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**Research Article**

# The Effectiveness of Implementing the Digitization Program for Integrated Procurement of Goods and Services to Achieve Procurement Goals and Targets at PT PLN (Persero)

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**ABSTRACT**

As one of the largest companies in Indonesia, PT PLN (Persero) has succeeded in entering the list of the top 10 largest companies in Southeast Asia according to the Fortune Southeast Asia 500 version in 2024, because it has successfully carried out business transformation and classy performance. PT PLN (Persero) has mapped all future business potential and carried out digital transformation through the development of revolutionary new technology. PT. PLN (Persero) has transformed IT system transformation, implementing smart technology and integrating the Internet of Things, Artificial Intelligence, Machine Learning and Big Data for operational efficiency and service improvement. -One of the Innovation initiatives of PT. PLN (Persero) in digitizing the procurement of goods and services is Smart Supply Chain and procurement such as e-procurement applications, e-catalog, e-DPT, e-marketplace, and vendor management system. The information systems and applications developed in the digitization of procurement have implemented regulations that have been updated based on Director's Regulation No. 0018.P/DIR/2023 dated 07 July 2023 concerning Strategic Policy for Procurement of Goods/Services for PT PLN (Persero). This article will analyze the effectiveness of the Implementation of Digitization of Procurement of Goods and Services at PT PLN (Persero) based on the latest board of directors' regulations to achieve targets for procurement of goods and services, namely appropriate quality, quantity, location, time, socioeconomic objectives and costs using the service availability variable, fulfillment, efficiency, and security. The method used in this research is a quantitative method with a purposive sampling survey approach with the criteria that the respondent is a user of the digital procurement system at PT PLN (Persero). Based on the results of questionnaire test analysis, observations, and other supporting data, it can be concluded that the Implementing the Digitization Program for Integrated Procurement of Goods and Services to Achieve Procurement Goals and Targets at PT PLN (Persero) based on Directors' Regulation No.0018.P/DIR/2023 of this research are very effective because they fulfill all the criteria and variables tested.

**Keywords:** Digital Procurement, , artificial intelligence, effectiveness, integrated procurement, machine learning

## 1. INTRODUCTION

The rapid development of technology in the current disruptive era has an impact on changes in the behavior of both individuals and organizations throughout the world as well as increasing global competition between organizations. On the other hand, technological changes have also given rise to innovation and new business concepts throughout the company. One of the vital supply chain functions in today's digital era in a company is the field of procurement good and services to achieve key performance indicators targets.

Several things can influence the digitization transformation program for an organization, such as infrastructure, access, capacity, and human resources (Katz, 2015). The Digitization transformation program has a vital role in aligning existing procurement strategies and designing new procurement strategies to achieve goods and services procurement goals as well as overall organizational goals such as increasing revenue, customer growth, increasing network reliability, and competing with existing competitors.

On the other hand, Banerjee & Mishra argue that digital technology increases supply chain synergy that requires the support of internal and external stakeholders such as providers, manufacturers, distributors, retailers, vendors and customers [1]. Implementing a digital supply chain is not as simple as imagined but is complex and requires collaboration between fields. In recent years, "digital transformation" has become an important part of future business recognized by all industry circles, and almost all companies are carrying out digital transformation in the field of supply chain in a powerful way. Although the Information System of digital technology in the supply chain can theoretically be effective in increasing flexibility and adaptability, there are still many obstacles in the process of implementing digital supply chain transformation at every stage. Based on data, 80% of practices related to digital transformation fail [2]. When companies drive the digital transformation process, digitalization itself is not the goal, but rather the economic benefits and return on investment generated by digitalization. Therefore, the digital transformation objectives of a particular company can be divided into the following aspects : □

- Open source: reach more customers better and increase company revenue;
- Savings: save operational costs, procurement costs, etc.;
- Improve efficiency: Increase the efficiency of internal and external collaboration within the company, improve system security, etc .

in the current digital era, PT PLN (Persero) has long initiated its transformation program before 2020 to increase customer satisfaction, business benefits, and organizational capabilities by making a successful breakthrough into the digital world through the implementation of a digital application system in the field of procurement of goods and services. services that have utilized technology by developing artificial intelligence-based information systems. So the goods and services procurement function at PLN through the digital procurement transformation program has generated savings of more than 1 trillion in the last 2 years. Another achievement that is the result of this program is that PLN received an award for best supply chain and procurement employer in Indonesia.

