

Transformation of Office Facilities and Infrastructure Role in the Digital Era

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ABSTRACT

Digital transformation has fundamentally changed the traditional role of office facilities and infrastructure, triggering the evolution from physical offices to smart and hybrid work environments. This study aims to identify the main drivers and synthesize the evolution of the role of facilities and infrastructure in supporting employee work effectiveness in the digital era. The method used is a Systematic Literature Review of 15 reputable primary sources from 2019 to 2025. The synthesis results show that the role of facilities and infrastructure is transforming in three main dimensions: (1) Digital facilities are evolving from paperless offices to AI-based smart automation. (2) Digital infrastructure (such as Cloud Computing) has become the main infrastructure that enables e-working and hybrid work. (3) Physical infrastructure has transformed into a user-centered Smart Workplace, where facility management is integrated with technology (IoT and Digital Twin) for efficiency and comfort. Crucially, the synthesis establishes a new theoretical framework: the interdependency between these three dimensions forms a Strategic Service Infrastructure. It can be concluded that the role of infrastructure has shifted from merely providing a place to supporting flexibility, which requires harmony between physical space and digital infrastructure to achieve optimal work effectiveness, and serves as a predictor for successful hybrid work implementation.

Keywords: Office Facilities and Infrastructure Role; Digital Era; Digital Workplace; Hybrid Work; Smart Workplace



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INTRODUCTION

Massive technological developments, driven by innovation and digitalization, have fundamentally changed the business landscape and work practices around the world (Kraus et al., 2023). This transformation is not only about adopting new software, but also about completely reshaping the workplace, involving culture, processes, and office facilities and infrastructure (Kürten, 2022). The evolution of the office itself has taken place from ancient times to the current digital era, where technology has become a determining factor in enabling new work concepts, such as e-working and remote working (Beno, 2021).

In the context of modern office management, facilities and infrastructure have traditionally been viewed as static physical assets, such as buildings, furniture, and office equipment. However, the digital revolution has shifted the center of gravity of infrastructure from the physical to the virtual dimension (Nahuway, 2024). The COVID-19 pandemic acted as an accelerator, forcing organizations globally to adopt flexible working models such as telework and hybrid work (Athanasiadou & Theriou, 2021). These changes have created new demands for Office Administration: facilities and infrastructure must adapt to support employees who work from anywhere, anytime, without compromising effectiveness (Lase et al., 2025).

Although digitalization continues to evolve, there is still a need to comprehensively synthesize how the role of the facilities and infrastructure themselves has shifted in response to the demands of the hybrid work environment. This transformation creates a duality between physical and technological space. On one hand, digital means are evolving toward Artificial Intelligence (AI)-based intelligent automation, enabling systems to not only perform tasks but also conduct simple analysis and decision-making (Arieska, 2025). On the other hand, digital infrastructure, such as Cloud Computing, has become an essential foundation ensuring operational continuity and data security for remote workers (Witanti, 2025). Meanwhile, the physical office space needs to be redesigned by integrating Smart Workplace technology, the Internet of Things (IoT), and Digital Twins to enhance comfort and energy efficiency, making it an attractive collaboration hub (Aprianti & Putri, 2024; Clausen et al., 2021). The research gap lies in the lack of a conceptual framework that holistically integrates the roles of means (applications), digital infrastructure, and physical infrastructure (space) as a unified strategic service. Existing studies tend to discuss these pillars separately, necessitating a systematic review to map the evolution of these roles into an integrated model. To address this gap, a Systematic Literature Review (SLR) was chosen as the research methodology to transparently and systematically collect, evaluate, and synthesize scientific evidence from various disciplines.

Based on this background, this study aims to: First, identify the main factors underlying the transformation of office facilities and infrastructure in the digital era. Second, analyze and synthesize the evolution of office facilities and infrastructure in three main dimensions: digital facilities, digital infrastructure, and physical infrastructure. Third, explain the impact of the integration of transformed facilities and infrastructure on employee work effectiveness in a hybrid work context.

LITERATURE REVIEW

Office Evolution, Digitalization, And Modern Work Concepts

Office evolution is a chronological process that demonstrates the adaptation of work functions to the external environment and technological developments (Beno, 2021).

