International Journal of Social Science and Business
Volume 8, Number 1, 2024, pp. 10-26
P-ISSN: 2614-6533 E-ISSN: 2549-6409
Open Access: https://doi.org/10.23887/ijssb.v8i1.73593

The Success of Digital Transformation through Cloud: Revolutionary Innovation at PT Telekomunikasi Selular Indonesia

Arliadinda Danusaputro[1*], Dodie Tricahyono[2], Moh Riza Sutjipto[3]

[1,2,3] School of Economics and Business, Telkom University, Bandung, Indonesia

ARTICLE INFO

Article history:
Received December 12, 2023
Revised December 14, 2023
Accepted February 16, 2024
Available online February 25, 2024

Kata Kunci:
Change Management, Digital Business, Digital Transformation, Human Resources, Operational Strategy

Keywords:
Change Management, Digital Business, Digital Transformation, Human Resources, Operational Strategy.

ABSTRAK

Daya saing di era digital diperkuat oleh banyak perusahaan melalui transformasi digital, seperti PT Telekomunikasi Selular Indonesia, yang mengadopsi cloud computing. Namun, mereka menghadapi peningkatan gangguan layanan dan biaya penggunaan melebihi desain awal pada tahap awal implementasi. Penelitian ini bertujuan untuk menganalisis faktor-faktor krusial penentu keberhasilan transformasi digital dalam implementasi teknologi cloud di PT Telkomsel. Dalam penelitian ini, fenomena yang diteliti dieksplorasi melalui pendekatan studi kasus, memanfaatkan Teknik Analisis Data Creswell dan uji validasi triangulasi, termasuk wawancara mendalam, observasi, dan pengumpulan data sekunder. Informan yang terlibat dalam penelitian ini adalah pakar internal dan eksternal di bidangnya dan terlibat dalam proyek cloud ini. Selain melibatkan informan dari departemen IT, informan dari departemen lain juga dilibatkan untuk memberikan pemahaman yang komprehensif tentang penelitian ini. Model Critical Success Factors (CSF) untuk proyek cloud oleh Corriea dan Martens (2022) digunakan sebagai kerangka kerja untuk mengidentifikasi faktor-faktor penentu keberhasilan proyek cloud. Hasil analisis menunjukkan bahwa people, change management, kontrak, dan komunikasi menjadi faktor yang menjadi perhatian dalam menyukseskan transformasi digital dalam implementasi teknologi cloud di PT Telkomsel. Dengan demikian, penelitian ini memberikan wawasan berharga untuk meningkatkan strategi dan pendekatan dalam implementasi cloud dan berfungsi sebagai sumber pembelajaran bagi organisasi lain yang menjalani transformasi digital menggunakan teknologi cloud.

ABSTRACT

The competitiveness in the digital era is strengthened by many companies through digital transformation, such as PT Telekomunikasi Selular Indonesia, which adopted cloud computing. However, they faced increased service disruptions and usage costs exceeding the initial design in the early stages of implementation. This study aims to analyses the crucial factors determining the success of digital transformation in the implementation of cloud technology at PT Telkomsel. In this research, the phenomenon under study is explored through a case study approach, utilizing Creswell's Data Analysis Technique and triangulation validation tests, including in-depth interviews, observations, and secondary data collection. The informants involved in this research are internal and external experts in their fields and are involved in this cloud project. In addition to involving informants from the IT department, informants from other departments are also involved to provide a comprehensive understanding of this research. The Critical Success Factors (CSF) model for cloud projects by Corriea and Martens (2022) is used as a framework to identify the determining factors for the success of a cloud project. The analysis results show that people, change management, contract, and communication are factors of concern in the success of digital transformation in the implementation of cloud technology at PT Telkomsel. Thus, this research provides valuable insights to improve strategy and approach in cloud implementation and serves as a learning resource for other organizations undergoing digital transformation using cloud technology.

*Corresponding author.
E-mail: arli.saputro@email.com (Arliadinda Danusaputro)

1. INTRODUCTION

The rapid development of technology and the digital era has led many business sectors to digitalize. Organizations can enhance their performance by optimizing business activities and processes by leveraging digital and information technology (Hendriarto, 2021; Sestino et al., 2020; Zawadzka-Pąk, 2022). One popular digitalization trend is the use of cloud computing technology. Cloud Computing refers to the on-demand availability of computer system resources, especially data storage (cloud storage) and computing power, without direct active management by the user (Bello et al., 2021; Matthew et al., 2018; Sehgal et al., 2020). According to Gartner research, by 2025, 51% of IT spending in four categories (application software, infrastructure software, business process services, and system infrastructure market) will shift from traditional solutions to public cloud, compared to 41% in 2022. Nearly two-thirds (65.9%) of expenditure on application software will be directed towards cloud technology in 2025, up from 57.7% in 2022 (Moore, 2022; Sehgal et al., 2020).

This is reflected in the journey of PT Telekomunikasi Selular Indonesia (Telkomsel), a leader in the telecommunications industry in Indonesia, which has adopted cloud technology to strengthen its position in the market (Chong & Ali, 2022; M. S. Jameaba, 2022; Nasution et al., 2020). This transformation process is about implementing new technology and involves significant changes in business operations, customer value, and company work culture (Kraus et al., 2021; Matarazzo et al., 2021). Innovation and quickly responding to market dynamics are essential in Telkomsel's digital transformation journey, though it has only sometimes been smooth (Jameaba, 2020; Sugihono et al., 2022). In the early stages of implementing cloud technology, the company faced issues such as service disruptions and unexpected costs, highlighting the importance of proper planning and execution of strategy. The key factors for successful cloud project implementation can be grouped into several categories (Ali et al., 2021; Correia & Martens, 2023). First, organizational factors play a crucial role in the success of cloud project implementation. The human factor also has a significant influence on cloud projects. The readiness and capacity of teams or employees to run cloud computing are crucial. Change and risk management are also important factors in cloud projects. Appropriate change management and the ability to identify and manage risks associated with cloud deployment are vital. The contract aspect between the customer and the cloud service provider is also a factor to consider, including terms, conditions, and obligations set in the contract. In terms of communication, effective communication management is extremely important. Another success factor is the process, as the absence of a defined process for the cloud model can be a challenge in implementing solutions. Lastly, technology degrees regarding project delivery strategies aim to accelerate implementation. Moreover, a key factor is a deep understanding of cloud technology, including its service models and architectural structure. Equally important is implementing effective change and project management to ensure a smooth transition to cloud systems.