This research discusses and analyzes the impact of smart digital technology that integrates the Internet of Things, Artificial Intelligence, Machine Learning and Big Data to improve services and supply chain efficiency which has significant potential and is the most influential in the digitalization program at PT. PLN (Persero). As well as being able to explore the factors that improve the success of implementing supply chain digitalization and also the obstacles that can hinder the implementation of supply chain digitalization programs at PT. PLN (Persero).

The digital procurement transformation program at PLN is integrated with existing applications at PLN and supports the development of digitalization of PLN procurement in the future.

The procurement digitalization program at PLN was launched to meet PLN's procurement needs based on Board of directors regulation no. 0018.P/DIR/2023 dated 07 July 2023 concerning Strategic Policy for Procurement of Goods/Services for PT PLN (Persero) by replacing the previous regulation, namely Director's Regulation No. 0022.P/DIR/2020 dated 02 March 2020 concerning Guidelines for Procurement of Goods and Services for PT PLN (Persero). The procurement requirements in question are as follows :

1. Provide value benefits quickly

   Prioritize and implement programs with the greatest impact/value contribution.

2. Include a comprehensive procurement transformation program

   It includes strategic procurement, operational procurement, and inventory management

3. Implement a digital application system

   Build customized applications to unlock the greatest potential value benefits

4. Utilizing existing IT systems

Utilize the currently installed platform

5. Enables long-term sustainability

To answer these procurement needs, the digital transformation program carried out at PLN is expected to produce the following goals :

1) Development of 5 digital-based application systems created within no more than 6 months that can provide output for the following problems and questions:

a. Who does PLN buy from?

b. How much does PLN need to buy?

c. What will PLN buy?

d. At what price should PLN buy?

e. How to negotiate the Best Price?

2) Provide real benefits within 6 months after deployment of the digital procurement application

3) Active implementation and utilization of the digital procurement application system by procurement planning and implementing officials at PLN with knowledge transfer

4) Benchmark to learn leading practices of digital transformation

One of the breakthroughs in the transformation program launched by the Managing Director of PLN is Digital Procurement, the embryo of the Procurement Digitalization program is currently being developed within the Mega Project Directorate. This digitalization program in the procurement of goods/services is not something new for the Mega Projects Directorate, because this program has been in process and is now an aspiration to support PLN's transformation strategy.

There is a stable application that is currently widely used in the PT. PLN (Persero) such as e-procurement applications, e-catalog, e-DPT, e-marketplace and vendor management system, SAP, AGO, e-SCM, and Owner Estimates applications, and in the future these existing applications will be planned to be integrated with applications that will be developed in the digital procurement transformation.

## 2.METHODOLOGY

This research was conducted within the PT. PLN (Persero) from February 2024 to March 2024. The method used in this research uses a quantitative method with a survey questions. Sampling was carried out using a purposive sampling technique (Sugiono, 2019: 133) which included several employees at the PLN Central Office [3]. The informant sample was taken using the Slovin formula: $n = N / (1 + (N \times e^2))$. The criteria for sample informants taken in this research were registered e-procurement application users taken from 424 respondents from PLN Central Office. The survey was carried out using a Google form which was sent directly to each specified informant.

The Slovin formula allows a researcher to sample a population with the desired level of accuracy [4]. Primary data was obtained through the results of answers to questions that have been loaded into a Google form based on the variables of the real benefits of the digitalization program on achieving performance in the field of procurement and supply chain, obstacles to implementing procurement digitalization, readiness of technological support for the procurement digitalization program. This research will analyze and describe the data obtained and draw conclusions.

