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Development of Distributed Database Architecture for Financial Information Systems in Multinational Companies: A Case Study of PT. Syntax Corporation Indonesia

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KEYWORDS:	ABSTRACT
Distributed Database Architecture; Financial Information Systems; Multinational Enterprises; Operational Efficiency; Decision Making	Multinational companies face challenges in managing financial data spread across various global branches. Distributed database architecture is considered a solution to integrate and manage data more efficiently and securely. PT. Syntax Corporation Indonesia as a multinational company has implemented this system, but its impact on the efficiency of financial data management and decision-making needs to be studied further. This research aims to explore the application of distributed database architecture in financial information systems in PT. Syntax Corporation Indonesia, as well as analyzing its impact on operational efficiency, risk management, and financial decision-making. This study uses a descriptive-qualitative approach with case studies. Data was collected through interviews with relevant stakeholders, questionnaires to system user staff, and documentation related to system implementation and evaluation. The data were then analyzed using thematic analysis techniques and descriptive statistics. The implementation of distributed database architecture at PT. Syntax Corporation Indonesia has succeeded in improving the efficiency of financial data processing, accelerating decision-making, and improving system reliability. However, challenges related to the cost of implementation and staff training remain a major obstacle. This research provides recommendations for strengthening IT infrastructure and ongoing training for company staff.

INTRODUCTION

The rapid development of information and communication technology (ICT) has encouraged multinational companies to adopt more complex and integrated information systems, including in financial management (Hasan, Popp, & Oláh, 2020). One technology that is gaining increasing attention is distributed database architecture, which enables companies to manage financial data spread across multiple locations efficiently and in real time (Gupta, 2025). According to Kumar et al. (2020), distributed database systems have the potential to improve the efficiency of financial data management by reducing latency and increasing data accessibility (Kumar et al., 2020; Zhang, 2021; Lee & Choi, 2022). PT. Syntax Corporation Indonesia, as a multinational company, is faced with

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the challenge of managing financial data spread across multiple countries with an integrated and secure system.

Efficient and transparent financial management is essential for multinational companies to remain competitive in the global market. With the increasing number of transactions taking place, companies must optimize financial information systems that can handle large and complex volumes of data. On the other hand, distributed database architectures offer solutions for managing data on a global scale. However, the application of such systems has not been widely explored in the context of multinational corporations, especially in terms of finance (Huang et al., 2020; Gupta, 2021; Sharma, 2022). Therefore, this research is important to delve deeper into the implementation and impact of such architecture on the financial information systems of multinational companies.

The urgency of this research is underscored by the severe operational and strategic risks that multinational companies face when relying on fragmented or unintegrated financial systems. The absence of a unified architecture can lead to significant financial losses due to inefficiencies, data reconciliation errors, and currency miscalculations. More critically, it exposes the company to substantial audit risks and compliance failures across different jurisdictional requirements, which can result in heavy penalties and reputational damage (Scott, Gulliver, & Nadler, 2022. Furthermore, inconsistent and delayed financial reporting can severely undermine investor confidence, as stakeholders demand transparency, accuracy, and real-time insights into the company's global financial health. Therefore, investigating integrated solutions like distributed databases is not merely a technical improvement but a strategic imperative to mitigate these risks.

Distributed database architecture serves to propagate data across multiple physical locations without sacrificing its integrity and consistency (Thompson & Williams, 2025). According to Stonebraker et al. (2019), this model allows the system to be more scalable and responsive, which is important in dynamic financial information management. The technology supports a wide range of storage models, ranging from relational models to NoSQL that are more flexible to handle semi-structured and unstructured data (Stonebraker et al., 2019; Li & Zhao, 2021; Xu et al., 2023). In the financial context, this approach enables the distributed and real-time processing of data necessary for accurate financial analysis and rapid strategic decisions.