The challenges faced by Telkomsel are reflective of common difficulties companies encounter in the early stages of digital transformation, often caused by a mismatch between technological capabilities and organizational readiness. This readiness is related to technological infrastructure, human resources, adaptive business processes, and effective change management. Several studies that examine digital transformation in the telecommunications industry prioritize enterprise architecture modeling and industrial IoT integration. This research focuses more on the application of cloud technology and specific factors that influence the success of digital transformation at PT Telkomsel (Dachyar et al., 2020; Rocha et al., 2019). Meanwhile, the previous research, which focuses on the human resources aspect of digital transformation, provides a broader coverage, encompassing technological and strategic aspects (Rafiah et al., 2022; Sugiarto & Wahyuningtyas, 2023). The similar research, exploring the role of transformational leadership in digital business model innovation, differs from this study's focus on the technical and operational aspects of digital transformation through cloud technology (Heubeck, 2023; Montasser et al., 2023). Therefore, the uniqueness of this study lies in its comprehensive examination of the key factors determining the success of digital transformation, not only in terms of technology but also in strategic and operational aspects.

Hence, this study aims to analyze the critical factors determining the success of digital transformation in implementing cloud technology at PT Telkomsel. Thus, this study contributes significantly to understanding the crucial factors influencing the success of digital transformation, particularly in the application of cloud technology at PT Telkomsel. With in-depth analysis, this study identifies essential elements that companies must consider in their digital transformation process, such as technological infrastructure, competent human resources, and practical implementation strategies. These findings benefit PT Telkomsel in optimizing the use of cloud computing and provide insights for other companies in similar phases. Consequently, this study contributes significantly to the literature on digital transformation and can serve as a reference for practitioners and academics in information technology.

2. METHODS

This study employs the Creswell Qualitative Analysis Technique and Triangulation Validation to achieve a deep understanding and validity of findings. Creswell's qualitative analysis technique encompasses three main steps: data reduction, data display, and conclusion drawing. Qualitative data is reduced into smaller units, such as themes or categories, and presented in narrative or quotation form, then interpreted to draw conclusions. Additionally, validation triangulation involves collecting data from three different sources, namely interviews, observation, and documentation, with the aim of ensuring the validity and consistency of research findings. Through this combination, the study strives to minimize bias, enhance the validity of findings, and provide a more comprehensive perspective, hoping that the results will contribute a deep, consistent, and valid understanding from various perspectives and methods used. This study focuses on an in-depth exploration of a case study on digital transformation utilizing cloud technology in a specific project context. It employs purposive sampling involving 8 participants representing various aspects of the project. Data collection is carried out through a comprehensive research methodology with descriptive analysis techniques. The variables studied can be seen in the operational variable data that has been presented in Table 1.

Table 1. Operational Variables

Variable	Operational Definition	Code	Dimention	Interview Questions	Reference
Organizational	Organizational support for cloud success.	P.1.1	Senior Management Support	What is the level of commitment and support from Management to influence the success of implementing cloud digital transformation in the organization?	(Chow & Cao, 2008)
		P.1.2	The company's organizational environment	Does the company's organizational environment (internal/external) support the success of cloud implementation?	(Chow & Cao, 2008)
		P.1.3	The organizational environment of the project team	Does the organizational environment within the project team support successful cloud implementation?	(Chow & Cao, 2008; Jalal & Koosha, 2015)
People	Team or employee readiness to run cloud computing.	P.2.1	The team's technical knowledge	What is the level of technical knowledge of the team on cloud project implementation?	(Chow & Cao, 2008)
		P.2.2	The PM's knowledge of managing conflicts of interest	To what extent does a Project Manager's ability to manage conflict influence the progress and success of a cloud project?	(Chow & Cao, 2008)
		P.2.3	The capacity of the team (soft skills)	Do the soft skills of the team influence the success of cloud implementation?	(Chow & Cao, 2008)

Variable	Operational Definition	Code	Dimention	Interview Questions	Reference
		P.2.4	Customer engagement	How does the level of customer engagement contribute to the success of cloud project implementation?	(Wang et al., 2016)
		P.2.5	Team Collaboration and Cooperation	How do collaboration and teamwork contribute to the success of cloud project implementation?	(Hussain et al., 2021)
Change & Risk Management	Change and risk management that supports successful cloud implementation	P.3.1	Change Management	How is change management applied to the implementation of cloud digital transformation?	(Wang et al., 2016)
		P.3.2	Risk Management	How is risk management implemented in the implementation of cloud digital transformation?	(Olaru, 2014; Wang et al., 2016)
Contract	Negotiated items in the contract between the customer and the cloud service provider.	P.4.1	The items negotiated in the contract	How do the terms, conditions and obligations (related to SLA, Access restrictions, costs and type of service) regulated in the cloud service usage contract affect the successful implementation of cloud digital transformation projects?	(Armbrust et al., 2010; Hofmann et al., 2010; Olaru, 2014; Wang et al., 2016)
		P.4.2	PM knowledge in contract management	What is the role of knowledge about contract management in influencing the success of a project carried out by a Project Manager?	(Chow & Cao, 2008)
Communication	Effective communication in cloud implementation projects.	P.5	Communication management (Effective and model of communica-tion)	How is communication managed in implementing cloud digital transformation projects?	(Kennedy et al., 2017; Wang et al., 2016)
Project	Aspects related to project implementation and success.	P.6.1	Schedule	How does project schedule planning and control, which involves activities defined and controlled based on date, effort, and resources, contribute to the success rate of a cloud project?	(Chow & Cao, 2008)

Variable	Operational Definition	Code	Dimention	Interview Questions	Reference
		P.6.2	Project's Nature	How does the nature of the project, whether as "Closed scope" (specified scope) or "Variable scope" (coverage that can change), affect the level of success of a cloud project, especially at Telkomsel?	(Chow & Cao, 2008)
		P.6.3	Project's Type	Does Project's type affect the success of a cloud project at Telkomsel? can you explain a little why?	(Chow & Cao, 2008)
		P.6.4	The project stages	Are the project stages implemented well and influence the success of cloud implementation?	(Suryanto & Nugroho, 2020)
Processes	Clear processes are defined, mapped and managed appropriately.	P.7	Process management	How is classification, mapping and implementation related processes implemented in cloud digital transformation projects?	(Chow & Cao, 2008; Padalkar & Gopinath, 2016)
Tech Degree	Techniques involving delivery strategies and agile techniques help ensure that cloud solutions can be delivered successfully	P.8	The delivery strategy	How do delivery strategies and agile apply to cloud digital transformation projects?	Chow and Cao (2008)

From the variables mentioned above, the case study at PT Telkomsel will be explored in depth through interviews with several sources who have practical experience in application migration and have worked for more than 10 years, thus possessing extensive knowledge of the technical and business aspects of digital transformation projects. Here are the characteristics of the sources. The following Table 2 is the characteristics of the source.