## 3. RESULT AND DISCUSSION

### 3.1 The process of Realization Digital Procurement

PT. PLN (Persero) as the largest company in Indonesia and is accompanied by high complexity dynamics in the procurement area which triggers technological transformation initiatives to answer all the challenges faced. If you look at the data in PLN's annual report up to 2022, PLN has a total of 6,928 generating units, an installed capacity of 69,040 MW, electricity production of 308,002 GWH, a capacity of 61,725 MW, a distribution network length of 1,033,662 kms. Achieving the electricity sales target of 273 Twh with an additional number of customers reaching 3,092,218 MW. On the other hand, PLN's customer service received recognition and appreciation with the

achievement of a customer satisfaction index of 97.41% and an electrification ratio of 99.63%, which means that PLN has electrified almost the entire Indonesian people. As a company that runs the electricity business, PLN has also been able to earn a net profit of 14.4 trillion rupiah. In facing future developments in information technology and digitalization and increasing competitiveness, PLN is adapting technological trends such as big data analytic, integration systems, cloud computing, mobility, social media, internet of things, and artificial intelligence which supports various corporate application platforms. On April 21, 2020, the President Director of PT. PLN (Persero) has launched the PLN Transformation program with the tagline Power Beyond Generations which has 4 objective strategies, namely Lean, Green, Innovative, and Customer Focused. One of the breakthroughs that refers to the PLN Transformation program is LEAN with the Procurement digitalization program as a strong foundation for procurement excellence. In some parts, the development of Digital Procurement requires additional digital tools that will help the process of procuring goods/services, especially to reduce time if procurement works still use manual processes. However, the focus of Breakthrough Digital Procurement does not stop with the availability of digital tools for procurement, but will also touch on the business processes currently being carried out. So the process of developing digital procurement at PLN has gone through various transformation phases and stages as depicted in the following picture:

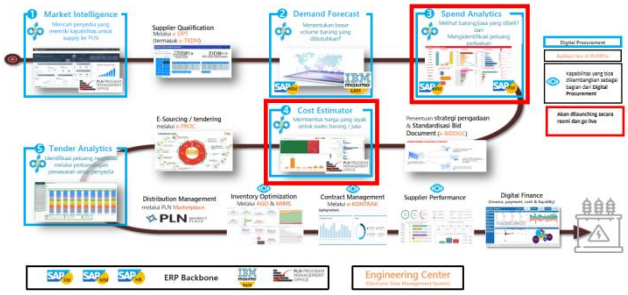


**Figure 1.** of stages of Digital Procurement Development at PT PLN (Persero)

From Figure 1 above explains the stages of digital procurement development at PLN which has gone through a transformation phase that has changed many of PLN's business processes in the procurement of goods and services which are supported by the existing application platform. For this reason, several combinations of breakthrough initiatives have been prepared by PT. PLN (Persero) to make this Digital Procurement program a success, namely as follows :

1. Business Process Improvement assisted by the application of digital tools with descriptive analytic, which consists of 2 sub-initiatives, namely :

a. Cost Estimator

The Cost Estimator module was developed taking into account the results to overcome PLN's challenges such as limited cost structure data available, static cost structures, and manual updates to cost estimates.

To overcome these problems, it is hoped that this module can help automate updates and produce cost models and cost structures, automatically update external market factors, automatically update and recommend owner estimates against benchmark prices, and determine owner estimates and produce reports that can be downloaded.

The following displays the cost estimator module :

**Figure 2.** Module Cost Estimator

b. Tender Analytic

The Tender Analytic module was developed taking into account the results to overcome PLN's challenges such as the process of checking the completeness and suitability of offers which is very manual and time-consuming,

limited visibility of possible opportunities, and unstructured negotiations due to limited visibility of the things being negotiated.