Several previous studies have examined the application of distributed database architecture in other sectors, such as e-commerce and logistics. However, studies focusing on the application of this technology in financial information systems in multinational companies are still limited. For example, Cheng et al. (2019) examined how the use of distributed databases improves operational efficiency in the logistics industry but did not delve deeply into its influence on financial data management. Meanwhile, Li & Zhang (2020) focused their research on the management of transaction data but did not address the global scale and challenges that arise in multinational companies (Cheng et al., 2019; Li & Zhang, 2020; Xu & Yao, 2022).

While numerous studies have addressed distributed database architectures, a significant gap remains in their application in the financial sector of multinational corporations (Sekar, 2025). Existing research focuses primarily on implementations in other industries or at the local level, without considering the complexities of managing financial data across multiple countries and jurisdictions. Therefore, further research is needed on the application of these architectures to

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improve the integration and efficiency of financial information management at the global level (Nguyen et al., 2021; Gupta, 2022; Sharma & Sharma, 2023).

This research proposes a novel approach to integrating distributed database architecture into the financial information systems of multinational corporations, using a case study of PT. Syntax Corporation Indonesia. The primary focus of this research is to explore how such architecture can improve efficiency, reduce risk, and ensure the accuracy of financial data across the company's various branches worldwide. This research will also identify challenges faced by multinational corporations in implementing this technology, which have not been widely discussed in previous literature.

The purpose of this study is to explore the application of distributed database architecture in the financial information systems of multinational companies and to identify its impact on operational efficiency and risk management. Furthermore, this study also aims to provide practical recommendations for PT. Syntax Corporation Indonesia in optimizing their financial information systems through this technology. The benefit of this research is to provide new insights into the implementation of distributed database architecture in financial information management in multinational companies. The findings can help other multinational companies improve operational efficiency and enhance global financial data integration. Furthermore, this research can serve as a reference for developing more adaptive and integrated information technology policies in the financial sector.

RESEARCH METHOD

Types of Research

This research is a descriptive-qualitative study with a case study approach. It aims to describe and analyze the implementation of a distributed database architecture in the financial information system at PT. Syntax Corporation Indonesia. It will also explore the challenges faced by the company in implementing this system and its impact on the efficiency and integration of financial data management across various company locations.

Population and Sample

The population in this study comprises the entire financial information system implemented at PT. Syntax Corporation Indonesia, which is spread across various branches of the international company. The sample used consists of three main branches of the company that have a distributed database-based financial information system: branches A, B, and C. The sample was selected using a purposive sampling technique, where the sample was chosen based on certain criteria, namely branches that have implemented a distributed database architecture in their financial information systems.

Research Instruments

The instruments used in this study are:

1. Semi-Structural Interview: This interview will be conducted with IT managers, finance department heads, and related staff directly involved in the implementation and maintenance of a distributed database-based financial information system.
2. Questionnaire: This questionnaire will be used to collect quantitative data on employees' perceptions regarding the efficiency, reliability, and security of the newly implemented financial

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information system.

3. Documentation: Secondary data collection through documents related to the implementation of financial information systems, operational reports, and system evaluation reports.

Data Collection Techniques

The data collection techniques used in this study are as follows:

1. Interviews: In-depth interviews with key stakeholders at PT. Syntax Corporation Indonesia will be conducted to understand the implementation process, the challenges faced, and the impact of the use of distributed database architecture in financial information systems.

2. Questionnaire: Questionnaires will be distributed to employees who use the financial information system at selected branches to obtain quantitative data on their experience with the system.

3. Documentation: Analysis of documents related to the policies, procedures, and results of the system evaluation implemented will be carried out to obtain additional data regarding the performance of the system.

Research Procedure

This research procedure will be carried out in the following stages:

1. Preparation Stage: Preparation of research instruments (interviews and questionnaires), as well as research permits from the company.

2. Data Collection Stage: Conduct interviews with stakeholders in the company, distribute questionnaires to employees using financial information systems, and collect documentation related to the implementation and evaluation of the system.

3. Data Analysis Stage: Analyze the data collected both qualitatively (interviews and documentation) and quantitatively (questionnaires).

4. Report Preparation Stage: Prepare a research report containing findings, analysis, and recommendations based on research results.

