, and behavioral intention. Respondents were purposively selected based on their active involvement in digital workflows, particularly in the use of BIM, PMIS, and CDE systems, ensuring relevant and representative data.

Participants included project managers, site engineering managers, digital construction coordinators, engineers, and operational staff from both head office and project sites. Their field operations experience and exposure to digital workflows made them relevant for assessing behavioral readiness and organizational alignment. In-depth interviews with ten key informants from senior management, the Engineering and IT Division, and project teams provided qualitative insights that complemented and enriched quantitative findings. Together, this respondent pool offered a comprehensive view of the company's digital transformation landscape, especially in identifying behavioral and structural barriers to technology adoption.

Data analysis examined alignment between digital transformation strategies and behavioral readiness. Document reviews and leaderless group discussion insights were analyzed to identify major implementation challenges and systemic barriers. A fishbone (Ishikawa) diagram visualized root causes, categorizing issues into domains such as manpower, method, machine, material, measurement, and environment.

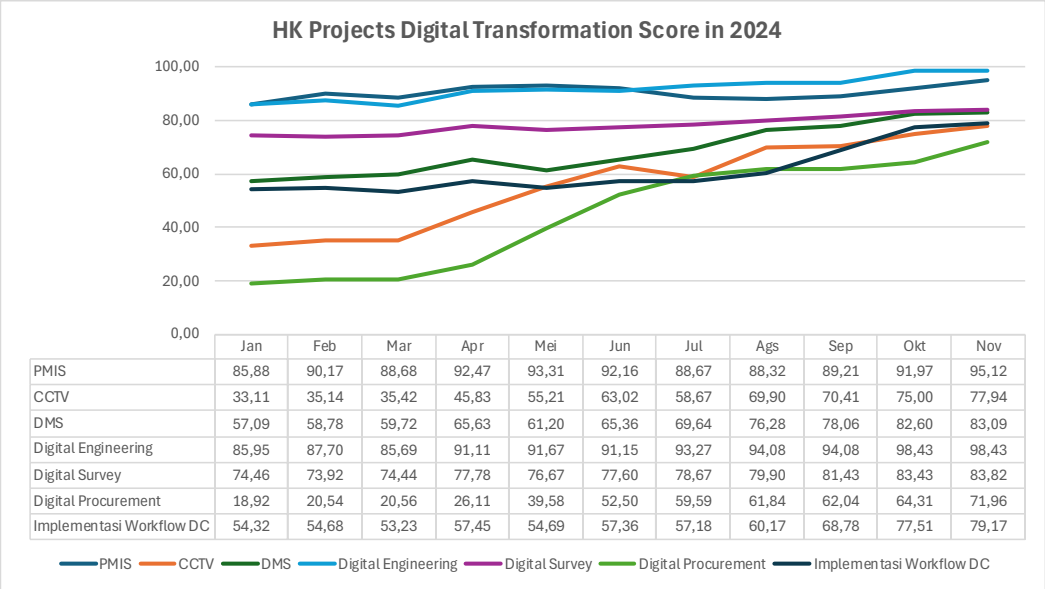
Qualitative interview data underwent thematic analysis using NVivo software. Transcripts were coded into dimensions aligned with the conceptual framework, including awareness and urgency, desire and attitude, knowledge and training, ability and empowerment, reinforcement and cultural integration, subjective norms, and behavioral intention. This coding structure highlighted recurring themes and differences across roles and organizational levels.

Quantitative questionnaire data were analyzed using descriptive statistics to calculate means and standard deviations. Pearson's correlation tested validity, and Cronbach's Alpha assessed internal consistency. Results were mapped to the Digital Readiness Assessment (DRA) framework, focusing on People, Process, Technology, and Strategy to evaluate overall readiness. The final analysis phase integrated qualitative and quantitative findings through triangulation, enabling a comprehensive interpretation of behavioral, structural, and strategic factors influencing digital transformation success at PT Hutama Karya (Persero).

RESULTS AND DISCUSSION

Overview of Digital Construction Workflow Implementation

Document analysis of Hutama Karya's internal digital transformation materials revealed a standardized digital construction workflow consisting of five main phases: Initiating, Planning, Execution, Handover and Closeout, and Post-Construction. While the procedural design demonstrates high-level alignment with best practices such as the integration of Common Data Environment (CDE), BIM 4D/5D, and digital dashboards, actual implementation across projects remains inconsistent. Field data indicate that some projects still rely heavily on manual documentation, lack real-time data capture, and fail to comply with standard operating procedures. This points to a gap between formal strategy and field-level adoption.