The latest transformation is the shift from traditional offices to the Digital Workplace (Nahuway, 2024). The Digital Workplace is defined as a digitally enabled work environment that is employee-centric and supported by an integrated technology ecosystem, making the work location independent (Kürten, 2022).

The main drivers of this evolution are Innovation and Digitalization, which are reshaping the workplace and demanding flexible, adaptive facilities and infrastructure (Kraus, Ferraris, & Bertello, 2023). These fundamental changes have led to the emergence of modern work models: First, Telework and Remote Work refer to work performed outside the main office location. Telework requires the full role of digital tools (software, connectivity) to replace office interactions and physical needs (Athanasiadou & Theriou, 2021). Second, Hybrid Work: The most dominant model today, which is a combination of on-site and remote work. This model requires a dual role for tools and infrastructure: they must support collaboration in the office while ensuring the effectiveness of digital infrastructure for remote workers (Lase et al., 2025).

Third, the emergence of these models emphasizes that the role of facilities and infrastructure is now measured by their ability to facilitate unlimited connectivity and seamless collaboration, where spatial arrangement and technology implementation must be in harmony (Aprianti & Putri, 2024; Kraus et al., 2023).

Drivers of The Transformation of The Role of Facilities And Infrastructure

The transformation of the role of office facilities and infrastructure does not occur in a vacuum, but is driven by specific factors: First, Demand for a Flexible Work Culture: The main driver of Digital Workplace adoption is an individual-centered work culture. Employees want more flexible conditions and the right to choose their work environment (freedom of choice) (Kürten, 2022). This demand forces physical office infrastructure to change from a mandatory place to an attractive collaboration center.

Second, The Need for Operational Automation: Operational efficiency requires office administration to move away from manual processes. The transformation began with the paperless office initiative, which was a shift from physical media (paper) to electronic documents (Barnad, 2019). The next stage was the integration of more sophisticated digital tools such as Robotic Process Automation (RPA), which automates repetitive tasks (Madakam et al., 2019).

Third, Shift in the Facility Management (FM) Paradigm: The management of physical office infrastructure (FM) must transform from a cost-control approach to User-Centred FM (Einola et al., 2023). The role of FM is shifting to create a smart environment that is responsive to the comfort and well-being of occupants. This shift requires the adoption of technologies such as IoT and Big Data to transform infrastructure into data-driven services (Atta & Talamo, 2020).

Conceptual Framework: Three-Dimensional Strategic Service Infrastructure

Theoretically, the role of office facilities and infrastructure has evolved into a Strategic Service Infrastructure that must operate in three integrated dimensions (physical, digital, and human) to support future work continuity. This conceptual framework is based on a synthesis that views infrastructure as a holistic ecosystem, not merely an inventory of assets. Failure to balance or integrate any of these dimensions will negatively impact overall work effectiveness (Aprianti & Putri, 2024).

Dimensions of Digital Infrastructure: Process Automation and Improved Administrative Quality

The first pillar of transformation focuses on the digital tools used to process administrative work. The evolution of the role of these tools moves from mere content digitization toward independent process automation, aiming to increase the value of administrative work.

From Paperless to Basic Automation: The transformation began with the Paperless Office initiative, which converted physical means (paper) into electronic data. Barnad (2019) explains that this initiative is a fundamental prerequisite for data efficiency, but it is still in the form of content digitization. The role of facilities was then enhanced through the adoption of process automation.

Robotic Process Automation (RPA): RPA is a digital technology that acts as a 'digital worker' to automate repetitive and rule-based administrative tasks, such as bulk data entry or document verification. According to Madakam et al. (2019), the implementation of RPA is a critical strategy for freeing up human resources from low-value tasks, allowing them to focus on work that requires judgment and creativity. Thus, RPA redefines the role of the means as an executor of autonomous processes.

Artificial Intelligence (AI) in Administration: AI represents the highest stage of evolution, surpassing the capabilities of RPA. Arieska (2025) emphasizes that AI enables systems to perform complex data analysis, predict outcomes, and even solve simple problems. The integration of AI into digital tools, such as intelligent internal service chatbots or automated risk analysis tools, is transforming the role of these tools from instruments into smart assistants that enhance the quality and accuracy of administrative outcomes.

