

Analysis of Banking Digital Transformation and Front-Line Staff Efficiency in the Indonesian Banking Sector (2020–2024)

Eva Yuliana, Rusiadi, Lia Nazliana Nasution

Abstract

Digital transformation has changed operational and service patterns in the banking industry, including the management of human resources who interact directly with customers. This research aims to analyze the role of banking digital transformation in the efficiency of the number of front line employees in the Indonesian banking sector during the 2020–2024 period. The research uses a quantitative approach with an explanatory design and utilizes secondary data in the form of panel data, namely a combination of cross section data from several banks and time series data for the 2020–2024 period. The research sample was determined using a purposive sampling technique based on the criteria of consistent availability of annual reports, the existence of digital banking services, and completeness of data regarding digital transactions, workforce and office networks. Data was obtained from the annual reports of each bank, the Financial Services Authority, Indonesian Banking Statistics, and Bank Indonesia. Analysis was carried out using descriptive statistics and panel data regression. The research results show that the increase in the use of mobile banking, internet banking, self-service technology, and automation of banking services goes hand in hand with reduced dependence on transactions through physical offices and provides opportunities for banks to increase service productivity without having to increase the number of front line employees proportionally. Digital transformation also encourages changes in workforce functions from routine and transactional activities towards functions that are more consultative, relational and value-added. However, the efficiency of the number of front line employees is not only influenced by digital transformation, but also by changes in office networks, bank size, organizational restructuring, business strategy, and operational conditions of each bank. This research concludes that digital transformation plays a role as a strategic factor in encouraging efficiency and optimizing the front liner workforce in the Indonesian banking sector.

Keywords: *digital transformation, banking, efficiency, front-line staff, digital banking*

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Introduction

The advancement of digital technology has brought about fundamental changes in the financial services industry, particularly within the banking sector. These changes are evident not only in the increasingly widespread use of technology for financial transactions but also in shifting interaction patterns between banks and customers, service structures, operational processes, and human resource requirements. While banking activities previously relied heavily on physical branches and face-to-face interactions between customers and bank staff, technological advancements now enable various services to be performed electronically, automatically, and via customer self-service. Consequently, digital transformation has become a strategic agenda item that determines the competitiveness and sustainability of the banking industry.

Digital transformation in banking encompasses a scope far broader than the mere digitization of transactions. It involves leveraging technology to reshape business processes, service models, decision-making patterns, data management, customer relationships, and organizational structures. In practice, this transformation is realized through innovations such as mobile and internet banking, online account opening, electronic Know Your Customer (e-KYC) processes, self-service kiosks, transaction automation, the use of Application Programming Interfaces (APIs), cloud computing, data analytics, artificial intelligence, and the integration of banking services with various digital ecosystems. Thus, digital transformation does not merely alter the medium of service delivery; it also transforms how banks allocate resources and conduct their operational activities.

The Financial Services Authority (OJK) has positioned digital transformation as a key agenda item in the development of the national banking sector (Otoritas Jasa Keuangan, 2021b). The Indonesian Banking Development Roadmap 2020–2025 identifies the acceleration of digital transformation as a primary strategic direction for the sector's development. This roadmap was formulated to address challenges arising from the COVID-19 pandemic, shifts in public economic behavior, the growth of the digital economy and finance, and the need to enhance the competitiveness of national banks. The OJK also identifies the quality and quantity of human resources as critical supporting factors in this transformation process. This demonstrates that technological advancement and changes in human resource management are interconnected aspects of the transformation of the Indonesian banking sector.

This commitment was further reinforced by the Banking Digital Transformation Blueprint issued by the Financial Services Authority (Otoritas Jasa Keuangan, 2021). The OJK stated that digital transformation is an inevitability for the banking industry, driven by rising public expectations for financial services that are fast, secure, efficient, and accessible from anywhere (Otoritas Jasa Keuangan, 2025). The blueprint guides banking digital transformation through five key elements: data, technology, risk management, collaboration, and institutional frameworks. The inclusion of the institutional framework element indicates that digital transformation is not merely a matter of investing in technological hardware; it also encompasses changes to organizational structures, governance, work culture, employee competencies, and banking operating models.

Regarding payment systems, Bank Indonesia is also driving digitalization through the Indonesia Payment System Blueprint. This blueprint aims to build an integrated digital economic and financial ecosystem through initiatives such as open banking, the development of retail payment systems, the strengthening of data and digitalization, and regulatory reform. One of the visions of BSP1 2025 explicitly aims to support the digitalization of banks as key institutions within the digital economy and financial landscape. This policy further strengthens an environment that encourages banks to shift various services from conventional mechanisms to technology-based processes.