	Jan	Feb	Mar	Apr	Mei	Jun	Jul	Ags	Sep	Okt	Nov
PMIS	85,88	90,17	88,68	92,47	93,31	92,16	88,67	88,32	89,21	91,97	95,12
CCTV	33,11	35,14	35,42	45,83	55,21	63,02	58,67	69,90	70,41	75,00	77,94
DMS	57,09	58,78	59,72	65,63	61,20	65,36	69,64	76,28	78,06	82,60	83,09
Digital Engineering	85,95	87,70	85,69	91,11	91,67	91,15	93,27	94,08	94,08	98,43	98,43
Digital Survey	74,46	73,92	74,44	77,78	76,67	77,60	78,67	79,90	81,43	83,43	83,82
Digital Procurement	18,92	20,54	20,56	26,11	39,58	52,50	59,59	61,84	62,04	64,31	71,96
Implementasi Workflow DC	54,32	54,68	53,23	57,45	54,69	57,36	57,18	60,17	68,78	77,51	79,17

Figure 1. HK Projects Digital Transformation Score in 2024

Root Cause Analysis from Group Discussion

The leaderless group discussion (LGD) surfaced numerous challenges faced by site teams in adopting digital workflows. These included low digital literacy, insufficient training, resistance to change, inconsistent infrastructure, and misalignment between manual and digital procedures. Using a fishbone (Ishikawa) diagram, these problems were categorized into six domains: Manpower, Method, Machine, Material, Measurement, and Environment. Notably, over 50% of the identified problems were related to behavioral and technological readiness.