Table 2. Characteristics of the Person Interviewed

Interviewee	Experience	Company	Question
N1	Project migration billing system and CRM, Migration Lead in Project Cloud Enablement at Telkomsel	Telkomsel	All
N2	Expert in IT Infrastructure Telkomsel, Migration Lead in Project Cloud Enablement at Telkomsel.	Telkomsel	All
N3	Dojo Application Migration Lead in the Cloud Enablement Project at Telkomsel.	Telkomsel	All
N4	Software Project Management, Project Planning, Project Management Office (PMO), Technology Integration, Cross-functional Team Leadership	External Telkomsel	All

Interviewee	Experience	Company	Question
N5	Expert in Telkomsel IT Operations, Dojo Network Migration Lead in the Cloud Enablement Project at Telkomsel.	Telkomsel	All
N6	Senior Systems & Communications Development Specialist, Information Security Professional	External Telkomsel	All
N7	Business Incubation IT Development Support, Dojo Application Migration in the Cloud Enablement Project at Telkomsel.	Telkomsel	All
N8	Assistance in the procurement of the Cloud Enablement Project.	Telkomsel	Organizational, People, Contract

Source: (Correia & Martens, 2023)

In qualitative research, data analysis, involves several steps to understand and interpret meticulously collected data. One of the initial steps is data transcription, where all collected data, such as interviews, observations, or documents, is converted from audio or visual format into written text. After transcription, the data is coded by assigning labels or categories to relevant data units. This coding technique aids in organizing and categorizing data, allowing researchers to gain meaningful insights and patterns from qualitative information. This study examines a cloud empowerment project, gathering data from interviews and key documents. The project revealed through early meeting notes and weekly PMC updates, demonstrates a Hybrid Cloud approach, integrating both private and public clouds comprehensively. Focusing on managing large application traffic underscores efficient workload optimization. Collaboration with three partners reflects an intense and complex partnership in addressing technical and managerial challenges. Utilizing the Replatform migration method indicates a commitment to the efficient use of cloud technology. Despite minor delivery obstacles, the project primarily adhered to the schedule. The documents highlight efforts to maintain the schedule, underscoring the team's skill in overcoming challenges.

The following are the categorized results of the interviews from themes that emerged from each factor, namely Organization (Role and Support of Senior Management and the Importance of Policies and Organizational Culture), People (Employee Training and Development, Team Management, Communication, and the Role of Collaboration and Project Management Skills), Change and Risk Management (Change Management and Continuous Risk Evaluation), Contracts (Contract Management and PM Knowledge in Contract Management), Communication (Communication Management), Project (Planning and Project Management, Project Management Strategies and Supporters), Processes (Classification, Mapping, and Implementation of System Processes, Operational Processes), and Technology Degree (Technology Strategy and Implementation).

3. RESULTS AND DISCUSSIONS

Results

Results are the main part of scientific articles, containing: final results without data analysis process, hypothesis testing results. Results can be presented with tables or graphs, to clarify the results verbally.

Interview Transcript

The first step is to transcribe all the data that has been collected, such as interviews, observations, or documents. Interviews were conducted according to the availability of the respondents; some were done online and some offline. There were 19 questions with 8 respondents, and the total number of interview responses was 143, covering all aspects of CSF (Correia & Martens, 2023). The research on cloud implementation at Telkomsel shows that the organizational environment plays a crucial role in the project's success. As expressed by N1 in P1.1, "*The organizational environment greatly determines the success of cloud implementation at Telkomsel.*" The study also identifies the importance of management support and an adaptive organizational structure, as explained by N2 in P1.1:

> *"The internal organization at Telkomsel is very supportive of the implementation of cloud enablement at Telkomsel with commitment and support from management and top-level management for the success of the cloud enablement project at Telkomsel. Meanwhile, the*

> *internal project team structure tries to deliver the project according to the expectations and requirements that have been created. Policies must be adjusted and transformed to fit in with technology and processes for cloud governance and cloud operating models. HR is the biggest challenge in implementing cloud at Telkomsel and post-implementation, the need for cloud experts who are very knowledgeable in cloud implementation and operations."*

Challenges in technical knowledge and HR capacity are also highlighted. For example, in P2.1, N2 states, "*It's below average for technical knowledge,*" emphasizing the need for internal capability improvement. The research also underscores the importance of contract management and effective communication in the project, as revealed by N1 in P4.1, "*Requirements and contracts are important, especially in determining the relationship between Telkomsel and its partners. In the context of the cloud project at Telkomsel, contracts are made with a lengthy process involving legal and finance teams.*" P5 explains:

> *"Communication management is part of change management, and most of the activities in a project are communication (from communicating project initiation to management and stakeholders to execution in deployment). One of the things done in the Telkomsel cloud project is the weekly PMC to share the status with all involved stakeholders regularly."*

Additionally, this study emphasizes the importance of planning, scheduling, and effective risk management. N1 in P6.1 emphasizes, "Effective scheduling, scope, and resource arrangement are crucial to the project's success." Therefore, this research reveals that the success of cloud implementation at Telkomsel depends on various interrelated factors, including a supportive organizational environment, sufficient HR capacity, risk management, and efficient communication.

Observation Transcript

In understanding the observation transcript, it's important to recognize that it is a valuable tool in qualitative research. The transcription process involves converting observed events into written text for further analysis. Thus, the observation transcript is not just a record but a critical step in the qualitative research process, providing the necessary depth and context for a comprehensive understanding (Table 3).

Document Transcription

Document transcription allows researchers to access and understand written material's context and hidden meanings. In this study, not only were interviews conducted with respondents, but supporting documents were also used as relevant data sources. To determine the root cause of service disruptions, this research used data from the service monitoring department responsible for Telkomsel's service performance. Figure 1 follows the distribution of information on the root causes of service disruptions between 2022 and 2023.