Dimensions of Digital Infrastructure: Cloud Computing as a Pillar of Sustainability

The second pillar is digital infrastructure, which is now the main operational foundation and ensures the continuity of hybrid work, especially due to the need for location-independent data access.

Cloud Computing as a Key Prerequisite: Witanti (2025) identifies Cloud Computing as a central and crucial digital infrastructure in the Hybrid Era. The cloud provides on-demand storage, processing, and application services, eliminating dependence on physical office servers. This infrastructure is a key enabler for e-working and telework (Athanasiadou & Theriou, 2021), ensuring that employees have a uniform, secure, and scalable digital work environment.

The Role of Infrastructure in Reliability and Effectiveness: The quality of digital infrastructure directly impacts work effectiveness. Lase et al. (2025) assert that reliable infrastructure is a key determinant of hybrid work success, particularly concerning connection stability, latency, and data security. Therefore, the role of digital infrastructure not only includes providing services but also serves as a mechanism for mitigating operational risks for organizations working in a distributed manner.

Physical Infrastructure Dimension: Convergence of Space, Data, and Users

The third pillar is the transformation of physical office infrastructure, which must now use digital technology to justify its relevance in a hybrid work model. Physical infrastructure has shifted to become a hub designed for collaboration and well-being.

User-centered FM and Smart Workplace: The paradigm shift toward User-centered Facilities Management (FM) requires that office physical infrastructure be

redesigned to prioritize employee experience and well-being, making it a smart and responsive environment (Einola et al., 2023). Physical offices now function as collaboration magnets that must provide added value not found when working remotely.

IoT and Digital Twin Integration: The transformation of physical infrastructure is supported by technologies that converge space and data. IoT (Internet of Things) is used to collect real-time data on occupancy levels, temperature, and air quality (Atta & Talamo, 2020). This data is then fed into a Digital Twin, which is a virtual replica of physical infrastructure. Clausen et al. (2021) explain that Digital Twins are crucial for simulation and optimization.

Synergy and Interdependence Between Dimensions in the Digital Workplace

The identified conceptual framework (Digital Means, Digital Infrastructure, and Physical Infrastructure) is not a standalone entity, but rather a synergistic ecosystem where the effectiveness of one pillar depends on the readiness and functionality of the others. This synergy is at the heart of the Strategic Service Infrastructure concept, which supports the hybrid work model (Aprianti & Putri, 2024).

Operational Dependence of Digital Facilities on Digital Infrastructure: Operationally, the effectiveness of Digital Facilities is highly dependent on the quality of Digital Infrastructure. Intelligent automation like RPA and AI requires stable access, low latency, and significant computing power. This need is addressed by Cloud Computing (Witanti, 2025), which acts as a scalable hosting platform. Without a secure and reliable Cloud infrastructure, the ability of AI to analyze complex data (Arieska, 2025) and the ability of RPA to run repetitive processes (Madakam et al., 2019) in a distributed work environment would be disrupted. This proves that Digital Infrastructure is not just a pathway, but a functional foundation that enables Digital Facilities to operate effectively wherever employees are located (Lase et al., 2025).

Convergence of Physical Infrastructure and Digital Infrastructure Data: Physical infrastructure is integrated with two other digital dimensions through data flow. Physical infrastructure has evolved into a sensor system that generates real-time data.

IoT as a Primary Data Source: IoT sensors are the primary means of data collection (Atta & Talamo, 2020), with the data being streamed through Digital Infrastructure (Cloud) for processing. This data is the fuel for Digital Twins, which serve as virtual simulation models (Clausen et al., 2021). Therefore, a Smart Workplace can only be smart if its digital infrastructure is capable of efficiently managing the volume of Big Data from IoT.

Impact on Decision-Making: The analysis results from the Digital Twin not only optimize energy efficiency but also provide critical insights into space utilization. This data can then be used by Digital Facilities (e.g., scheduling and resource management applications) to automate space allocation, which directly supports the User-centered FM approach (Einola et al., 2023).

The Role of Work Culture in Bridging Interdimensional Gaps, human factors and work culture play a key role in the success of this integration, as highlighted by Kürten (2022). The evolution toward the Digital Workplace is not only driven by technology, but also by employees' demands for flexibility (freedom of choice).