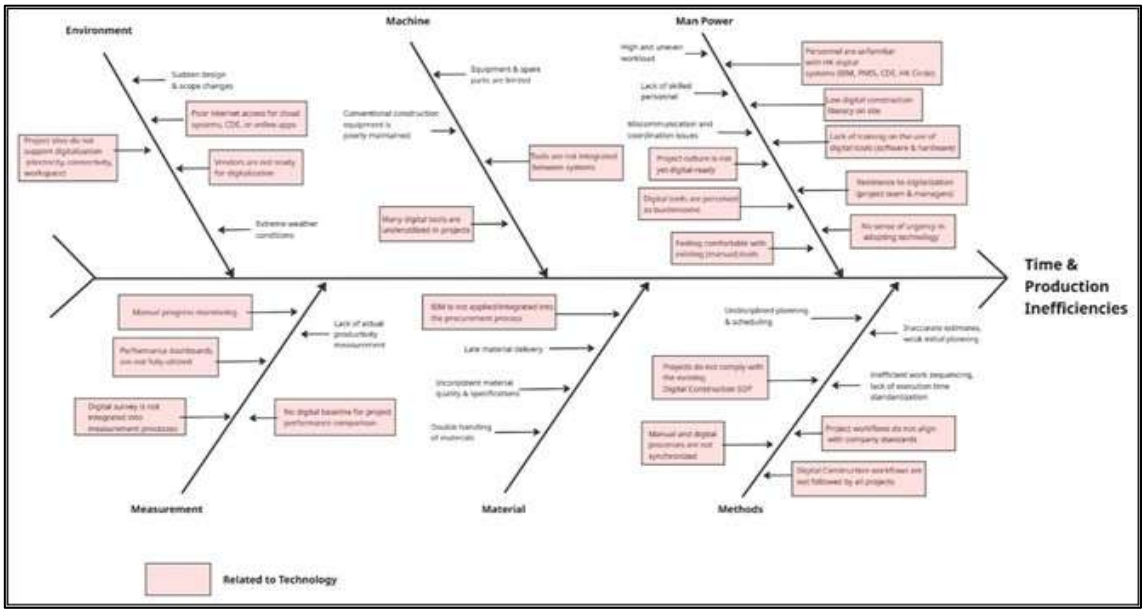


Figure 2. Ishikawa Diagram for Root Cause Analysis from LGD Results

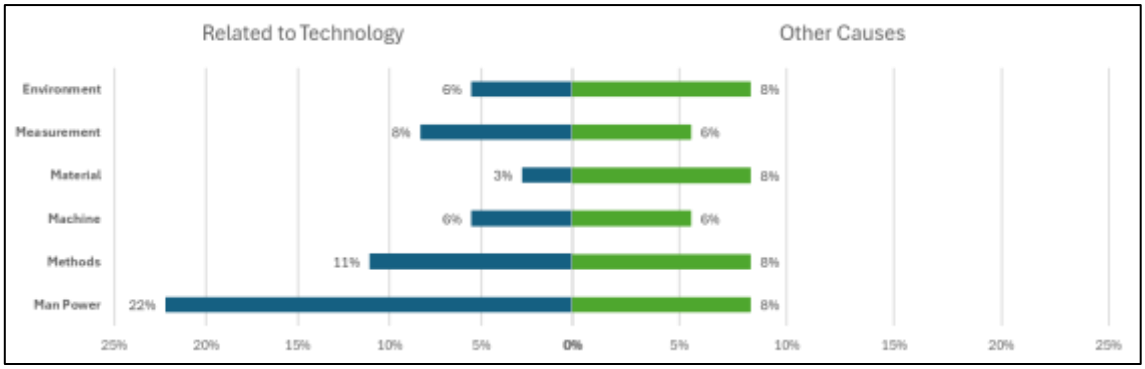


Figure 3. Ishikawa Diagram

Interview Findings: Thematic Insights

Thematic coding using NVivo software identified recurring issues across seven dimensions derived from the ADKAR, TPB, and Kotter frameworks. Most respondents expressed strong awareness and motivation to adopt digital tools, recognizing their potential to improve transparency and efficiency. However, several highlighted insufficient practical training, lack of access to licensed tools, and weak cultural reinforcement as barriers. The role of leadership and peer influence (subjective norm) was perceived inconsistently, with some project teams reporting strong support, while others felt digital transformation was not a clear management priority.

Table 1. Key Findings of Interview Results & Representative Quotes

No.	Dimension	Summary of Key Findings	Representative Quotes
1	Awareness & Urgency	Most respondents understand the importance of digital transformation, but communication is inconsistent, especially at project level.	"The direction of transformation is clearly communicated, and regular evaluations are carried out every month." (P6)
2	Desire & Attitude	Motivation to adopt digital tools is high when benefits are clear, but resistance appears due to extra admin tasks or unclear impact.	"It simplifies the work process, and the resulting output becomes more accountable and traceable." (P7)
3	Knowledge & Training	Training was provided initially, but more practical, hands-on learning is needed.	"Sufficient, but a gradual understanding of the various technologies is needed in order to gain full proficiency." (P8)
4	Ability & Empowerment	Confidence depends on availability of tools and support; limited licenses and persistent traditional mindset are challenges.	"A key barrier is from users who are still comfortable with conventional manual methods, making it difficult to shift towards a digital culture. The transition takes time." (P1)
5	Reinforcement & Culture	Monitoring and rewards are inconsistent. Some successes highlighted, but limited organization-wide follow-up.	"Not specifically. Participation has mostly involved internal or external competitions and conferences. However, there are no formal internal reward mechanisms based on structured assessments or performance indicators." (P10)
6	Subjective Norm	Mixed perceptions of social support; some feel supported by peers and leaders, others sense lack of higher management backing.	"Sometimes it's supported, sometimes it's not. Among peers, there is mutual collaboration and support, but supervisors tend to focus more on

No.	Dimension	Summary of Key Findings	Representative Quotes
			other priorities rather than the digital transformation process." (P5)
7	Behavioral Intention	High intention to continue using digital tools if system support and digital culture improve.	"Creating an environment that enables easy access to and operation of digital systems." (P4)

Questionnaire Results: Descriptive and Statistical Analysis

The questionnaire results reinforced the interview findings. High mean scores were observed for the Desire & Attitude (M = 4.64) and Behavioral Intention (M = 4.53) dimensions, indicating a strong willingness among employees to adopt digital tools. However, lower mean values for Knowledge & Training (M = 4.10) and Reinforcement & Culture (M = 4.19) suggest areas needing strategic im-provement. Cronbach's Alpha values for all dimensions exceeded 0.75, confirming strong internal consistency. Pearson's correlation analysis further validated the instrument's construct reliability.

Table 2 Result of Validity & Reliability Test for Questionnaire

No.	Dimension	Validity Test			Reliability Test	
		Statement Code	Value of r	Status	Cronbach's Alpha	Status
1	Awareness & Urgency	AU1	0.577	Valid	0.755	Reliable
		AU2	0.505	Valid		
		AU3	0.611	Valid		
		AU4	0.423	Valid		
		AU5	0.669	Valid		
2	Desire & Attitude	DA1	0.488	Valid	0.869	Reliable
		DA2	0.562	Valid		
		DA3	0.485	Valid		
3	Subjective Norm	SN1	0.717	Valid	0.825	Reliable
		SN2	0.540	Valid		
4	Knowledge & Training	KT1	0.362	Valid	0.774	Reliable
		KT2	0.572	Valid		
5	Ability & Empowerment	AE1	0.576	Valid	0.892	Reliable
		AE2	0.540	Valid		
		AE3	0.440	Valid		
6	Reinforcement & Culture	RC1	0.429	Valid	0.767	Reliable
		RC2	0.666	Valid		
		RC3	0.523	Valid		
		RC4	0.608	Valid		
7	Behavioral Intention	BI1	0.318	Valid	0.941	Reliable
		BI2	0.650	Valid		
		BI3	0.637	Valid		