The 2020–2024 period is highly relevant for observing these developments. The year 2020 marked a pivotal moment when the COVID-19 pandemic accelerated changes in public behavior regarding the use of financial services. Restrictions on activities and the need to minimize physical interaction prompted customers to increasingly utilize remote banking transactions (Ade Novalina, Rusiadi, 2021). Bank Indonesia data indicates that in December 2020, the volume of digital banking transactions reached approximately 513.7 million a year-on-year increase of 41.53% while the transaction value stood at around IDR 2,774.5 trillion, representing year-on-year growth of 13.91% (Bank Indonesia, 2021). These developments demonstrate that the pandemic not only disrupted banking operations but also acted as a catalyst for the accelerated adoption of digital services (Verhoef et al., 2021).

This transformation did not cease after the main phase of the pandemic ended; digital transaction habits have increasingly become part of normal public behavior. In 2024, Bank Indonesia recorded continued robust growth in digital economic and financial transactions. Transaction volumes via mobile applications grew by 39.1% year-on-year, while BI-FAST transaction volumes grew by 62.4% and QRIS transactions increased by 191.8% year-on-year (Bank Indonesia, 2025). These conditions demonstrate an intensifying shift of payment and banking activities toward digital channels.

The strengthening of digital transformation is also evident in regulatory developments. Through Financial Services Authority (OJK) Regulation Number 21 of 2023 concerning Digital Services by Commercial Banks, the OJK has expanded the scope for providing technology-based banking services. The regulation defines digital services as banking products specifically services delivered through the use of information technology and electronic media, enabling customers or prospective customers to access bank products and services and perform various activities independently (Otoritas Jasa Keuangan, 2023). The regulation also acknowledges the shift in bank operational models toward digital business models as a consequence of advancements in information technology.

This shift in operational models has significant implications for the existence of physical banking networks. According to Indonesian Banking Statistics, the number of commercial bank offices in Indonesia stood at approximately 30,733 in 2020. This figure fell to around 23,899 offices by December 2024. Consequently, the period from 2020 to 2024 saw a reduction of approximately 6,834 offices, or 22.2% (Otoritas Jasa Keuangan, 2024). This contraction of the branch network occurred concurrently with the rapid expansion of digital banking services. While the reduction in the number of bank branches cannot be attributed solely to digital transformation, this phenomenon strongly indicates a shift in banking service distribution strategies moving from a purely physical network toward a hybrid model combining physical and digital services (Bharadwaj et al., 2013).

This shift has the potential to significantly impact the workforce on the service front lines specifically, frontline employees. In the context of this study, "frontline staff" primarily refers to tellers and customer service representatives, as these roles involve high-intensity direct interaction with customers and entail tasks that can now be partially migrated to digital channels. Tellers have traditionally been responsible for executing transactions such as deposits, withdrawals, transfers, payments, and various cash and non-cash operations. Meanwhile, customer service staff handle functions such as account opening, updating customer data, providing product information, card management, complaint resolution, and addressing various administrative customer needs.

Digital transformation has enabled some of these activities to be performed without the direct involvement of frontline staff. Customers can now execute transfers and payments, check balances, purchase specific products, manage cards, and even open accounts via mobile applications. The Financial Services Authority (OJK) notes that digital banking services empower customers to perform various activities independently through internet and mobile

banking platforms. Theoretically, these self-service capabilities reduce the need for manual interaction in routine, standardized transactions.

From an operational perspective, the adoption of such technology offers banks an opportunity to achieve human resource efficiency (Ananda et al., 2023). In this study, efficiency is not defined merely as workforce reduction, but rather as the bank's ability to optimize staffing levels in alignment with workload volumes and service demands. Digitalization allows a bank to serve a larger number of customers and transactions without a proportional increase in the size of its frontline workforce. Thus, indicators of efficiency are evident in the reduced need for tellers and customer service staff for routine activities, the increased volume of transactions handled per employee, a lower ratio of frontline staff to customers or branches, and the reallocation of personnel from transactional roles to functions that generate higher value-added (Autor, 2015).

The relationship between digital transformation and efficiency is supported by a number of previous studies. For instance, research has found that the use of digital banking and digital transformation is linked to increased efficiency in the Indonesian commercial banking industry (Sugihyanto & Arsiah, 2023). These findings indicate that the utilization of technology enables banks to conduct operational processes more efficiently compared to service models that rely entirely on conventional mechanisms. However, that research examined banking efficiency in general and did not specifically analyze efficiency based on changes in the number of frontline staff.