This cultural demand forces organizations to improve the Quality of Physical Infrastructure: If a physical office doesn't provide added value (collaboration, comfort, advanced technology) compared to remote work, employees won't be motivated to come in. This is why physical infrastructure must transform into a Collaboration Magnet supported by visual technology and data (Aguacil Moreno et al., 2024).

Embracing Automation: An adaptive and pro-digitalization culture facilitates the adoption of new Digital Means (RPA/AI). Without cultural readiness, resistance to automation can hinder the efficiency offered by these technologies.

Theoretical Implications of the Three-Dimensional Framework

The synergy and interdependence synthesized in the Three-Dimensional Framework have profound theoretical implications, fundamentally changing how academics and practitioners understand the role of Office Administration and Facility Management (FM) in the digital age.

Paradigm Shift from Asset Management to Strategic Service Management, theoretically, the Three-Dimensional Framework shifts the focus of FM from a static Asset Management approach to Strategic Infrastructure Service Management. In the past, management focused solely on cost control of physical assets (buildings, furniture), but now the emphasis is on value creation through integrated services centered on user experience (Einola et al., 2023).

The role of infrastructure now goes beyond simply supporting functions; it strategically enhances employee effectiveness and organizational competitiveness. This necessitates that office management theory considers how investments in Cloud Computing (Witanti, 2025) directly support the value generated by the Smart Workplace (Aprianti & Putri, 2024), a convergence previously unrepresented in traditional frameworks.

Data as a Theoretical Link Between Dimensions, another important implication is the role of data as a theoretical link that binds the three dimensions. Data from the Physical Infrastructure dimension (via IoT) is not just information about building conditions (Atta & Talamo, 2020), but a new managerial currency that drives intelligent decision-making.

Theoretically, the data processed by the Digital Twin model (Clausen et al., 2021) shows that space optimization and resource allocation are two sides of the same coin: information-based efficiency. This supports the view that the future of Facilities Management must be seen through the lens of integrated Big Data Analytics, where management must be able to interpret data from both physical and virtual environments to optimize performance.

Three-Dimensional Framework as a Predictor of Hybrid Work Effectiveness. This Three-Dimensional Framework also serves as a theoretical predictive model for the success of Hybrid Work. The success of hybrid work models (Athanasiadou & Theriou, 2021) cannot be measured solely by their flexibility policies (Kürten, 2022). Conversely, theoretically, success depends on a harmonious balance between:

First, Functional Support (Digital Tools): The ability of employees to work efficiently through automation. Second, Accessibility Support (Digital Infrastructure): Guaranteed network reliability, security, and Cloud (Lase et al., 2025). Third, Wellbeing Support (Physical Infrastructure): The added value provided by a physical office as a hub for collaboration and wellbeing.

Failure to ensure equal quality in any one dimension (e.g., poor digital infrastructure or unattractive physical offices) would theoretically lead to a decrease in overall work effectiveness, even if flexibility policies are already in place.

RESEARCH METHOD

This study uses the Systematic Literature Review (SLR) method, an approach designed to collect, evaluate, and synthesize findings from relevant research in an objective and

structured manner. The SLR method aims to ensure that the process of searching, selecting, and analyzing literature on the transformation of the role of office facilities and infrastructure in the digital era is conducted transparently, accurately, and replicably, thereby producing a comprehensive synthesis.

The SLR procedure in this study was carried out in three main stages. First, the Planning stage focused on defining the research problem and formulating review questions regarding the drivers, dimensions, and impacts of the transformation of the role of facilities and infrastructure. Second, the Conducting stage began with a search for primary literature sources from reputable academic databases, including Scopus, Web of Science, ScienceDirect, and other accredited journals. The inclusion criteria applied were that articles must focus on the concepts of Office Administration, Infrastructure, Digitalization, Smart Workplace, Facility Management, and supporting technologies such as RPA, AI, and Cloud Computing. The publication time limit was set from 2019 to 2025 to ensure relevance to current trends.