This module is expected to be able to overcome the above problems by producing bid templates with a predetermined structure, automating outliers and incomplete data, automating potential negotiation opportunities, and automating the results of bid analysis into fact-based negotiation packages.

The following is the appearance of the Tender Analytics module:

**Figure 3.** Module Tender Analytic

2. Digital Procurement Tools which are more continuous development, both to facilitate new users and develop new features have 2 sub-initiatives, namely:

a. PLN Marketplace

The PLN Marketplace application is currently a bridge between users and vendors in ordering materials that have been contracted in the form of KHS by DIVSCM. It is hoped that improvements will be made to the process of ordering MDU materials, which was previously manual, becoming digitized. Then change the limited MDU Contract visibility to a single source of centralized KHS MDU contract management. Other features of this application are vendor performance assessment, dashboard monitoring, and transaction tower control, as well as support for small and medium industries.

The following is a display of the SCM Marketplace application :

**Figure 4.** SCM Marketplace Application

b. E-Procurement

The e-procurement application is an electronic medium for carrying out the process of procuring goods, construction work, consultancy services, and other services starting from the procurement planning stages, procurement initiation, and procurement implementation to contracted work.

The following is a display of the e-procurement application:


**Figure 5**. E-procurement Application

3. Logistic Optimization

Logistics is one area for improvement which includes warehouse items and transportation. It is hoped that with this logistics optimization, the material will be distributed effectively and on time so that the units that need it get the material according to the time needed. There are 3 sub-initiatives for logistics optimization, namely :

a. Dashboard e-SCM

This e-Scm application is for electronic allocation of Main Distribution Materials which in the future will be improved in terms of automation and integration. The SCM Dashboard is a digital platform developed to monitor material stock in unit warehouses and inventory values which are made into infographics making it easier for users to analyze and compare material stock or inventory between units in one layer.

The following is the display of the e-SCM dashboard application:


**Figure 6.** Dashboard e-SCM

b. Centralized MDU Inventory Optimization, to carry out inventory optimization to maintain the security of supply for MDU material needs whose procurement is carried out centrally by DIVSCM.

c. Centralized MDU Transportation Optimization of Distribution Transformer Materials, to optimize the MDU transportation sector, starting with transportation optimization (Distribution Transformers) whose procurement is carried out centrally by DIVSC

4. Procurement Ups-killing which functions to increase procurement skills as well as internalize procurement programs with 3 sub-initiatives, namely :

a. E-Contract

This application is to ensure that contracts are within the scope of PT. PLN (Persero) has uniformity and meets the standards of existing regulations.

b. E-Procurement Learning

This module is used as a training ground to make it easier for procurement employees to understand the procurement of goods and services and all regulations relating to procurement.

c. E-Consultancy

This application functions to carry out consultations related to online procurement.

5. Development of Supply Demand Management which will be assisted by digital tools that use descriptive analytic, artificial intelligence, and machine learning with 3 sub-initiatives, namely :

a. Spend Analytic

The Spend Analytic module was developed to overcome PLN's challenges in terms of limited visibility of PLN spending in a comprehensive and detailed manner, the absence of spending information available for making decisions, and the lack of scenario-based analysis to estimate the impact of sourcing initiatives.

To overcome this problem, it is hoped that this module can help prepare spend data by automatically extracting, filtering, and cleaning PLN's actual transaction data to produce a current and reliable spend database, producing an automatic spend dashboard with insights with various views and dimensions tailored for strategic decision making. and operations, as well as enabling rationalization and optimization of simulations against specific speed entities with visibility into potential benefits.

The following displays the spend analytic module:

**Figure 7.** Module Demand Forecast

b. Demand Forecast

The Demand Forecast module was developed by considering challenges at PLN such as the accuracy of annual demand forecasts, the accuracy of requirements for implementing 3-month forecasts, and urgent requests from PLN units that are difficult to verify.