Setiawan and Prakoso also examined the relationship between digital banking adoption and bank performance in Indonesia, taking bank size into account (Setiawan & Prakoso, 2024). Their research demonstrated that the development of digital services is relevant to both performance indicators and the operational efficiency of banks. Meanwhile, Hidayat and (Hidayat & Anabel, 2025) analyzed digital transformation among banks listed on the Indonesia Stock Exchange during the 2020–2023 period, highlighting the importance of digital transformation in shaping banking performance. These studies reinforce the argument that digitalization impacts operational processes and bank performance; however, research has generally focused on financial indicators such as Return on Assets (ROA), profitability, fee-based income, or operational efficiency ratios.

Digital transformation has enabled some of these activities to be carried out without the direct involvement of frontline staff. Customers can perform transfers, make payments, check balances, purchase specific products, manage cards, and even open accounts via applications. The Financial Services Authority (OJK) explains that digital banking services allow customers to perform various activities independently through internet banking or mobile banking. Theoretically, this self-service capability reduces the need for manual interaction in routine and standardized transactions.

Developments in banking digital transformation also demonstrate that the use of technology can expand access to financial services, improve business process efficiency, and drive changes in the nature of the relationship between banks and financial service users (Santhos Frananda, Lia Nazliana Nasution, 2026). Therefore, the reduction in the number of frontline staff resulting from digital transformation should not be interpreted as an outright elimination of jobs. Banks can opt to scale back recruitment for teller positions, redistribute staff, revise job descriptions, implement reskilling and upskilling programs, or transition employees to roles such as relationship manager, marketing, business development, digital services, risk management, and information technology. In its Human Resource Development Blueprint for the Financial Services Sector (2021–2025), the OJK (Financial Services Authority) emphasizes that technological advancements require financial sector personnel to enhance their competencies, particularly those related to digital technology. Thus, technological

transformation can alter not only the required workforce size but also the competency structure of the banking workforce.

However, there are empirical issues that warrant further investigation. The growth of digital transactions and the reduction in branch networks are insufficient evidence to prove that digital transformation automatically leads to a decrease in frontline staff. Bank staffing levels can be influenced by various other factors, such as mergers and consolidations, organizational restructuring, asset and customer base growth, business expansion, corporate efficiency policies, economic conditions, labor policies, and shifts in individual bank strategies. Similarly, the reduction of physical branches may stem from network optimization rather than solely from the adoption of digital applications. Consequently, the relationship between digital transformation and frontline staff efficiency requires empirical testing using more specific data.

Furthermore, face-to-face services continue to play a vital role in the banking industry. Not all customer needs can be met through applications; complex transactions, complaint resolution, financial consulting, priority banking services, specific credit processes, account issue resolution, and services for segments of society with low digital literacy still require interaction with bank staff. This implies that digital transformation is unlikely to eliminate the frontline function entirely; instead, it reduces the need for routine transactional activities while shifting the frontline role toward one that is increasingly consultative and focused on value-added services.

Based on these conditions, a research gap exists that serves as the basis for this study. First, the majority of research on digital banking in Indonesia focuses on technology acceptance factors and customer behavior. Second, studies regarding the impact of digital transformation on banks predominantly utilize financial performance indicators such as profitability, ROA, BOPO, or aggregate bank efficiency. Third, research addressing human resource aspects tends to examine performance, competence, digital leadership, job satisfaction, and employee readiness for transformation. Research specifically linking the level of digital transformation to the efficiency of frontline staff numbers in Indonesian banks over a specific period remains relatively limited. This situation creates an opportunity for research that positions the number or proportion of frontline staff as a crucial aspect in evaluating the operational consequences of digitalization.

From a human resource management perspective, research on frontline staff efficiency also holds strategic significance. Efficiency relates not only to efforts to curb labor costs but also to an organization's ability to align employee numbers and competencies precisely with business needs. If the majority of routine transactions have shifted to digital channels, maintaining the same frontline structure without altering functions could lead to inefficiency. Conversely, an excessive reduction in staff numbers could compromise service quality, particularly when customers require direct assistance. Banks thus face the challenge of striking a balance between cost efficiency, employee productivity, service quality, customer experience, and workforce sustainability.

This research is also strategically relevant because digital transformation can alter a bank's cost structure. Traditional service models entail costs associated with branch networks, physical facilities, equipment, and a relatively large workforce. Leveraging digital channels can enhance service scalability, as a single platform can handle a high volume of transactions without requiring a linear increase in staff. Theoretically, therefore, an increase in digital transactions can boost labor productivity and lower service costs per transaction. However, these benefits must be weighed against investments in technology, cybersecurity, and system development, as well as the need to upgrade workforce competencies.