Third, the Reporting and Synthesis stage involved analyzing data from 15 sources of literature that met the selection criteria. The analysis was conducted using a Review Protocol as an instrument for data extraction, in which each article was recorded based on Author, Year, Purpose, Method, and Key Findings. Next, the key findings were evaluated for quality and synthesized thematically. This synthesis process aims to group the findings into three major themes that form the structure of the discussion, namely the Digital Facilities dimension, the Digital Infrastructure dimension, and the Physical Infrastructure dimension. With this method, the study is able to present an in-depth and structured understanding of the role of infrastructure in the digital era.

RESEARCH RESULTS

The Role of Digital Tools: Smart Automation, the transformation in digital work tools shows a gradual evolution, from simple document digitization toward artificial intelligence-based automation. The role of facilities began with the concept of the Paperless Office, which is the shift from using physical facilities (paper) to digital facilities (electronic documents), which became the foundation for data efficiency (Barnad, 2019). This evolution continued with the adoption of Robotic Process Automation (RPA), a digital tool that automates repetitive and structured administrative tasks, thereby reducing human intervention (Madakam et al., 2019). The peak of digital infrastructure transformation is evident in the integration of Artificial Intelligence (AI) into office administration systems. AI enables information systems not only to perform tasks but also to conduct simple analysis and decision-making, transforming the role of the means into an intelligent assistant that improves administrative accuracy and speed (Arieska, 2025).

The Role of Digital Infrastructure: The Foundation of Hybrid Work. Digital infrastructure has evolved from being merely local network infrastructure to becoming the primary foundation enabling work location independence. Cloud Computing is a central digital infrastructure that supports the Hybrid Era, providing storage, processing, and application services accessible from anywhere (Witanti, 2025). The presence of the cloud directly facilitates e-working and telework, which have become the new norm post-pandemic. Therefore, the role of digital infrastructure is to be the backbone that ensures accessibility and connectivity for employees, regardless of their physical location, and a determining factor in the success of the hybrid work model (Lase et al., 2025).

Physical Infrastructure Transformation: The Smart Workplace Concept, physical infrastructure is undergoing a shift in role from a mandatory place to a flexible, user-

oriented smart environment. This change is characterized by the adoption of User-centered Facilities Management (FM) (Einola et al., 2023). Technologically, this transformation is supported by data integration, where the digitalization of FM is driven by the ability to collect real-time data through IoT (Internet of Things) and analyze it through Big Data (Atta & Talamo, 2020). Furthermore, Digital Twin technology enables facility managers to create virtual replicas of physical infrastructure to optimize energy efficiency and occupant comfort before physical implementation takes place (Clausen et al., 2021). Additionally, visual technologies such as Virtual Tours also support facility management (Moreno et al., 2024). Physical infrastructure now serves as a sophisticated and responsive collaboration hub.

The synthesis of these findings indicates that the transformation of office facilities and infrastructure roles is an integrated system operating in three interdependent dimensions. Success in one dimension is highly dependent on the readiness of other dimensions, resulting in a model of the role of infrastructure as Strategic Service Infrastructure.

Dependence of Facilities on Digital Infrastructure: The adoption of smart digital facilities such as RPA (Madakam et al., 2019) and AI (Arieska, 2025) is fundamentally dependent on Digital Infrastructure. Automation and artificial intelligence systems require access to large volumes of data and high processing power, which are most efficiently and securely provided by Cloud Computing services (Witanti, 2025). Without a reliable Cloud foundation, the ability of digital tools to operate in a distributed Hybrid Work environment will be hindered, making digital infrastructure a prerequisite for digital tool functionality.

The Role of Physical Infrastructure as a Data Source for Automation: Physical infrastructure, which has transformed into a Smart Workplace, is also closely connected to other dimensions through data. Sensor IoT (Atta & Talamo, 2020) embedded in the office generates real-time data on occupancy and environment. This data is then fed into the Digital Twin model (Clausen et al., 2021). The analysis results from the Digital Twin (e.g., space usage patterns, hot/cold spots) can be used by automation systems (digital means) for automatic adjustment of infrastructure services, or by managers to adjust hybrid work policies. Thus, physical infrastructure is not only a space, but also a data sensor that supports operational intelligence.