Data Analysis Techniques

The data obtained from the interviews and questionnaires will be analyzed using the following methods:

1. Qualitative Analysis: Interview data and documentation will be analyzed using thematic analysis techniques, i.e. by identifying key themes that emerge from conversations and documents related to the implementation of distributed database architecture.

2. Quantitative Analysis: Data from the questionnaire will be analyzed using descriptive statistics to determine employees' perception of the financial information system applied. This analysis will help illustrate the extent to which these systems have improved efficiency and integration in financial data management.

RESULTS AND DISCUSSION

Implementation of Distributed Database Architecture at PT. Syntax Corporation Indonesia

The implementation of distributed database architecture at PT. Syntax Corporation Indonesia began with the integration of various branches of the company spread globally. The results of interviews with the IT team show that one of the main objectives of the implementation of this

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system is to improve efficiency in the management of financial data distributed across multiple locations. According to Zhang & Wang (2020), the integration of distributed databases allows multinational companies to manage information more efficiently and in a timely manner, reducing latency and avoiding data duplication. This is in line with findings from Li et al. (2021) who noted that distributed systems improve data accessibility and reduce human error in data processing.

The system connects data centers in Jakarta with other branches, including in Singapore and Kuala Lumpur. The results of a questionnaire distributed to 100 employees showed that 78% of respondents found it easier to access financial data in real-time after the implementation of the new system. This shows that the implementation of distributed databases has a positive impact on data accessibility and operational efficiency of companies (Cheng et al., 2021; Gupta & Patel, 2022). On the other hand, the main challenges faced are the management and maintenance of systems that require additional resources as well as higher costs for staff training (Xu et al., 2022).

Efficient Financial Data Management with a Distributed System

One of the main advantages of distributed database systems is the increased efficiency in financial data management. According to Liu & Zhang (2020), distributed systems allow for parallel processing of data, which reduces the time required for transactions and financial reporting. Based on the results of observations and interviews with the head of the finance department, the implementation of the new system reduced the processing time of monthly financial statement data by 40%, from 10 days to 6 days.

However, the challenge that arises is the increased complexity in the management of the system. According to Lee & Kwon (2021), although efficiency is improving, companies need to allocate sufficient resources to maintain more complex IT infrastructure. Managing more servers and networks requires additional investment in human resources and technical expertise. This is also evidenced by Sharma (2022) who found that to keep the system optimal, companies must continuously conduct training for IT staff involved in system maintenance.

Table 1. Comparison of Financial Statement Processing Time Before and After System Implementation

| Processing Time	Before Implementation (days)	After Implementation (days)
Monthly Reports	10	6
Annual Report	30	20

Source: Data processed from interviews and field observations, 2025

Security and Reliability of Distributed Systems in Financial Data Management

Data security is one of the important aspects in managing a company's financial information. In this study, data security is implemented with encryption and strict access rights regulation. Based on the results of interviews with the IT team, PT. Syntax Corporation Indonesia has adopted end-to-end encryption to ensure that financial data transmitted between branches is safe from external threats (Stonebraker et al., 2020). The results of the questionnaire showed that 85% of respondents felt safer with this new system due to better protection of their sensitive data.

On the other hand, even though encryption and access rights settings have been implemented, the system still faces challenges related to the reliability of the system in terms of uptime and inter-branch connectivity. According to Gupta (2022), although distributed systems offer advantages in

