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RAW MATERIAL OPTIMIZATION WITH NEURAL NETWORK METHOD IN CONCRETE PRODUCTION ON PRECAST INDUSTRY

Ranti Hidayawanti[1], Yusuf Latief[1], Iriansyah Sangadji[2], Lisa Oksri Nelfia[3] and Elfi Fadillah[4]

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ABSTRACT

Construction development development in Indonesia is growing rapidly and requires the right materials for infrastructure development such as roads, bridges, high-rise buildings, residential, and housing. From the existing infrastructure, it is needed concrete innovations such as precast so that construction can be finished more quickly with good quality of materials. The need for good quality and smooth supply of materials will determine the success of a construction project. This must also be supported by time management in order to get efficient completion times, affordability of prices until considering the negative environmental impact. Utilization of technology by using precast is one solution to this problem. Although this issue has been done, however the downstream efficiency factor is increasing the competitiveness of the Construction Industry which still has to be continuously improved to be improved to the next stage. In this paper, will discuss how the procurement inventory as raw materials with the concept of a readiness framework by using the neural network method can produce precast products with good quality. The purpose of this research is to innovate products and technologies used in the precast industry in Indonesia. The method used is to utilize the neural network to produce the best quality of precast results. The results of this study show that the level of influence of readiness on products and technology above 70% can produce an efficiency of 80% in precast production.

Keywords: Raw Material, Neural Network, Concrete, Precast

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RAW MATERIAL OPTIMIZATION WITH NEURAL NETWORK METHOD IN CONCRETE PRODUCTION ON PRECAST INDUSTRY

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ABSTRACT

The development of construction is presently experiencing rapid growth in Indonesia, leading to the requirement of the right materials for infrastructural enhancements, such as roads, bridges, high-rise residential buildings, and housing. From the existing infrastructure, concrete innovations such as precasts are needed with good quality materials, for the quick completion of constructions. This is because the need for good quality and smooth material helps to determine the success of a building project, with the use of technology through precast being a problem-solving process. Therefore, this study aims to analyze the patterns by which inventory procurement predictions produce precasts with good quality, using the e readiness framework concept of the neural network through appropriate decision-making processes. It also focuses on innovating technological products used in the Indonesian precast industry. The Neural Network was used to produce the best target quality time and precast commodities. The result indicated two outputs from 2 neural network models, using five similar input-value variables. Based on the Adaline neural network, the outputs were observed as the highest sales-cost predictions for precast products, which often occurred in 1, 5, 6 and 9 months. Besides this, production activities were also normally operated at level (1), with profit optimization being highly considered before months 1, 5, 6 and 9. For the LVQ neural network, the result was a predictive classification of class intensity levels, where fast decision-making processes occurred in months 1, 6 and 9. Cost optimization was also carried out by ordering raw materials several months in advance, considering the trend in material prices and logistics.

Keywords: Raw Material, Neural Network, Concrete, Precast.

INTRODUCTION

The Indonesian government has been undergoing massive infrastructural development since 2019, with an effect observed in the significant increase in precast products' demand in 2022. Based on these data, precast production was carried out by 76 registered factories, which were distributed throughout the country. Each factory had an increase in production, which varied between 210,000-500,000 tons yearly, to serve the increasing demand. This indicated that the average monthly production of each organization needs to reach 45,000 tons.

In Indonesia, efficiency is often measured from a cost and time perspective, showing that the use of precast concrete is more efficient than conventional methods [1]. Although this utilization is more efficient, technology-based precast supply chain parameters still need to become effective support. This supply chain is classified into various phases, namely planning, designing, manufacturing, transportation, installation, and construction. To achieve an integrated construction, the parties in these phases need to have efficient communication and effective collaboration in providing accurate and up-to-date information. According to the governmental data, the main problems in the precast supply chain phases began from the following, (1) poor planning, (2) ineffective communication between designers and manufacturers, (3) incompetent employees/workers, (4) damage to raw materials, and (5) large sizes and heavy precast components and coordination in the bad project site. Besides these conditions, the key issues also contributed to negative consequences on the efficiency, productivity and effectiveness of precast delivery [2]. After procurement, the damages to raw materials are often found to affect the quality of the process and precast production during the inventory phase (initial stage). This explains that the procurement division needs to be able to provide the certainty of scheduling receipts for efficient project completion when ordering raw materials. Irrespective of these conditions, practical raw material orders and assembly time have still not been highly considered, leading to the probable effects and implications of excess inventory occurrences and additional project-financing increment, respectively. Therefore, a methodology should be determined for the effective, efficient, and economical control of precast plants' inventory management [3].