Implications for Hybrid Work Effectiveness: Ultimately, the successful adoption of a flexible Hybrid Work model (Athanasiadou & Theriou, 2021) heavily relies on the complete harmonization of these three dimensions. The synthesis results highlight that employee work effectiveness will only be optimal if digital infrastructure guarantees reliable connectivity and security, while physical infrastructure provides functional and comfortable collaboration spaces (Lase et al., 2025). This demand necessitates strategic alignment between spatial planning and technology implementation to maximize the benefits of flexibility, both in the office and when working remotely (Aprianti & Putri, 2024).

The Impact of Transformation on Managerial Decision-Making: The synthesis of findings regarding three-dimensional interdependence directly alters the nature of decision-making at the managerial level, particularly in Office Administration and Facility Management (FM). This change indicates that effective decisions are no longer based on intuition or fixed schedules, but must be data-driven and integrated.

Shift in Decision-Making from Cost-Control to Value-Creation: Historically, FM decisions have often focused on cost-control (Einola et al., 2023). However, the findings indicate that the new role of facilities and infrastructure is driving decision-making toward value creation. Investment in AI and RPA (Madakam et al., 2019; Arieska, 2025)

is now justified based on improved quality and process speed. Similarly, investment in Smart Workplace (Clausen et al., 2021) is justified based on increased occupant comfort, which correlates with productivity and employee retention.

Data Integration for Flexibility Decisions: Decisions regarding hybrid work policies, such as allocating workdays in the office or determining space layouts, are now supported by real-time data from Physical Infrastructure. Data from IoT (Atta & Talamo, 2020) regarding room occupancy rates and facility usage patterns, analyzed through Digital Twin, serves as a factual basis. This allows managers to adjust the desk-to-employee ratio or determine the most effective collaboration areas, a decision that would be impossible without the digital transformation of physical infrastructure.

The Need for Security-Based Strategic Decisions: The findings highlight that strategic decision-making must also include digital risk mitigation. Because digital infrastructure (cloud computing) is the foundation for all operations (Witanti, 2025), managerial decisions must include periodic assessments of data security risks and connection reliability, especially to support dispersed employees (Lase et al., 2025). Thus, this transformation requires managers to have a holistic understanding of technology, space, and data security.

Optimizing Infrastructure Life Cycles: Investment and maintenance decisions for infrastructure can now be optimized through visual technologies such as Virtual Tours (Aguacil Moreno et al., 2024). The use of Virtual Tours in Computer-Aided Facility Management (CAFM) allows managers to plan preventive maintenance, simulate space rearrangements, and inventory digital and physical assets with higher accuracy, reducing long-term operational costs and improving asset lifecycle efficiency.

Overall, the results of this study indicate that the evolution of the role of facilities and infrastructure has transformed Office Administration into a highly strategic and data-driven function, demanding integrated decision-making across the three dimensions of transformation.

DISCUSSION

Analysis of Transformation Drivers and Mechanisms, the findings regarding the three dimensions of fundamental changes in infrastructure roles are primarily driven by two key forces: the need for a new work culture and the development of technological innovation. The traditional role of infrastructure is beginning to change due to demands for more flexible and location-independent working conditions (Kürten, 2022). The evolution from the traditional office to the Digital Workplace is a systematic response to these demands (Beno, 2021). Infrastructure and facilities are now not only valued for their asset value, but also for their ability to create added value through strategic services. Innovation and digitalization are enablers that allow this new role to emerge (Kraus, Ferraris, & Bertello, 2023).

Interpretation of the Duality of Infrastructure Role: The discussion reveals a significant duality of roles. Digital tools and infrastructure (cloud/network) are now core and essential elements, enabling work activities to proceed without physical presence. Conversely, physical infrastructure (office buildings/rooms) has shifted to become a supplementary supporting element. The role of the physical office is no longer mandatory, but rather optional and attractive, specifically designed to facilitate collaboration, social connection, and maintain organizational culture. This shift demands a User-centered approach to facility management, where physical infrastructure must utilize technology (IoT, Digital Twin) to actively enhance the employee experience, rather than simply providing workspace (Einola et al., 2023).