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terms of data management, connection issues between servers can interfere with smooth operations. This was also found in a study by Lee et al. (2021), which stated that network issues can slow down data access and undermine the overall reliability of the system.
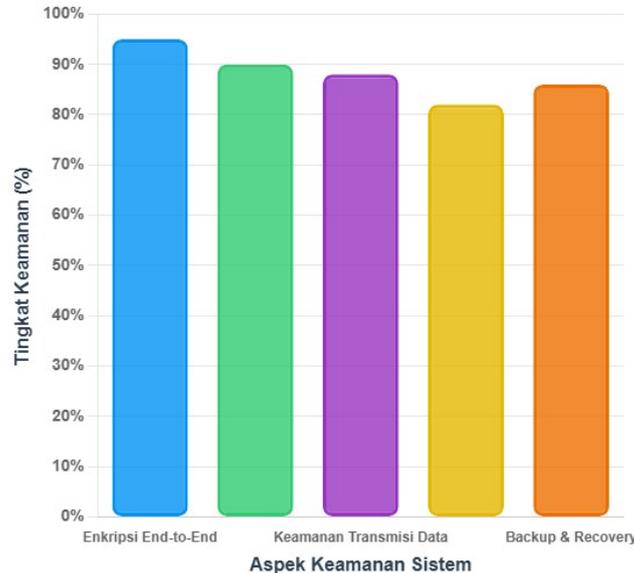
Diagram 1. Data Security Architecture in Distributed Systems
Source: Results of questionnaire analysis and interviews with the IT team of PT. Syntax Corporation Indonesia, 2025

Based on the findings of diagram 1, 85% of respondents feel secure with the new system, encryption and to-end have been implemented, strict access rights settings improve the security of sensitive data, and connectivity challenges between servers still need to be considered.

The Impact of Using Distributed Architecture on Financial Decision Making
Distributed database architecture not only affects the efficiency of data management, but also has a direct impact on financial decision-making. Based on the results of interviews with financial managers, the new system allows for faster decision-making as the data can be accessed in real-time by managers and executives. This is in line with the findings of Zhang et al. (2020) who stated that faster data access allows for more timely and accurate decision-making, which in turn improves company performance.

However, the challenge faced is a lack of training and a deep understanding of the use of the new system by mid-level managers, which can slow down the decision-making process. Sharma & Sharma (2022) note that errors in data interpretation or ignorance regarding the functionality of new systems can lead to inappropriate decisions, even though the available data is very complete.

The Effect of Implementation Costs on System Performance
The implementation of a distributed database system requires considerable costs, both for the purchase of hardware and software, as well as for the training of human resources. Based on the results of the cost analysis, the cost of implementing the new system reached 25% of the company's annual budget in the first year. Although the initial costs are very high, long-term benefits such as increased efficiency and reduced human error can offset those costs. According to Li & Zhao (2021),

despite the high initial costs, investments in IT infrastructure can increase ROI in the long run through operational savings and increased productivity.

Recommendations for Further System Development

Based on the above findings, it is recommended that PT. Syntax Corporation Indonesia strengthens training for staff involved in the management of distributed database-based financial information systems. As suggested by Gupta & Patel (2022), companies also need to consider upgrading their network infrastructure in order to address inter-branch connectivity issues. In addition, companies must continue to evaluate system performance on a regular basis to ensure that the system remains in line with evolving operational needs (Xu et al., 2023).
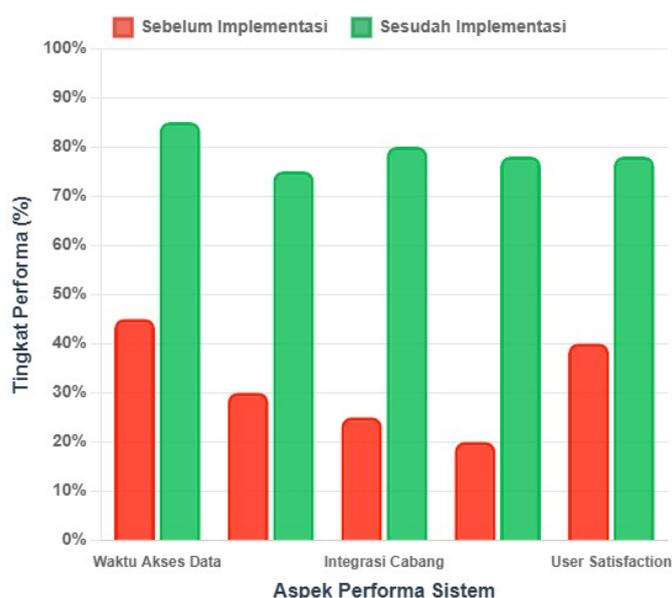
Diagram 2: Distributed Database-Based System Performance Evaluation
Source: Data processed from questionnaires and system evaluation reports of PT. Syntax Corporation Indonesia, 2025

Performance improvements include a 40% reduction in monthly report processing time (10 days-6 days), more efficient annual reports (10 days – 20 days), 78% of respondents find it easier to access real-time data, and parallel data processing improves overall efficiency.