To overcome this problem, it is hoped that this module can help create annual forecasts automatically which produce demand plans based on historical data and pipeline programs, calculate material requirements automatically calculate supply plans using supply and inventory data, monitor forecasts automatically produce monitoring dashboards for data demand, supply, and inventory, as well as forecast updates automatically produce rolling demand forecasts and supply plans for the following month

The following is a display of the Demand Forecast module :

**Figure 8**. Module Demand Forecast

c. Market Intelligence

The Market Intelligence module was developed by considering challenges at PLN such as manual processes for identifying new providers of goods and services, manual supplier qualification processes, supplier qualification reports in hard copy form and not being able to compare between suppliers.

To overcome this problem, it is hoped that the market intelligence module can use artificial intelligence and machine learning as well as big data to identify potential new providers automatically through searching public information and available research data. New provider pre-qualification automatically prequalifies providers using leading qualification frameworks and groups them into provider groups.

Provider data visualization and reporting automatically update the prequalification dashboard and provide downloadable provider qualification reports.

The following displays the market intelligence module that has been implemented at PT. PLN (Persero) :

**Figure 9.** Module Market Intelligence

6. Vendor Management functions to maintain relationships with PLN vendors, because the existence of professional relationships will make them always support PLN policies which in the end can create a healthy and mutually supportive market climate. There are 3 sub-initiatives, namely :

a. E-DPT

This application has been implemented and is part of e-procurement which manages providers registered in the DPT (Selected Provider List) and facilitates the process that takes place before providers enter the DPT, both for domestic and foreign providers

b. Vendor Management Program

This module functions to foster good relationships with vendors so that providers and PLN can understand each other's problems and solve them together.

c. Vendor Performance Management

The next process after the contracThis module functions to assess vendor performance and can provide insight and input regarding vendor status such as blacklisting, needing improvement, etc.

So hopefully with the implementation of digital procurement in the future, the following overall benefits will be obtained :

- End to end, it becomes trustworthy (auditable) as part of good corporate governance.
- Potential savings of 8%-20% from addressable spending. Assuming a normalized base price and depending on the calculation approach.
- Increased productivity of the procurement process (e.g. auction) up to 20%.
- Systemized and standardized process automation. So it focuses more on analysis and reduces transactional activities.
- Can be developed on top of existing systems so it is scalable and cheaper than packaged software
- Continue the momentum toward procurement excellence

3.2 Validity test

Testing of the validity factors was proven by using questionnaire output 424 respondents in Table 1 below :

Table 1. Test of Validity

| No | Tested question | Number of respondents | R Calculated | R Table | Result |
|---|---|---|---|---|---|
| **The Real Benefits of the Digitalization Program** | | | | | |
| 1 | Digital Procurement support daily activities and making decision in business process | 424 | 0.288 | 0.098 | Valid |
| 2 | Digital procurement increase transparency and tracebility | 424 | 0.188 | 0.098 | Valid |
| 3 | Digital procurement support data collection and analysed data procurement and supply chain | 424 | 0.395 | 0.098 | Valid |
| 4 | Digital procurement support efficiency and effectiveness to achieve key performance indicators | 424 | 0.388 | 0.098 | Valid |
| 5 | Digital procurement create protection system for data procurement cyver security | 424 | 0.321 | 0.098 | Valid |
| **Obstacles to Implementing Digitalization of Procurement** | | | | | |
| 6 | Existing infrastructure can handle digital transformation | 424 | 0.488 | 0.098 | Valid |
| 7 | Suppliers are already involved and support in the process of digital transformation | 424 | 0.421 | 0.098 | Valid |