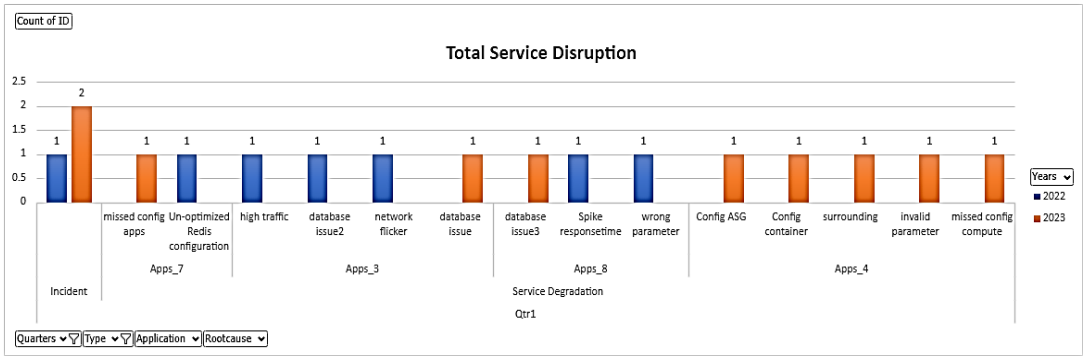

Figure 1. RootCause dari Service Disruption

From the data, it is evident that several issues occurred due to configuration errors, including those related to the ASG (Auto Scaling Group), container configuration, and missed compute configuration in the cloud, resulting in compromised service performance. Therefore, it is crucial to ensure that configurations and operational management are conducted meticulously and accurately to prevent potential problems in the project. To understand the details of high usage costs, this study utilized the MBR (Management Business Review) document report, one of which includes a service usage analysis. Analysis of service usage from the MBR report for the period November - December 2022 is presented in Figure 2.

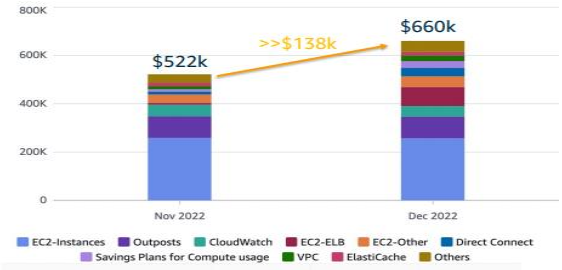

Figure 2. Cost of Each Service

One of the services optimized was the CloudWatch service. Upon investigation, it was found that costs were associated with the PutLogEvents operation, which involves sending log data to a log group in CloudWatch Logs. However, these logs are not urgent to be monitored in real-time. Store the logs in storage instead so they can be accessed whenever needed. This information can be seen in Figure 3.

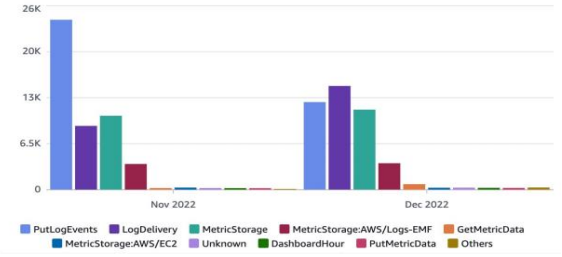

Figure 3. Cloudwatch Optimization

From the information above, we learn that when using a service, it is essential to know its functions and costs. If it is deemed unnecessary, it can be omitted or replaced with a more cost-effective and efficient method. Additionally, conducting a test or Proof of Concept (POC) beforehand is crucial to estimate the potential costs. Apart from detailed information about service disruptions and MBR report documents, this research utilizes supporting documents, including kickoff meeting documents and PMC Weekly update documents. The kickoff meeting document reflects the characteristics of the cloud enablement project being investigated, which include: (a) Adopting Hybrid Cloud: This project combines private and public clouds, demonstrating a comprehensive approach to the application of cloud technology; (b) High Application Workload: The project focuses on applications with significant traffic volume, emphasizing the importance of managing and optimizing these substantial workloads; (c) Collaboration with 3 Partners in Cloud Transformation Migration: This project involves three partners in the cloud migration and transformation process, reflecting intense and complex cooperation in facing technical and managerial challenges; (d) Replatform Migration Method: The migration method used in this project is Replatform, implying a change in the core architecture by utilizing readily available cloud platforms. This approach shows a commitment to maximizing the benefits of cloud technology effectively.

In the PMC Weekly Update document, some notes reflect the progress of this project. Despite some constraints affecting delivery and causing delays, the project remains on track. Additionally, the document notes that certain aspects could be accelerated to ensure the project remains within the set timeframe. This indicates that the project team has successfully overcome some challenges encountered during the project's execution and continues to strive to keep the project on the right track and according to the predetermined schedule.

Validation

This method involves collecting data from various sources, as shown in Table 3 the various sources in question are the results of interviews, observations, and documents related to the cloud project at PT Telkomsel. This approach allows researchers to combine viewpoints and information from multiple perspectives, enhancing the reliability and validity of the research findings.

Table 3. Triangulation Verification

Faktor	Interview	Observation	Document
1. Organizational	Telkomsel has strong support from senior and	PT Telkomsel established a special	The kick-off meeting document details the

	Faktor	Interview	Observation	Document
		top-level management, as evidenced by their commitment and the establishment of Objectives and Key Results (OKR) at the corporate level. The organizational structure that facilitates this, collaboration between teams and departments, and a corporate culture that values innovation, speed, customer orientation, and open thinking have enhanced the efficiency of cloud project execution. Telkomsel has also matured in adapting financial policies and procurement strategies, successfully transitioning to a new financial model through a leasing system in cloud implementation. However, challenges such as a lack of cloud experts, knowledge gaps between internal teams and third parties, and post-implementation coordination issues are identified as negative aspects that need further attention.	organization to run the cloud enablement program. Initially, this new division was part of the Group IT Operation and area, but after 1.5 years, it was separated into the Group IT Corporate Solutions and Cloud Center of Excellence (CoE). Support from non-IT teams such as HCM and Legal is also enthusiastic, as this is a strategic company program. The support from top-level management is evident in every weekly PMC meeting.	project team structure, illustrating diverse involvement from various departments. It also reveals the existence of specialized Divisions and Departments, such as the Cloud Center of Excellence, which plays a central role in guiding this project. These Divisions and Departments not only reflect the complexity of cross-departmental collaboration within the project team but also affirm the organization's commitment to this initiative. The presence of the Cloud Center of Excellence as a specialized entity indicates a focused and special attention to managing cloud technology to ensure the overall success of the project.
2	People	Telkomsel has implemented several positive steps in supporting cloud project execution. Investments in training and certification are ongoing, creating opportunities for continuous knowledge and skill enhancement for the team. Customer involvement, the team's soft skills, and inter-team collaboration are also key	The "People" aspect of this cloud enablement includes internal employees (Telkomsel's staff) and external employees (Telkomsel's partners) within the consortium. The internal employees related to the cloud still need to gain experience and certification. The application team also has never used cloud	The kick-off meeting document revealed that information about the consortium of vendors shows the duties and responsibilities of each party. However, an email from the cloud operational manager indicated a follow-up regarding the vendors' capabilities, showing that their ability to handle operations does