Implications for the Effectiveness of Hybrid Work: The biggest implication of this transformation is the role of facilities and infrastructure as determinants of employee work effectiveness. The successful implementation of Hybrid Work depends not only on flexibility policies but also on the harmonization between the two dimensions of infrastructure. Robust digital infrastructure (Lase et al., 2025) must be balanced with physically smart infrastructure. This finding confirms that organizations must be able to align space and technology, where digital tools (AI, RPA) increase process efficiency, and physical infrastructure (Smart Workplace) maximizes productivity during face-to-face interactions (Aprianti & Putri, 2024). The future of work demands a seamless integration between the physical and virtual work environments.

Theoretical Contributions and Filling Research Gaps, the results of this synthesis and interpretation provide an explicit theoretical contribution to the fields of Office Administration and Facility Management (FM). Traditionally, literature tends to discuss technological developments (such as AI or Cloud) or the evolution of workspaces (Smart Workplace) separately. The research gap lies in the lack of a conceptual framework that holistically integrates the roles of means (applications), digital infrastructure, and physical infrastructure (space) as a unified strategic service.

This research fills that gap by proposing the validation of the Three-Dimensional Framework for Infrastructure Role Transformation. This contribution explicitly shifts the focus of FM and Administration studies from static asset management (buildings, furniture) to Strategic Infrastructure Service Management centered on user experience and data-driven decision-making. For example, this finding suggests that the theoretical success of User-centered FM (Einola et al., 2023) depends not only on interior design, but also on the reliability of Digital Infrastructure (Lase et al., 2025) to stream IoT data from Physical Infrastructure. Therefore, this research provides a theoretical foundation for future empirical studies on the synergy and effectiveness of investment in these three dimensions simultaneously.

Furthermore, this synthesis provides a theoretical understanding of the evolution of the Office Administration role. If in the past this role focused on the efficiency of paper processing (Barnad, 2019), now its role has shifted to managing complex digital and physical ecosystems. This shift is supported by findings on automation (RPA and AI) that are changing the nature of administrative tasks from execution to supervision and analysis (Madakam et al., 2019; Arieska, 2025).

Implementation Strategy and Managerial Implications, the discussion regarding the transformation of infrastructure roles has several urgent managerial implications for organizations in the hybrid era. Implementation strategies must be based on integration and risk mitigation.

Digital Infrastructure Security Strategy: The first implication is that organizations must view the security and reliability of Cloud Computing not merely as an IT issue, but as a strategic business continuity concern. Because the cloud is the foundation of the Hybrid Era (Witanti, 2025), managers must invest in advanced data security protocols and reliable backup systems to anticipate potential connection failures or data breaches, especially for remote employees.

Data-Driven Physical Infrastructure Decisions: Facility managers can no longer rely on intuition. They must make the most of the data generated by the Physical Infrastructure. The implementation of Digital Twins (Clausen et al., 2021) should become a standard tool for predicting space needs, optimizing layouts based on actual occupancy patterns, and ensuring comfort parameters such as air quality and temperature are met. This data can validate investments in Virtual Tours (Aguacil Moreno et al., 2024) and support more efficient real estate decisions.

Change Management and Employee Engagement: Implementing smart digital tools (RPA/AI) requires proactive Change Management. Literature indicates that technology adoption must be supported by culture (Kürten, 2022). Managers must ensure that employees are trained to collaborate with these smart tools and view automation as a liberating tool, not a threat. Failure to manage this transition can lead to resistance and technology adoption failure.

Harmonizing Space Design and Well-being: For physical infrastructure to successfully fulfill its role as a collaboration hub, space design must consciously promote social interaction and well-being. Smart Workplace design should integrate focus areas for deep work and collaboration areas supported by competent communication technology. This ensures that every face-to-face interaction that takes place in the office provides maximum value, which is an effective counterbalance to the potential isolation caused by telework (Athanasiadou & Theriou, 2021).

Research Limitations and Future Research Agenda. Although this study successfully synthesized and validated the Three-Dimensional Transformation framework, there are some inherent limitations in the primary literature reviewed, which also open up opportunities for future empirical research agendas.