| | | | | | |
|---|---|---|---|---|---|
| 8 | Leadership commitment support digital transformation | 424 | 0.515 | 0.098 | Valid |
| 9 | Communications and socialization digital procurement for internal and external stakeholder | 424 | 0.679 | 0.098 | Valid |
| 10 | Employees have good resource and capabilities for digital transformation | 424 | 0.298 | 0.098 | Valid |
| **Readiness of Technological Support** | | | | | |
| 11 | Digital procurement platform will simplify all business process | 424 | 0.255 | 0.098 | Valid |
| 12 | Readiness infrastructure and technology support me to work with remote access | 424 | 0.284 | 0.098 | Valid |
| 13 | User interface digital procurement platform enable me to work more effective and efficient | 424 | 0.647 | 0.098 | Valid |
| 14 | Analytical Tools and platform will automate and speed up transactions and process | 424 | 0.484 | 0.098 | Valid |
| 15 | Digital procurement is able to prevent fraud opportunities and conflicts of interest in the process of procuring goods and services | 424 | 0.578 | 0.098 | Valid |

Table 1 shows the Pearson Correlation Value (r count) for each question is bigger than the value of the r table. It Shows that all indicators/question items that measure all variables have a very strong and valid correlation.

### 3.3 Reliability Test

The reliability test was carried out using the SPSS application on the results of the questionnaire with a total of 424 respondents and the results are shown in Table 2 below:

**Table 2.** Test of Reliability

| No | Tested Questions | Cronbach's alpha | R Table | Results |
|---|---|---|---|---|
| 1 | Question 1 | 0.57 | 0.098 | Reliable |
| 2 | Question 2 | 0.594 | 0.098 | Reliable |
| 3 | Question 3 | 0.517 | 0.098 | Reliable |
| 4 | Question 4 | 0.524 | 0.098 | Reliable |
| 5 | Question 5 | 0.532 | 0.098 | Reliable |
| 6 | Question 6 | 0.57 | 0.098 | Reliable |

| | | | | |
|---|---|---|---|---|
| 7 | Question 7 | 0.594 | 0.098 | Reliable |
| 8 | Question 8 | 0.556 | 0.098 | Reliable |
| 9 | Question 9 | 0.565 | 0.098 | Reliable |
| 10 | Question 10 | 0.624 | 0.098 | Reliable |
| 11 | Question 11 | 0.632 | 0.098 | Reliable |
| 12 | Question 12 | 0.574 | 0.098 | Reliable |
| 13 | Question 13 | 0.534 | 0.098 | Reliable |
| 14 | Question 14 | 0.562 | 0.098 | Reliable |
| 15 | Question 15 | 0.541 | 0.098 | Reliable |

Based on Table 2 above, it can be seen that all statements from the variables efficiency, fulfillment, Service Availability, and Privacy have Cronbach Alpha (α) > r table values. So that each question item in this research can be stated to have a consistent reliability value and is suitable for use in this research.

### 3.4 Benefits of the Digitalization Program

Based on the results of a survey of 424 respondents, it shows that the average value for all Benefits of the Digitalization Program is 4.03 on a Likert scale of 5 as can be seen in Figure 8. This shows that the real benefit indicators is effective and efficient because to achieve key performance indicators for procurement goals.

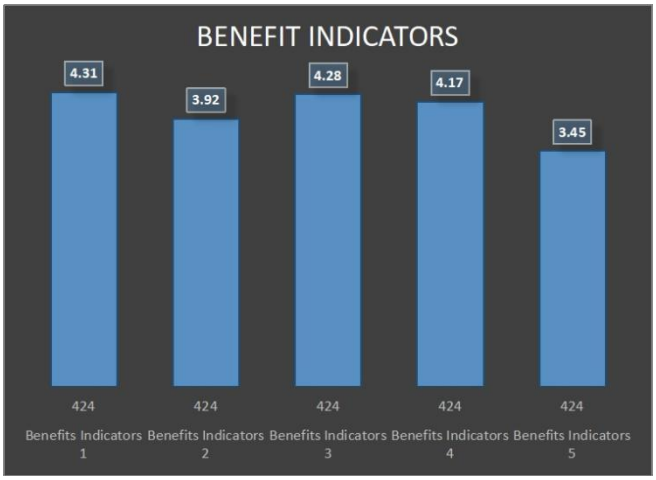


**Figure 10**. Results of Benefits Indicators

### 3.5 Obstacles of the Digitalization Program

Based on the results of a survey of 424 respondents, it shows that the average value for Obstacles Indicators is 4.28 on a Likert scale of 5 as can be seen in Figure 11. This shows that these variables have passed through the obstacles like infrastructure items, stakeholder management, and leadership commitment.