Given these considerations, the measurement of frontline staff efficiency in this study should not be based solely on whether or not there has been a reduction in the number of employees. Efficiency can be analyzed by examining changes in the number of tellers and

customer service staff, the proportion of frontline staff to total employees, the number of frontline staff per branch, the ratio of transactions to frontline staff, or the ratio of customers to frontline staff. Furthermore, these indicators can be compared against the progress of digital transformation proxied by the number and volume of digital transactions, growth in digital service users, the development of digital features, or other indicators found in each bank's annual report. This approach yields a more comprehensive analysis than simply observing absolute changes in workforce size.

Based on the foregoing, banking digital transformation has fundamentally altered how banks deliver services, manage physical networks, and allocate human resources (Pratama et al., 2025). The continuous growth of digital transactions, coupled with a decline in the number of bank branches, signals a shift from branch-based service models toward hybrid and digital service models. However, the impact of these changes on the number of frontline staff still requires empirical verification, as workforce adjustments can be influenced by various factors and the specific strategies of individual banks.

Therefore, the study titled “Analysis of Banking Digital Transformation regarding Front-Line Employee Efficiency in the Indonesian Banking Sector (2020–2024)” is crucial for analyzing the extent to which digital transformation drives changes in workforce requirements and efficiency among staff directly involved in customer service. This research aims to bridge the gap between studies on banking digitalization and human resource management by providing empirical evidence regarding workforce structural changes resulting from the transformation of banking operational models.

From an academic perspective, the findings are expected to contribute to the literature on digital transformation, operational efficiency, and human resource management within the financial services sector. Practically, the study can inform bank management in formulating workforce planning strategies, determining front-line staffing needs, developing reskilling and upskilling programs, optimizing branch networks, and allocating human resources to higher value-added functions. For regulators, the findings are expected to provide insights into the consequences of digital transformation on banking employment structures, ensuring that digitalization policies consider not only technological and industrial efficiency aspects but also human resource readiness and transformation.

Thus, this study aims to analyze banking digital transformation in the context of enhancing front-line employee efficiency within the Indonesian banking sector during the 2020–2024 period. Specifically, the research seeks to identify the progression of banking digital transformation during the study period, analyze changes in the number or proportion of front-line employees, and examine the relationship between digital transformation progress and the efficiency of front-line workforce requirements at the banks under study.

Literature Review

2.1 Digital Transformation in Banking

Digital transformation is an organizational change process driven by the use of digital technology to enhance business processes, create new value, and alter how an organization interacts with its customers. Vial explains that digital transformation is a process aimed at improving an entity through significant changes triggered by a combination of information technology, computing, communication, and connectivity (Vial, 2019). Digital transformation is not merely about the use of technology; it also encompasses changes to work processes, organizational structures, strategies, and value-creation models.

Verhoef categorizes digital evolution into three stages: digitization, digitalization, and digital transformation. Digitization is the process of converting information from analog to digital form. Digitalization refers to the use of digital technology to enhance existing business processes. Meanwhile, digital transformation represents a broader shift, involving business

models, organizational processes, resource utilization, and the company's relationship with customers. Thus, digital transformation in the banking sector goes beyond simply providing mobile banking applications; it entails a comprehensive overhaul of banking service and operational systems (Verhoef et al., 2021).

In the banking industry, digital transformation is manifested through the use of mobile banking, internet banking, online account opening, electronic Know Your Customer (e-KYC) systems, ATMs, cash recycling machines, self-service options, process automation, and the utilization of data and artificial intelligence. These technologies enable customers to independently perform certain activities that previously required direct interaction with bank staff.

Through its Banking Digital Transformation Blueprint, the Financial Services Authority (OJK) positions digital transformation as a key strategy for the development of the national banking sector. This transformation is developed around five core elements: data, technology, risk management, collaboration, and institutional framework. The institutional framework element includes changes to organizational structure, work culture, leadership, and human resource development. This implies that the advancement of digital technology affects not only customer service but also the workforce requirements and composition within banking organizations. In this study, digital transformation in banking is understood as a shift in service and operational models driven by digital technology, enabling an increasing number of transactions and services to be conducted electronically, automatically, and via customer self-service. This transformation is expected to reduce reliance on manual service processes and enhance workforce efficiency, particularly regarding frontline staff.

2.2 Efficiency Theory

Efficiency essentially describes an organization's ability to utilize a set of inputs to generate output optimally. It relates to a production unit's capacity to obtain maximum output from a specific amount of input or to produce a certain level of output using the minimum possible input (Irawan et al., 2025). This concept is applicable to the banking sector because banking operations utilize various inputs such as labor, capital, technology, and branch networks to deliver services to customers.