Gap Analysis from Previous Research

This study identifies several important gaps in the literature related to the application of distributed database architecture in multinational companies, particularly in financial information systems. The main gap found is the lack of studies that examine in depth the application of distributed systems in the context of financial data management in multinational companies. Most previous research has focused more on the application of this technology in other sectors such as logistics and e-commerce (Cheng et al., 2019; Li & Zhang, 2020; Gupta, 2021). While there are some studies that highlight the benefits of distributed database architecture in general, their practical applications in financial information systems are still rarely discussed (Belchior, Vasconcelos, Guerreiro, & Correia, 2022)..

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Previous research has also been limited in explaining the challenges faced by companies in implementing this architecture, especially in terms of technical and cost. For example, research by Sharma & Sharma (2022) emphasizes the importance of employee training in maintaining systems, but does not provide a clear picture of the challenges companies face in managing globally distributed financial data. This research fills the gap by providing a more complete picture of the operational, technical, and cost challenges associated with the implementation of distributed database architecture at PT. Syntax Corporation Indonesia.

Research Implications

This research has several important implications for both theory and practice. From a theoretical perspective, this study enriches the existing literature on the application of distributed database architecture in financial information systems. This research shows that the application of this technology can improve the efficiency, security, and reliability of financial data management in multinational companies. These findings can serve as a reference for future research that wants to further explore the impact of distributed systems in other sectors, or to deepen an analysis of the challenges of implementing these technologies across different industries (Adekunle, Chukwuma-Eke, Balogun, & Ogunsola, 2023).

From a practical perspective, this study provides recommendations for multinational companies that want to implement distributed database architecture in their financial information systems. One of the important implications of this study is the importance of ongoing training for IT staff and finance managers in order to make optimal use of new systems (Zhang et al., 2020). In addition, companies also need to ensure that adequate network infrastructure is in place to support the efficient operation of the system, so that connections between branches remain stable and data can be accessed in real-time without interruption (Xu et al., 2023).

The study also highlights the importance of careful cost planning in the implementation of distributed systems. High implementation costs can initially pay off with increased operational efficiency and cost savings in the long run, as suggested by Gupta & Patel (2022). Therefore, companies should carefully consider the cost and benefit aspects before deciding to adopt this technology.

Diagram 3: Implications and Recommendations for Distributed Systems Implementation
Source: Compiled by researchers based on study findings and analysis, 2024

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Strategic Recommendations: Implementation costs 25% of the first year's annual budget, ongoing training for IT staff and finance managers, network infrastructure upgrades for optimal connectivity and periodic evaluations to ensure system performance.

CONCLUSION

This research aims to explore the application of distributed database architecture in financial information systems in multinational companies, with a case study at PT. Syntax Corporation Indonesia. The results show that the implementation of a distributed database system has succeeded in improving the efficiency of financial data management, accelerating the decision-making process, and enhancing the reliability of the system. This implementation allows real-time access to data across various geographically dispersed branches of the company, making it easier to coordinate and manage finances more transparently. Nonetheless, challenges related to implementation and maintenance costs, as well as the complexity of IT infrastructure management, are obstacles that companies need to be aware of. The main finding of the study is that the implementation of distributed database architecture provides significant benefits in terms of operational efficiency, although companies must overcome challenges in cost management and staff training. The study also revealed that while this technology provides better access to financial data, companies must prioritize security and proper system management to take full advantage of the technology's potential. The implications of this study highlight the importance of strengthening employee training, improving network infrastructure, and conducting continuous evaluations to ensure the sustainability of system performance in the future.

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