	Faktor	Interview	Observation	Document
		success factors for the project. However, there are challenges related to below-average technical knowledge, a gap between the migration and operation teams, and a need for optimal team knowledge utilization in terms of Cloud usage costs. In team management, the Project Manager's expertise in managing conflicts of interest and ensuring the project stays on the right track is crucial for success. However, there is still room for improvement in comprehensively optimizing the team's knowledge.	services for their applications. Meanwhile, the external employees from Telkomsel's partners are expected to have competent skills, especially since they are part of a contract requiring the team's capability to run this program.	not meet the set certification requirements. This information suggests that a careful evaluation of vendors is underway and that maintaining high qualification standards is crucial to ensure the project's sustainability and success. This reflects the importance of choosing vendors that meet the needs and standards set by the organization.
3	Change and Risk Management	Telkomsel has established a strong Change Management process, including using the Change Advisory Board (FCAB) forum and creating a good migration strategy. Risk management is continuously carried out with a phased approach that demonstrates wisdom in addressing potential risks throughout the project. However, there is still a conservative tendency to adopt changes involving cloud technology. Although this does not directly harm the project's success, it reflects a level of conservatism that needs to be overcome to fully optimize the benefits of cloud technology.	Telkomsel still uses the on-premise change release process, which should be changed when using new cloud technology. As for risk management, it is evident that optimization is done only after implementation. Furthermore, a long-term review, such as the worst-case scenario of re-reverting to on-premise (Cloud repatriation), has yet to be apparent.	The monthly operational report shows that the Change Release administration process still uses the old mechanism, namely through the on-premise system. This information indicates that implementing the change and release processes still needs to fully utilize the advantages and flexibility of cloud mechanisms, which could be more efficient and innovative. Further evaluation may be necessary to assess potential improvements or migration to more modern solutions to enhance the efficiency and responsiveness of the Change Release administrative process.

	Faktor	Interview	Observation	Document
4	Contract	Telkomsel has meticulously conducted the contracting process, involving legal and financial teams, to ensure that terms and obligations are recognized and officially included in the contract documents. However, there are still shortcomings in Service Level Agreement (SLA) management, particularly regarding response times to service requests and in detailing the scope of work from partners. Knowledge of the contract assists the Project Manager in managing issues that may arise during the project and in controlling the schedule, although continuous vigilance and socialization across the team are still needed to avoid misunderstandings or lack of understanding related to the contract's complexity. Support from independent parties in assessing contract points also provides an advantage in making decisions that are fact-based and objective regarding contract implementation.	The implementation of cloud technology at Telkomsel is through a project with a binding contract. However, one of the vendors in the consortium does not fully understand the details of their scope of responsibility, rights, and obligations. As a result, in operational practice, they only fulfill the minimum obligations.	The contract contains information that this cloud implementation uses a consortium (more than one vendor). Some are responsible for migration, and others for operations. However, the details need to be explained clearly, only mentioned in general terms, lacking structured and systematic detailing of the scope of work, the scope of applications to be handled, and the SLA for operational work.
5	Communication	Telkomsel has designed a strategy and communication plan for the project that involves regular communication at various levels, ensuring transparency and regularity of information to all stakeholders, including top-level management updates and	Internal team communication within Telkomsel is running smoothly, evident from the coordination between Telkomsel departments. However, consortium team communication could be more effective, as seen from the handover	From the incident report, it can be concluded that there is a delay in handling disturbances related to misconfiguration. A lack of adequate technical undenied from among the operational team of the vendor triggers this condition. Inadequate

	Faktor	Interview	Observation	Document
		daily operational meetings. However, there are indications that the level of communication declines after the project's completion, highlighting the importance of maintaining good communication post-project to ensure the maintenance and further development of the project's results. Additionally, there are difficulties in internal communication among consortium members, which can hinder efficient collaboration and coordination between teams, especially in projects involving cross-departmental and external consortiums. Therefore, it is crucial to improve internal communication within the consortium to ensure the project's overall success.	gap between the migration and operational teams. The operational team's laptops are not allowed for WhatsApp use, whereas daily activities rely on WhatsApp.	internal coordination between the vendor's operational team and the migration team, acting as a consortium, is the primary cause of the delay in handling. Consequently, the time required to address incidents is longer than expected. In-depth evaluation of communication and collaboration between teams and improvements in technical understanding among them can be key steps to address this challenge and enhance future incident response accountability.
6	Project	Telkomsel has successfully managed the project with a well-planned and effective scheduling approach and good scope management, achieving success through a clear definition and mutual agreement on scope priorities and delivery timelines. However, challenges arise in managing external factors affecting implementation, particularly delays caused by external factors. Moreover, overlap with other strategic projects creates conflicts in	The project has been running smoothly. However, there is a need for better preparation before the project, such as ensuring that this new technology aligns with the required functions and costs. Post-implementation monitoring is also necessary within the project, even if it involves internal consortium communication.	According to the PMC Document Report, this project is run by a competent external PMO team (vendor), allowing the project to proceed smoothly according to the timeline. Although there are some obstacles, they do not significantly impact the overall project. The initial BoQ (bill of quantity) document needs to detail the services used, leading to discrepancies with the actual service usage.