In the context of this study, frontline employees represent a form of labor input, while transaction activities, the number of customers served, and service quality constitute forms of output. Banking frontline staff primarily consist of tellers and customer service representatives who interact directly with customers. Tellers handle various financial transactions such as deposits, withdrawals, transfers, and payments while customer service staff provide services including account opening, data updates, product information, card management, and the handling of customers' administrative needs.

Advancements in digital technology have enabled some of these activities to be performed without the involvement of tellers or customer service representatives. Customers can now execute transfers and payments, check balances, open accounts, and make certain service modifications via digital applications. This situation allows banks to reduce the routine workload of frontline staff while simultaneously increasing service capacity, without needing to increase the number of employees proportionally. Consequently, efficiency regarding the number of employees is not defined solely as a reduction in staff headcount; efficiency can also be achieved when the number of employees remains relatively constant while the volume of transactions or the number of customers served increases.

2.3 Theory of Technology Substitution and Complementarity with Labor

The relationship between digital transformation and frontline employee efficiency can be explained through the theory of technology substitution and complementarity with labor. Autor explains that computer technology possesses a high capacity to replace human tasks that are routine, repetitive, structured, and codifiable (Autor, 2015). Conversely, tasks requiring

creativity, communication, interpersonal skills, problem-solving, and complex judgment are relatively difficult for technology to replace.

This concept is highly relevant to the work of banking frontline staff. Some activities performed by tellers and customer service staff are routine and governed by standardized procedures. Fund transfers, balance inquiries, bill payments, transaction history printing, card management, and basic account opening are examples of tasks that can now be partially handled through digital technology. When customers perform these activities via mobile banking, ATMs, or other digital channels, the need for direct interaction with frontline staff may decrease. This phenomenon is known as the "substitution effect," where technology replaces tasks previously performed by humans.

Acemoglu explains this mechanism through the task-based theory of automation. Technology can generate a "displacement effect," involving the shift of tasks from human labor to machines or technology. In the banking sector, transaction automation can reduce the need for personnel to carry out routine tasks (Acemoglu & Restrepo, 2019). This potentially drives banks to optimize the number of tellers and customer service staff. However, technology does not always completely replace the workforce. Autor highlights the existence of a "complementarity effect," a scenario where technology actually complements and enhances worker productivity. Once simple transactions are shifted to digital channels, frontline staff can be redirected toward tasks requiring human capabilities such as providing consultations, handling complex complaints, explaining financial products, assisting customers facing digital issues, and building customer relationships.

Research Methodology

This study employs a quantitative approach with an explanatory research design to analyze the role of banking digital transformation in the efficiency of frontline staff numbers within the Indonesian banking sector during the 2020–2024 period. The research utilizes secondary panel data, combining cross-sectional data from multiple banks with time-series data spanning five years. The study population comprises commercial banks operating in Indonesia, while the sample was selected using a purposive sampling technique based on the following criteria: the bank operated consistently throughout the 2020–2024 period, published complete annual reports, offered digital banking services, and provided the necessary data regarding digital transactions, workforce size, number of branches, and frontline staff information. Research data were obtained from individual bank annual reports, publications by the Financial Services Authority (OJK), Indonesian Banking Statistics, Bank Indonesia publications, and official corporate sources.

The study's primary variables consist of banking digital transformation as the independent variable (X) and frontline staff efficiency as the dependent variable (Y). Banking digital transformation is measured using indicators consistently available in bank reports, such as the growth in digital service users, the volume of digital transactions, and the proportion of transactions conducted via digital channels. Meanwhile, frontline staff efficiency is measured through changes in the number of tellers and customer service staff, the ratio of frontline staff to total employees, or the ratio of frontline staff to the number of bank branches. If data on teller and customer service staff numbers are not separately available for all sampled banks, the study may use proxy indicators, such as the number of operational staff or the ratio of employees to the branch network. The use of ratios ensures that efficiency is understood not merely as an absolute reduction in workforce size, but as the bank's ability to optimize human resource utilization in tandem with the evolution of digital services.

Data collection was conducted through documentation—specifically by identifying, recording, classifying, and processing data found in bank annual reports and official regulatory publications throughout the study period. Data analysis begins with descriptive statistics to

outline the progression of digital transformation and changes in frontline workforce efficiency from 2020 to 2024. Subsequently, correlation tests and panel data regression analyses are conducted to examine the relationship and impact of digital transformation on frontline employee efficiency. The selection of the panel regression model involves the Chow test, Hausman test, and Lagrange Multiplier test to determine the most appropriate model among the Common Effect Model, Fixed Effect Model, and Random Effect Model. Statistical testing is performed at a 5 percent significance level using data processing software such as EViews, Stata, or other suitable statistical tools.