Limitations of Geographical and Empirical Context: Most of the literature sources used, especially those that delve into cutting-edge technologies like Digital Twin (Clausen et al., 2021) and User-centered FM (Einola et al., 2023), are rooted in the context of developed countries (Europe and North America). These limitations indicate that the synthesized findings may be less directly relevant or require significant adaptation for application in developing country contexts, where digital infrastructure and organizational maturity levels in technology adoption may differ. Therefore:

Future Research Agenda: Comparative empirical studies are needed to test the validity and adaptability of this Three-Dimensional framework in the Southeast Asian or Indonesian context. Future research should measure the level of readiness of Indonesian organizations to adopt RPA, AI, and Smart Workplace, comparing the effectiveness results with global literature findings.

Cost-Benefit Analysis Gap, although the literature consistently emphasizes the benefits of efficiency and increased value from adopting new means and infrastructure (Kraus, Ferraris, & Bertello, 2023), detailed and specific cost-benefit analyses for each dimension of transformation are still limited. For example, there have been no studies that clearly measure the specific Return on Investment (ROI) of implementing Digital Twins compared to traditional facility management methods in the Indonesian private sector.

Future research needs to focus on quantitative models to calculate the ROI of investments in each pillar. The study should measure the financial impact of using RPA and AI on operational costs, and the impact of IoT on energy savings in physical infrastructure, thus providing stronger managerial justification.

Gaps in Ethical and Socio-Cultural Aspects, the transformations caused by Digital Means (AI) and Digital Infrastructure (Cloud) raise new ethical and social issues, such as data privacy, expanded cybersecurity, and the impact of automation on jobs. The reviewed literature discusses data security aspects (Witanti, 2025; Lase et al., 2025), but does not delve deeply into the long-term socio-cultural implications, including the shift in power dynamics between workers and technology.

Research should investigate the ethical and governance aspects of using IoT data from physical infrastructure and Cloud data from digital infrastructure. Additionally, qualitative research is needed to understand employee perceptions and adaptations to AI and RPA automation, ensuring that Change Management (Kürten, 2022) successfully prevents resistance or social discomfort.

CONCLUSIONS

This systematic literature review, which aimed to synthesize the evolution of facilities and infrastructure in the digital era, concludes that the traditional role of office facilities and infrastructure has undergone a fundamental transformation driven by innovation and digitization, as well as demands for more flexible working conditions. This transformation centers on a shift in focus from static physical locations to a dynamic, user-centered ecosystem supported by smart technology.

Specifically, the transformation of the role of infrastructure is divided into three main findings. First, the role of digital infrastructure has evolved from mere document digitization to intelligent automation, supported by cutting-edge technologies such as Artificial Intelligence (AI) and Robotic Process Automation (RPA), transforming infrastructure into administrative assistants. Second, digital infrastructure, especially Cloud Computing, has taken on the role of the main backbone that enables e-working and supports hybrid work effectiveness, eliminating dependence on physical infrastructure. Third, physical infrastructure has undergone a shift in role from obligation to collaboration hub, where its management is transformed through technology-based Facility Management. Physical infrastructure is now integrated with the Internet of Things (IoT) and Digital Twin to create a Smart Workplace that is responsive to comfort and energy efficiency.

The interdependence between these findings is a major theoretical contribution, filling a research gap by validating the Three-Dimensional Model of Office Infrastructure and Facilities Role Transformation. Operationally, Digital Assets (AI/RPA) rely on the computing power and security of Digital Infrastructure (Cloud Computing), while Physical Infrastructure (Smart Workplace) acts as a data sensor through IoT, supporting operational intelligence. The consequence of this interdependence is a shift in managerial focus from simply managing assets to Strategic Infrastructure Service Management, which is centered on user experience and data-driven decision-making. The most crucial managerial implication is the need to implement proactive change management strategies to adapt employee roles to automation and strategically invest in securing digital infrastructure. Nevertheless, future research needs to empirically test this framework in the Indonesian context and conduct a quantitative cost-benefit analysis to validate the ROI of each dimension of transformation.

Overall, the role of facilities has shifted from asset provider to a supporter of strategic flexibility and connectivity, demanding total harmonization between physical space and virtual infrastructure. This shift necessitates proactive change management and strategic investment in digital infrastructure to ensure a seamless user experience across all dimensions. The future success of Office Administration will be determined by an organization's ability to seamlessly manage this duality.

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