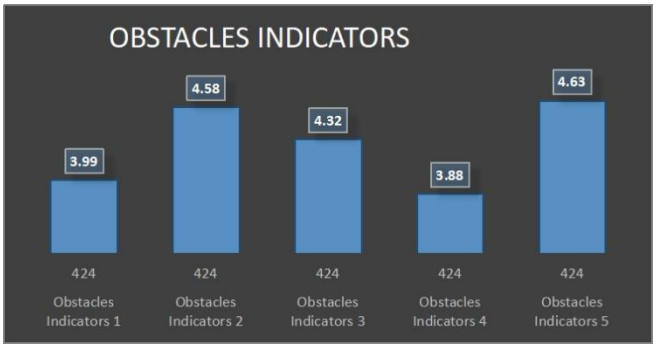


**Figure 11.** Results of Obstacles Indicators

3.6 Readiness

For the Readiness Results, an average value of 4.41 was obtained from a Likert scale of 5 in Figure 12. This shows that the Readiness Indicators variable have proved the improvement of infrastructure and technology to support digital procurement at PLN.

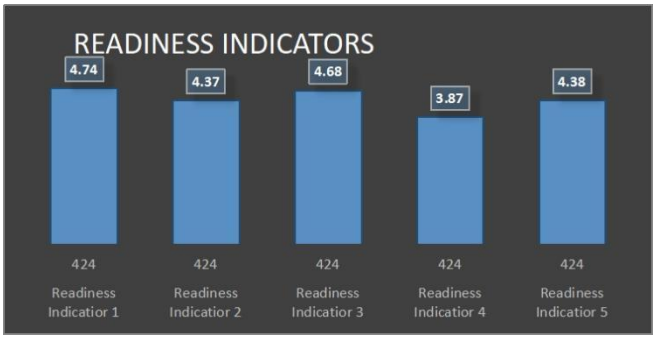


**Figure 12.** Results of Readiness

## 4.CONCLUSION

From this study, the following conclusions were obtained:

a). The survey using a Likert Scale of 5 gives results with the following average values: the level of real benefit of digital procurement is 4.03, the Obstacles of digitization program indicator is 4.28, Readiness Infrastructure and technology is 4.41. The result of these survey calculations, validity test, and reliability test indicate that success of the procurement digital transformation program at PT. PLN (Persero) to achieve procurement excellence goals.

b). The effectiveness of Implementing the Digitization Program for Integrated Procurement of Goods and Services to Achieve Procurement Excellence Goals and Targets at PT PLN (Persero) in improving PLN efficiency of the company in terms of time and productivity of employees and the company can be said to have been very effective based on the results of survey questionnaire tests, observations, and other supporting data.

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**Mario Hadi Kusuma** was born in Riau on 27 March 1987. Completed his Bachelor of Engineering at the Faculty of Information Technology, Ahmad Dahlan University, Yogyakarta in 2009. Worked at PLN Bangka Belitung as Assistant Analyst for Database Services (2011 – 2015), Assistant Analyst and Supervisor for the Procurement Department (2015-2019), and Learning Analyst at PT PLN (Persero) UPDL Palembang (2020 - present). The author has a certificate of competence in procurement and is an Integrated Organizational Risk Management Expert (AMROT-BNSP)/(CRMP-GIRMA). The published scientific work is The Effectiveness of the New PLN Mobile Application in Improving Service Quality and Customer Satisfaction in Tanjungpandan City at the IOP Conference series in 2021.