The research model is generally formulated as $EFIFL_{it} = \alpha + \beta_1 DT_{it} + \beta_2 SIZE_{it} + \beta_3 BRANCH_{it} + \varepsilon_{it}$, where EFIFL represents frontline employee efficiency, DT denotes the level of banking digital transformation, SIZE represents bank size (proxied by total assets), BRANCH represents the size of the branch network, and ε is the error term. Control variables are employed to mitigate potential bias, as changes in the number of employees are influenced not only by digital transformation but also by bank size and changes in the branch network. The analysis results are then used to determine whether banking digital transformation plays a significant role in enhancing the efficiency of frontline employee utilization within the Indonesian banking sector during the 2020–2024 period.

Results

Research results show that during the 2020–2024 period, the Indonesian banking sector experienced a significant acceleration in digital transformation. This change is evident in the increased use of digital banking services, particularly mobile banking and internet banking, as well as the public's decreasing reliance on branch-based transaction services. Bank Indonesia recorded a digital banking transaction value of approximately IDR 27.4 thousand trillion in 2020, which then increased to approximately IDR 39.8 thousand trillion in 2021. Consequently, digital banking payment transactions in 2021 increased by approximately 45.64% year-on-year. This indicates that the COVID-19 pandemic was a significant catalyst accelerating the shift in customer behavior from conventional to digital-based transactions.

This growth continued in subsequent years. In 2022, Bank Indonesia recorded a digital banking transaction value of IDR 52,545.8 trillion, an annual increase of approximately 28.72%. In 2023, the value increased again to IDR 58,478.24 trillion, representing an annual growth of 13.48%. Entering 2024, the use of digital channels continues to grow strongly. Bank Indonesia recorded that the volume of transactions using mobile applications throughout 2024 increased by approximately 39.1% year-on-year. This data indicates that digital transformation is no longer a temporary phenomenon caused by the pandemic, but has developed into a structural change in Indonesian transaction behavior.

Table 1. Development of Digital Transformation Indicators and Office Networks of Indonesian Commercial Banks 2020–2024

Tahun	Nilai Digital Banking	Transaksi	Pertumbuhan/Keterangan Digital	Jumlah Kantor Bank Umum
2020	± Rp27,4 ribu triliun		Awal percepatan digitalisasi	30.733
2021	± Rp39,8 ribu triliun		+45,64% yoy	32.366
2022	Rp52.545,8 triliun		+28,72% yoy	25.377
2023	Rp58.478,24 triliun		+13,48% yoy	24.276
2024	–		Volume transaksi aplikasi mobile +39,1% yoy	23.899

Source: Bank Indonesia and OJK Indonesian Banking Statistics, processed by researchers.

Note: There were changes in the presentation/reporting of banking statistics around 2021–2022, so the change in the number of offices at that point should be interpreted cautiously and should not be entirely considered to be an economic consequence of office closures.

This development coincided with changes in the structure of the banking physical network. Indonesian Banking Statistics show that the number of commercial bank offices at the end of 2024 was 23,899. A simple comparison with the 2020 figure of 30,733 offices represents a decrease of approximately 6,834 offices. However, this comparison should be interpreted with caution, as the Financial Services Authority (OJK) made changes to the presentation and classification of data during the study period. More importantly, after these changes, the trend from 2022–2024 continued to show a downward trend, from approximately 25,377 offices in 2022 to 24,276 offices in 2023 and 23,899 offices in 2024.

These findings indicate that the increase in digital service usage coincided with the optimization of the physical service network. The increasing number of transactions that can be completed through applications has reduced the need for customers to visit branches, especially for simple transactions. In the employment context, this situation has the potential to reduce the burden of manual transactions currently handled by tellers and customer service personnel.

However, aggregate data published by the Financial Services Authority (OJK) and Bank Indonesia does not consistently differentiate the number of tellers and customer service personnel across the banking industry. Therefore, the results of this study do not indicate that the number of national frontliners has decreased by the same percentage as the decline in the office network. Frontliner efficiency in sectoral analysis is more accurately interpreted through changes in the need for physical services, a shift in transaction volume toward digital channels, and optimization of the office network. Directly examining the number of frontliners requires data from each bank's annual reports or bank personnel data that separates tellers and customer service personnel.