	Faktor	Interview	Observation	Document
		resource allocation and planning, emphasizing the importance of careful coordination between strategic projects to optimize efficiency and success in future projects.		
7	Process	Telkomsel has taken positive steps in the classification, mapping, and implementation of system processes with the assistance of partners, enabling in-depth evaluation regarding integration needs and adopting a strategic migration approach. Support from third parties for operational management of applications in the cloud is also a positive aspect, indicating efficient collaboration. However, there is still room for improvement, especially in deepening process mapping and adjusting migration strategies based on more detailed evaluations. Although supported by third parties, the organization of operational processes needs to be enhanced, particularly in monitoring, incident management, problem-solving, and application performance optimization in the cloud environment, to ensure more efficient and effective operations in the future.	The migration process from on-premise systems to the cloud has been excellent. The principal team assessed the platform method directly from the cloud service provider, which has been proven effective in other places. Thus, this process has been smooth.	According to the PMC Document Report, the migration process is tracked per activity, and there are no issues related to the system in terms of cloud implementation. This information indicates that monitoring and tracking migration progress are detailed, with each activity identifiable and evaluable. Furthermore, the absence of issues or obstacles in the system process implies smooth implementation into the cloud environment. This is a positive indicator of the quality of planning, coordination, and overall execution of the migration process.

	Faktor	Interview	Observation	Document
8	Tech Degree	Telkomsel has taken positive steps using a mixed approach between waterfall and agile methodologies, allowing flexibility and efficient project delivery. Practices such as socialization, Experience-Based Acceleration (EBA), and Game Day have also been adopted, demonstrating Telkomsel's awareness of the importance of training, action-based experience, and testing in ensuring project success. However, there is room for improvement in risk management, where a conservative tendency can still be overcome to fully support the agile approach.	The technical delivery of this project used new programs introduced by the Cloud service provider's team, such as EBA and game day, which have been very helpful in getting to know this new technology more deeply.	The PMC meeting document informs about the project delivery in the CCOE section, indicating that programs support the successful implementation of this cloud.

Discussion

To aid in understanding findings and analytical results, researchers create an infographic. The term 'infographic' (Information + Graphics) refers to a data visualization method designed to present complex information in a way that is easier and faster for the reader to comprehend (Suwondo, 2019). Here is the infographic diagram from this research that has been presented in Figure 4.

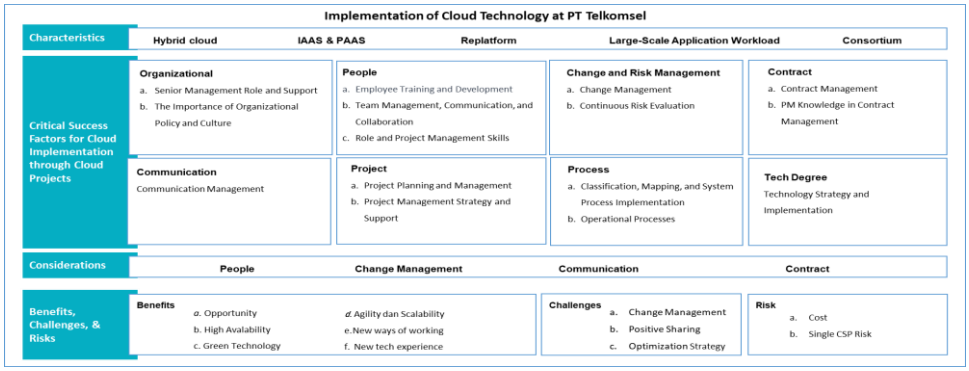

Figure 3. Infographic of Digital Transformation Research Results on Cloud Technology Implementation at PT Telkomsel

Triangulation analysis has identified several factors contributing to this issue, including Human Resources. Enhancing the technical knowledge of internal and external teams and bridging the gap between migration and operation teams is crucial for effectively addressing this issue. In terms of Contracts, formulating more specific Service Level Agreements (SLAs), particularly regarding response times, becomes critical. Clear details about the scope of work and SLAs help minimize uncertainty and ensure project alignment. Moreover, effective communication between migration and operation teams is essential to overcome information gaps and avoid misunderstandings. This is reinforced by a study explaining that creating a conceptually robust and comprehensive SLA structure strengthens the

importance of clear and detailed agreements in outsourcing settings (Bhardwaj & Goundar, 2016; Goo, 2010; Lepistö et al., 2020; Ubani & Emenike, 2023). In the context of Lewin's change management theory (unfreezing, moving, and refreezing), Telkomsel faces challenges in 'refreezing' during digital transformation (Burnes & Bargal, 2017; Cummings et al., 2016). The challenges include consolidating changes, ensuring sustainable implementation, and integrating changes into the existing system. Another area for improvement is the project cost exceeding initial estimates, influenced by stakeholders' lack of understanding of cloud technology services and the need for a detailed initial service usage proposal. Detailed estimation in the initiation and planning stages is crucial to anticipate cost increases, as explained by Suryanto & Nugroho in their book on Information Technology Project Management.

Further analysis reveals eight key success factors for cloud projects, relevant to Telkomsel's IT infrastructure. Organizational aspects and enhancing the technical knowledge of human resources are important factors. Greater emphasis on change management and risk management is also crucial. In terms of contracts, future improvements are necessary to ensure clarity of requirements and avoid ambiguity. Effective communication with partners is another essential element. For the project, careful planning and efficient management are key, while in terms of process, collaboration with partners and strong coordination between internal and external teams are necessary. Telkomsel employs a mixed methodology in their project, combining waterfall and agile techniques. Thus, these findings are supported by studies underscoring that human resource performance depends on many aspects, including knowledge, experience, technical and soft skills, motives, emotions, and behavior (Midhat Ali et al., 2021; Mulang, 2021; Nguyen et al., 2020). Therefore, the benefits of digital transformation at Telkomsel include high availability, environmentally friendly technology, agility, and scalability. The challenges faced include internal change management and application workload optimization. Identified risks include the inability to achieve cost reduction targets and dependence on a single Cloud Service Provider. This analysis helps identify steps that can be taken to enhance the success of cloud technology implementation at Telkomsel. Thus, these findings underline the importance of enhancing technical knowledge and inter-team communication in Telkomsel's digital transformation project and the need for more specific and detailed service level agreements. Consolidating changes with the effective application of Lewin's change management strategy can aid in 'refreezing' and ensure the integration of changes into the existing system. Drafting a detailed initial service usage proposal and accurate cost estimation at the early stage can anticipate and control cost increases. Furthermore, cloud project success factors emphasize the improvement of the organization, technical knowledge, change, risk management, and careful project planning and management. Telkomsel must also focus on the benefits of digital transformation, such as high availability and environmentally friendly technology, while addressing challenges and risks, including dependence on a single Cloud Service Provider and optimizing application workload.