Table 3 Statistical Result of Questionnaire and Correlation to DRA Framework

No.	Dimension	Mean	Standard Deviation	DRA Framework Correlation
1	Awareness & Urgency	4.481	0.661	Strategy
2	Desire & Attitude	4.643	0.480	People
3	Subjective Norm	4.274	0.735	People
4	Knowledge & Training	4.105	0.805	Technology
5	Ability & Empowerment	4.225	0.683	Technology
6	Reinforcement & Cultural	4.193	0.807	Process
7	Behavior & Intention	4.525	0.579	People

Triangulated Analysis and Implementation

By triangulating results from document reviews, interviews, and survey responses, a consistent pic-ture emerged: the primary enabler of digital transformation at Hutama Karya is employee motivation and awareness, while the main inhibitors are practical training gaps, inconsistent tool accessibility, and weak cultural reinforcement. The findings align with the DRA framework: the organization shows high readiness in the People and Strategy dimensions, but only moderate maturity in Tech-nology and Process integration.

Table 4 Triangulation of Interview & Questionnaire Results

No.	Dimension	DRA Mappings	Key Findings Interview	Key Findings Questionnaire	Triangulated Insight
1	Awareness & Urgency	Strategy	Most respondents understand the importance of digital transformation, but communication is inconsistent, especially at project level.	High mean (4.481), consistent SD (0.661); moderate to high readiness in recognizing digital urgency.	Strong readiness, but strategic communication of urgency needs improvement.
2	Desire & Attitude	People	Motivation to adopt digital tools is high when benefits are clear, but resistance appears due to extra admin tasks or unclear impact.	Highest mean (4.643), low SD (0.480); high readiness and motivation.	Strong alignment between qualitative and quantitative data; sustain and build on desire.
3	Knowledge & Training	People	Training was provided initially, but more practical, hands-on learning is needed.	Moderate mean (4.274), higher SD (0.735); indicating variability in social reinforcement.	Inconsistencies in support and reinforcement; enhance social norm messaging and leadership backing.
4	Ability & Empowerment	Technology	Confidence depends on availability of tools and support; limited licenses and persistent traditional mindset are challenges.	Lower mean (4.105), higher SD (0.805); moderate readiness, variability in training effectiveness.	Clear gap in training quality and coverage; targeted practical training needed.
5	Reinforcement & Culture	Technology	Monitoring and rewards are inconsistent. Some successes highlighted, but limited organization-wide follow-up.	Moderate mean (4.225), SD (0.683); indicating confidence but some variability.	Training and system access improvements needed; reinforce digital empowerment.
6	Subjective Norm	Process	Mixed perceptions of social support; some feel supported by peers and leaders, others sense lack of	Moderate mean (4.193), high variability (SD 0.807); culture reinforcement inconsistent.	Cultural integration of digital practices needs strengthening; consistent reinforcement and

			higher management backing.		monitoring required.
7	Behavioral Intention	People	High intention to continue using digital tools if system support and digital culture improve.	High mean (4.525), low SD (0.579); strong readiness and behavioral intention.	Strong alignment in both data sources; sustain high intent with supportive environment.

These results underscore the importance of addressing behavioral and organizational barriers not just technological factors when implementing digital transformation in infrastructure-heavy industries. While the availability of digital tools is no longer the main obstacle, their optimal use depends on structured behavioral change, leadership engagement, and long-term cultural integration. The study supports the need for a people-centered transformation strategy, as suggested by the integration of ADKAR, Kotter, and TPB in the conceptual framework.

CONCLUSION

This study investigated the behavioral and organizational barriers to digital transformation within PT Hutama Karya (Persero), with a specific focus on the adoption of digital construction workflows. Despite the company's substantial annual investment in digital technologies such as BIM, PMIS, and CDE, adoption remains inconsistent across projects. Using an integrative conceptual framework that combines Kotter's 8-Step Change Model, the ADKAR model, and the Theory of Planned Be-havior (TPB), this study demonstrated that the challenges of digital transformation are not primarily technological but behavioral and cultural in nature. The research findings reveal that while employ-ees show strong awareness, desire, and intention to adopt digital tools, there are significant gaps in training quality, accessibility of technology, and organizational reinforcement. The triangulated analysis confirms that digital readiness is relatively high in the dimensions of People and Strategy but remains moderate in Technology and Process, as defined in the Digital Readiness Assessment (DRA) framework. These insights underscore the importance of aligning technological investments with structured behavioral change efforts and leadership engagement. For digital transformation to succeed, organizations must go beyond deploying tools. They must foster a digital culture that em-powers individuals, reinforces new behaviors, and integrates transformation into daily operational practices. The study contributes to both theory and practice by offering a practical, multi-level framework for understanding and guiding digital transformation in construction SOEs. Future research is recommended to conduct longitudinal studies on behavioral interventions and to expand the scope beyond construction services to other divisions such as toll road operations and asset man-agement, where digital maturity may vary.

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