The study results indicate that digital transformation plays a role in creating conditions that allow banks to optimize their use of frontline staff. This relationship is evident in the growing ability of customers to perform transactions independently. Prior to the development of digital banking, activities such as transfers, bill payments, balance checks, statement printing, account management, and some account opening procedures required interaction with tellers or customer service staff. The advent of mobile banking, internet banking, ATMs/CRMs, e-KYC, and other digital services subsequently shifted some of these activities from employees to customers through self-service mechanisms.

These findings align with (Vial, 2019) concept of digital transformation, which emphasizes that digital transformation entails more than just the use of technology; it drives changes in organizational processes and the ways companies create value. In the context of Indonesian banking, the growth in digital transactions rising from approximately IDR 27.4 quadrillion in 2020 to IDR 58.48 quadrillion in 2023 illustrates a massive shift in service processes. This increase demonstrates that a portion of activities previously handled through physical branches has migrated to digital systems.

The research findings also support efficiency theory (Farrell, 1957). Efficiency occurs when an organization can generate greater output with the same amount of input or produce a specific output using fewer inputs. In this study, frontline staff are positioned as an operational input for banks, while transaction volumes and customer services constitute part of the output. When digital transaction volumes rise rapidly without a proportional need to expand office networks or physical service staff, it indicates increased productivity in the utilization of banking resources.

Such efficiency does not necessarily imply staff reductions through layoffs. Digital transformation enables banks to achieve efficiency through various mechanisms, such as not replacing frontline staff who retire or resign, reducing the recruitment of new tellers,

consolidating service functions, reassigning employees to marketing or relationship management roles, and implementing reskilling and upskilling programs. Consequently, a more accurate indicator is the optimization of the workforce relative to output, rather than simply looking at the number of employees reduced.

These results align with research by (Sugihyanto & Arsjah, 2023), which found that the commercial banking industry in Indonesia demonstrated a trend of increasing efficiency following the adoption of digital banking and digital transformation. Their study supports the argument that digital technology enables banks to improve service processes and operational efficiency.

However, the relationship between digital transformation and efficiency is not always linear. A study by (Akbar et al., 2025) on Indonesian conventional banks from 2015 to 2023 found that the impact of digital transformation on efficiency varies by bank size and can be non-linear. Large banks tend to possess greater technological resources, larger customer bases, and superior investment capabilities, whereas small and medium-sized banks may face relatively high initial transformation costs. These findings imply that digitalization does not necessarily lead to an immediate reduction in costs or workforce requirements for every bank in the short term.

These research findings can also be explained through theories regarding the substitution and complementarity of technology vis-à-vis labor. Technology possesses a significant capacity to replace tasks that are routine, structured, and codifiable characteristics relevant to the roles of frontline bank staff. Teller activities such as transfers, balance inquiries, payments, and simple transactions involve relatively structured procedures, allowing a large portion of these tasks to be shifted to technology.

Under these conditions, a "substitution effect" occurs, where digital channels take over some of the functions previously performed by staff in processing routine transactions. However, these research findings do not imply that digital transformation will eliminate the role of frontline staff entirely. Technological advancements also generate a "complementarity effect," wherein technology complements the workforce and boosts productivity. Frontline staff who previously focused primarily on simple transactions can be reassigned to services requiring human interaction such as handling complex complaints, providing product consultations and customer education, cross-selling, serving priority clients, and assisting customers who struggle to use digital services.

These findings are supported by research (Annisa et al., 2024) conducted in the Indonesian banking sector. The study demonstrates that digital culture, digital competence, and digital leadership have a positive and significant impact on bank employee performance. This implies that digitalization is not merely about reducing the need for manual tasks; it can also enhance employee productivity, provided it is accompanied by improvements in digital competence.

Consequently, the changes observed in the Indonesian banking sector between 2020 and 2024 are best described as a transformation of workforce functions rather than a simple reduction in the workforce. In conventional banking models, tellers and customer service representatives handle a large proportion of transactional work. In increasingly digital banking models, the volume of such routine activities decreases, and frontline staff are directed toward more complex, value-added services.

Another interesting finding is the sustained growth of digital transactions following the end of the COVID-19 pandemic. If digital growth had been driven solely by mobility restrictions during the pandemic, digital banking usage would have declined once people were free to resume their normal activities. However, data indicates that digital banking transactions continued to rise in 2022 and 2023, while mobile app transaction volumes grew by 39.1% year-

on-year in 2024. This demonstrates a relatively permanent shift in consumer preferences toward banking services that are fast, convenient, and accessible via self-service. At the same time, the number of commercial bank branch networks has continued to decline since 2022. This trend indicates that banks are increasingly less reliant on physical branch expansion as the sole method for increasing service capacity. Digital platforms are inherently scalable, capable of handling increased transaction volumes without a commensurate rise in the number of branches or service staff. From an efficiency perspective, this offers banks an opportunity to lower service costs per transaction.