4. CONCLUSION

This study shows that the success of digital transformation in implementing cloud technology at PT Telkomsel heavily depends on a combination of key factors. Crucial aspects include a supportive organizational environment, marked by strong commitment from senior management and an adaptive organizational structure. Adequate technical knowledge and the development of human resource capacity, both internal and external, are also critical in bridging the gap between migration and operation teams. Effective change management, including the consolidation of changes and the integration of changes into existing systems, is another important aspect. Additionally, risk management, effective communication, and clear and detailed Service Level Agreements (SLAs) play a vital role in ensuring the smooth and successful execution of the project. Lastly, technical aspects such as high availability, agility, scalability, and the use of environmentally friendly technology are key factors in supporting the success of digital transformation at Telkomsel. Therefore, the limitations of this study include a need for an in-depth understanding of cost aspects and the need for further evaluation regarding vendor performance and internal change management. Future research could focus on developing more effective methods for managing and optimizing costs and exploring strategies to enhance collaboration and communication among all parties involved, including vendors and external partners. This approach could address the challenges faced and ensure more effective and efficient implementation of cloud technology at Telkomsel.

5. REFERENCES

Ali, O., Shrestha, A., Osmanaj, V., & Muhammed, S. (2021). Cloud computing technology adoption: an evaluation of key factors in local governments. *Information Technology and People*, *34*(2), 666–703. https://doi.org/10.1108/ITP-03-2019-0119.

Armbrust, M., Fox, A., Griffith, R., Joseph, A. D., Katz, R., Konwinski, A., Lee, G., Patterson, D., Rabkin, A., & Stoica, I. (2010). A View of Cloud Computing. *Association for Computing Machinery*, *53*(4), 50–58. https://doi.org/10.1145/1721654.1721672.

Bello, S. A., Oyedele, L. O., Akinade, O. O., Bilal, M., Davila Delgado, J. M., Akanbi, L. A., Ajayi, A. O., & Owolabi, H. A. (2021). Cloud computing in construction industry: Use cases, benefits and challenges. *Automation in Construction*, *122*(1), 1–18. https://doi.org/10.1016/j.autcon.2020.103441.

Bhardwaj, A., & Goundar, S. (2016). Designing a Framework for Cloud Service Agreement for Cloud Environments. *International Journal of Cloud Applications and Computing (IJCAC)*, *6*(4), 83–96. https://doi.org/10.4018/IJCAC.2016100105.

Burnes, B., & Bargal, D. (2017). Kurt Lewin: 70 years on. *Journal of Change Management*, *17*(2), 91–100. https://doi.org/10.1080/14697017.2017.1299371.

Chong, D., & Ali, H. (2022). Literature Review: Competitive Strategy, Competitive Advantages, and Marketing Performance on E-Commerce Shopee Indonesia. *Dinasti International Journal of Digital Business Management*, *3*(2), 299–309. https://doi.org/10.31933/dijdbm.v3i2.1198.

Chow, T., & Cao, D. B. (2008). A survey study of critical success factors in agile software projects. *Journal of Systems and Software*, *81*(6), 961–971. https://doi.org/10.1016/j.jss.2007.08.020.

Correia, S. R. V., & Martens, C. D. P. (2023). Cloud computing projects: critical success factors. *RAUSP Management Journal*, *58*(1), 5–21. https://doi.org/10.1108/RAUSP-06-2021-0107.

Cummings, S., Bridgman, T., & Brown, K. G. (2016). Unfreezing change as three steps: Rethinking Kurt Lewin's legacy for change management. *Human Relations*, *69*(1), 33–60. https://doi.org/10.1177/0018726715577707.

Dachyar, M., Zagloel, T. Y. M., & Saragih, L. R. (2020). Enterprise architecture breakthrough for telecommunications transformation: A reconciliation model to solve bankruptcy. *Heliyon*, *6*(10), 1–22. https://doi.org/10.1016/j.heliyon.2020.e05273.

Goo, J. (2010). Structure of service level agreements (SLA) in IT outsourcing: The construct and its measurement. *Information Systems Frontiers*, *12*(2), 185–205. https://doi.org/10.1007/s10796-008-9067-6.

Hendriarto, P. (2021). Understanding of the role of digitalization to business model and innovation: economics and business review studies. *Linguistics and Culture Review*, *5*(S1), 160–173. https://doi.org/10.21744/lingcure.v5ns1.1347.

Heubeck, T. (2023). Managerial capabilities as facilitators of digital transformation? Dynamic managerial capabilities as antecedents to digital business model transformation and firm performance. *Digital Business*, *3*(1), 1–19. https://doi.org/10.1016/j.digbus.2023.100053.

Hofmann, G. E., Barry, J. P., Edmunds, P. J., Gates, R. D., Hutchins, D. A., Klinger, T., & Sewell, M. A. (2010). The Effect of Ocean Acidification on Calcifying Organisms in Marine Ecosystems : An Organism to Ecosystem Perspective. *Ewview in Advance*, *1*(1), 127–147. https://doi.org/10.1146/annurev.ecolsys.110308.120227.

Hussain, M., Khan, H. U., Khan, S. U., & Khan, A. W. (2021). Prioritizing the Issues extracted for Getting Right People on Right Project in Software Project Management From Vendors ' Perspective. *IEEE Access*, *9*(1), 8718–8732. https://doi.org/10.1109/ACCESS.2021.3049226.

Jalal, M. P., & Koosha, S. M. (2015). Identifying organizational variables affecting project management office characteristics and analyzing their correlations in the Iranian project-oriented organizations of the construction industry. *International Journal of Project Management*, *33*(2), 458–466. https://doi.org/10.1016/j.ijproman.2014.06.010.

Jameaba, M. (2020). Digitization, FinTech Disruption, and Financial Stability: The Case of the Indonesian Banking Sector. *SSRN Electronic Journal*, *1*(1), 1–44. https://doi.org/10.2139/ssrn.3529924.

Jameaba, M. S. (2022). Digitalization, emerging technologies, and financial stability: Challenges and opportunities for the banking industry. *Qeios*, *1*(1), 1–37. https://doi.org/10.32388/CSTTYQ.2.

Kennedy, D. M., Sommer, S. A., & Nguyen, P. A. (2017). Optimizing multi-team system behaviors: Insights from modeling team communication. *European Journal of Operational Research*, *258*(1), 264–278. https://doi.org/10.1016/j.ejor.2016.08.036.

Kraus, S., Jones, P., Kailer, N., Weinmann, A., Chaparro-Banegas, N., & Roig-Tierno, N. (2021). Digital Transformation: An Overview of the Current State of the Art of Research. *SAGE Open*, *11*(3), 1–15. https://doi.org/10.1177/21582440211047576.

Lepistö, S., Dobroszek, J., Lepistö, L., & Zarzycka, E. (2020). Controlling outsourced management accounting to build legitimacy. *Qualitative Research in Accounting & Management*, *17*(3), 435–463. https://doi.org/10.1108/QRAM-05-2019-0062.

Matarazzo, M., Penco, L., Profumo, G., & Quaglia, R. (2021). Digital transformation and customer value creation in Made in Italy SMEs: A dynamic capabilities perspective. *Journal of Business Research*, *123*(1), 642–656. https://doi.org/10.1016/j.jbusres.2020.10.033.

Matthew, U., Kazaure, J., & Okafor, N. (2018). Contemporary Development in E-Learning Education, Cloud Computing Technology & Internet of Things. *EAI Endorsed Transactions on Cloud Systems*, *7*(20), 1–20. https://doi.org/10.4108/eai.31-3-2021.169173.

Midhat Ali, M., Qureshi, S. M., Memon, M. S., Mari, S. I., & Ramzan, M. B. (2021). Competency Framework Development for Effective Human Resource Management. *SAGE Open*, *11*(2), 1–15. https://doi.org/10.1177/21582440211006124.

Montasser, D., Prijadi, R., & Balqiah, T. E. (2023). The Mediating Effect of IT-Enabled Dynamic Capabilities and Organizational Readiness on the Relationship Between Transformational Leadership and Digital Business Model Innovation: Evidence From Indonesia Incumbent Firms. *SAGE Open*, *13*(2), 1–18. https://doi.org/10.1177/21582440231181588.

Moore, S. (2022, February). Gartner Says More Than Half of Enterprise IT Spending in Key Market Segments Will Shift to the Cloud by 2025. *Gartner*, 1.

Mulang, H. (2021). The Effect of Competences, Work Motivation, Learning Environment on Human Resource Performance. *Human Resource Management*, *1*(2), 84–93. https://doi.org/10.52970/grhrm.v1i2.52.

Nasution, R. A., Arnita, D., Rusnandi, L. S. L., Qodariah, E., Rudito, P., & Sinaga, M. F. N. (2020). Digital mastery in Indonesia: the organization and individual contrast. *Journal of Management Development*, *39*(4), 359–390. https://doi.org/10.1108/JMD-03-2019-0081.

Nguyen, P. T., Yandi, A., & Mahaputra, R. (2020). Factors That Influence Employee Performance: Motivation, Leadership, Environment, Culture Organization, Work Achievement, Competence And Compensation (A Study Of Human Resource Management Literature Studies). *Dinasti Internastional of Digital Business Mangement*, *1*(4), 645–662. https://doi.org/10.31933/DIJDBM.

Olaru, M. A. (2014). Advantages and challenges of adopting cloud computing from an enterprise perspective. *Procedia Technology*, *12*(1), 529–534. https://doi.org/10.1016/j.protcy.2013.12.525

Padalkar, M., & Gopinath, S. (2016). Six decades of project management research: Thematic trends and future opportunities. *International Journal of Project Management*, *34*(7), 1305–1321. https://doi.org/10.1016/j.ijproman.2016.06.006.

Rafiah, K. K., Widianto, S., Kamal, I., Shofiana, A., Fajar, A. M., & Rudini, A. A. (2022). Digital readiness of SMEs: An Insight from Indonesia. *AFEBI Management and Business Review*, *7*(1), 12–26. https://doi.org/10.47312/ambr.v7i01.517.

Rocha, C., Narcizo, C. F., & Gianotti, E. (2019). Internet of management artifacts: Internet of Things architecture for business model renewal. *International Journal of Innovation and Technology Management*, *16*(8). https://doi.org/10.1142/S0219877019500627.

Sehgal, N. K., Bhatt, P. C. P., & Acken, J. M. (2020). *Computing with Security: Concept and Practice*. Springer Nature Switzerland AG.

Sestino, A., Prete, M. I., Piper, L., & Guido, G. (2020). Internet of Things and Big Data as enablers for business digitalization strategies. *Technovation*, *98*(1), 1–9. https://doi.org/10.1016/j.technovation.2020.102173.

Sugiarto, A., & Wahyuningtyas, R. (2023). Digital Capability Improvement Strategy of PT Telkomsel Employees (Regional Case Study of Papua and Maluku). *International Journal of Social Service and Research*, *3*(6), 1539–1550. https://doi.org/10.46799/ijssr.v3i6.394.

Sugihono, C., Juniarti, H. A., & Nugroho, N. C. (2022). Digital Transformation in The Agriculture Sector: Exploring The Shifting Role of Extension Workers. *STI Policy and Management Journal*, *7*(2), 1–19. https://doi.org/10.14203/stipm.2022.350.

Suryanto, A., & Nugroho, A. (2020). *Manajemen proyek teknologi informasi*. Deepublish.

Ubani, R. C., & Emenike, A. (2023). The Impact Of Service Level Agreement (SLA) On The Performance Of Transmission Company Of Nigeria (TCN) Abuja. *European Journal of Marketing and Management Sciences*, *6*(6), 21–43. https://aspjournals.org/Journals/index.php/ejmms/article/view/533.

Wang, C., Wood, L. C., Abdul-Rahman, H., & Lee, Y. T. (2016). When traditional information technology project managers encounter the cloud: Opportunities and dilemmas in the transition to cloud services. *International Journal of Project Management*, *34*(3), 371–388. https://doi.org/https://doi.org/10.1016/j.ijproman.2015.11.006.

Zawadzka-Pąk, U. K. (2022). Participatory Budgeting as the Instrument of Technologically Supported Dialogue in Cracow, Poland. *TalTech Journal of European Studies*, *12*(2), 3–19. https://doi.org/10.2478/bjes-2022-0009.