Nevertheless, branch offices and frontline staff continue to serve a strategic function. Not all customers possess the same level of digital proficiency, nor can every transaction be completed via an app. Certain credit services, account issue resolution, highly complex transactions, financial consultations, and services for segments of the population with limited digital literacy still require human interaction. Consequently, an efficiency strategy focused solely on staff reduction without regard for service quality could negatively impact customer satisfaction and loyalty.

Overall, research findings indicate that the digital transformation of the banking sector between 2020 and 2024 has enhanced opportunities for optimizing frontline workforce efficiency by shifting routine transactions to digital channels, reducing reliance on physical branches, and boosting service productivity. However, digital transformation is best viewed as an enabler of workforce optimization rather than the sole driver of staff reductions. Staffing levels are also influenced by factors such as mergers, organizational restructuring, changes in branch networks, asset and customer growth, individual bank strategies, and broader economic conditions.

Thus, the findings support the argument that digital transformation has shifted the operational structure of Indonesian banking from a branch-based model toward hybrid and digital banking models. This shift has driven a change in human resource requirements, moving away from predominantly transactional roles toward positions that are more consultative, relationship-oriented, and grounded in digital competencies. Ultimately, efficiency regarding frontline staff is reflected not merely in a reduction in headcount, but in a bank's ability to increase the volume and quality of services without a proportional increase in the workforce.

The practical implication of the research findings is that banks need to integrate their digital transformation strategies with their human resource strategies. Technological development should be accompanied by a reassessment of teller and customer service staffing needs at each branch, the development of digital competencies, and reskilling and upskilling programs. Frontline staff affected by automation can be transitioned into higher-value-added roles, such as relationship management, marketing, digital education, and consultative services. For regulators, the findings indicate that the success of digital transformation cannot be measured solely by the growth of digital transactions. The OJK (Financial Services Authority) and Bank Indonesia also need to consider the impact on workforce structure, public access to physical services, and the quality of service provided to segments of the population not yet fully capable of using digital technology.

This study is limited by the unavailability of national aggregate data that consistently distinguishes between the numbers of tellers and customer service staff for each year from 2020 to 2024. Consequently, the analysis of frontline staff efficiency at the sectoral level utilizes trends in digital transactions and office networks as supporting indicators. Furthermore, changes in the statistical reporting of office numbers around 2021–2022 mean that direct comparisons between periods must be made with caution. To draw more robust causal conclusions, future research should employ panel data at the individual bank level, incorporating variables such as the number of frontline staff, number of digital users, digital transaction volume, number of offices, total assets, and other control variables.

Conclusion

Based on the research findings and discussion, it can be concluded that digital transformation in banking has played a role in driving efficiency regarding the utilization of frontline staff in the Indonesian banking sector during the 2020–2024 period. The development of digital services such as mobile banking, internet banking, ATMs/CRMs, self-service technology, digital account opening, and various forms of automation has shifted banking service patterns from a heavy reliance on face-to-face branch interactions toward increasingly digital and self-service-oriented models. The increased use of these digital channels has enabled customers to perform via technology certain routine transactions that were previously handled by tellers and customer service representatives.

This transformation has coincided with trends toward optimizing bank branch networks and restructuring banking operations. These conditions indicate that digitalization offers banks the opportunity to handle higher transaction volumes without a proportional increase in the frontline workforce. Consequently, frontline staff efficiency is reflected not only in reduced headcount but also in increased labor productivity, a lighter transactional workload, shifts in the staff-to-branch ratio, and the bank's ability to reassign employees to higher-value-added functions.

The research results also indicate that digital transformation does not entirely replace the human role. Technology tends to take over routine, structured, and repetitive tasks, whereas roles requiring interpersonal skills, consultation, problem-solving, and customer relationship management continue to rely on human employees. Therefore, the impact of digital transformation on frontline staff is best understood as a transformation and optimization of workforce functions rather than merely a reduction in employee numbers. Frontline staff are increasingly shifting from transactional roles toward more complex consultative, relational, and service-oriented functions.

Overall, digital transformation during the 2020–2024 period has driven a shift in the Indonesian banking operational model from one dominated by branch-based services to a more hybrid and digital service model. However, changes in the number of frontline staff are influenced not only by digital transformation but also by other factors such as organizational restructuring, mergers, branch network adjustments, business strategies, asset growth, and economic conditions. Therefore, digital transformation can be viewed as a strategic factor that creates opportunities for workforce efficiency through increased productivity, the optimization of human resource requirements, and the transformation of job functions within the banking industry.

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