The utilization of technology has reportedly been implemented widely, to support the management of raw materials during the inventory processes. This was in line with the raw material control for precast tunnelling projects in China [4], where many businesses were leveraging historical sales and demand data to implement intelligent inventory management systems. Demand forecasting involves predicting/ensuring the consumption/collection of precast raw materials. This plays an important role in the area of inventory control and supply chain, due to enabling production and distribution planning. It is also conditioned to reduce raw material delivery times and optimize decisions on the supply chain [5]. This is to help the developers and operators of inventory management systems in improving efficiency, maximizing productivity, and minimizing material losses [6].

Many studies have also evaluated smart inventory implementation, namely the dynamic brick-and-mortar supply chain analysis. This evaluated the benefits of implementing smart applications and systems to improve Vendor Managed Inventory (VMI) efficiency. In the supply chain mechanism, the manufacturer configured the production level and replenished the inventory at the retailer's store, where prices were set up to affect sales and inventory. In this condition, the company also shared the revenue and inventory costs through an agreement. This condition was very dynamic when inventory increased and decreased at production and sales levels respectively, with periodical variations observed according to several stochastic errors [7]. In this case, the need for accurate predictions led to a more effective and cheap supply chain, as well as allowed companies to provide quality, quantity, periodical, and low-production cost products [8]. Many studies also used other machine learning approaches to map prediction patterns, such as fuzzy subtractive clustering [9].Therefore, this study aims to analyze the patterns by which inventory procurement predictions produce precast products with good quality, using the e-readiness framework concept of the neural network method through appropriate decision-making processes. In this condition, prediction modelling was prepared as part of the application of e-readiness in raw material management. The pattern of obtaining these materials was also used as the best test data, to assess the management model in smart inventory.

LITERATURE REVIEW

E-Readiness

Technology Readiness Index (TRI) 1.0 is constructed based on four-dimensional aspects, namely Optimism, Innovation, Discomfort, and Insecurity [10], as shown in Fig. 1. This is often applied to a company with the Strategic Alignment Maturity Model (SAMM), to determine the utilization level of information systems in all business operations [11]. It is also one of the innovative references used in managing highly efficient logistics. In addition, TRI is related to the Global Competitiveness and Logistics Performance Indexes (GCI & LPI), as well as other similar supportive dimensions.

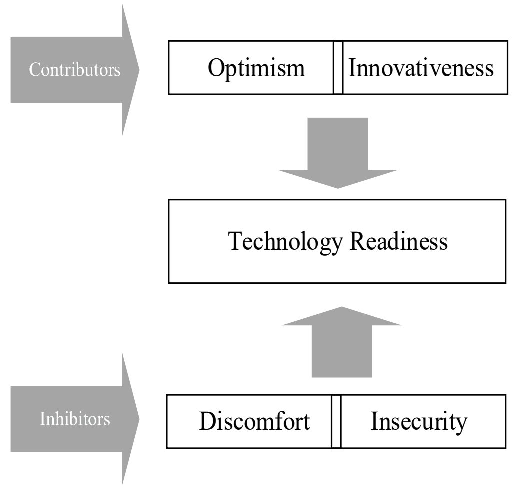

Fig. 1 E-Readiness Technology

In precast manufacturing companies, technology is also used in raw material management, by arranging and using a very suitable procedural schedule and method, respectively. Using linear programming methods, Markov models, and genetic algorithms, scheduling often emphasizes the management of time to handle and obtain raw materials [12]–[14]. In this condition, a good inventory receipt system is needed to provide more value during the prediction process, where efficient and periodical systematic performance is a function of operational activities. This helps to reduce time consumption in determining optimal operations in various parameters [15]. Additionally, process quality problems and production cost efficiency are adequately maintained [16]–[18].

Neural Network Utilization

The amount of inventory is often related to the company's profit and the entire supply chain's survival. This indicates that prediction processes need to increase the company's ability to prevent risks, improve profits, and reduce losses during the acquisition of inventory, using the backpropagation neural network (BP) method [19]-[20]. Some reports were also observed based on the development of technology readiness, such as [21]-[22]. This emphasized determining the optimization value of material handling, using a neural network with 2 algorithm methods, namely ALN and LVQ (Adaptive Linear Neuron and Linear Vector Quantization). These methods led to the prediction of cost-benefit into 3 categorical levels, namely high, medium, and low demand, as shown in Fig. 2.

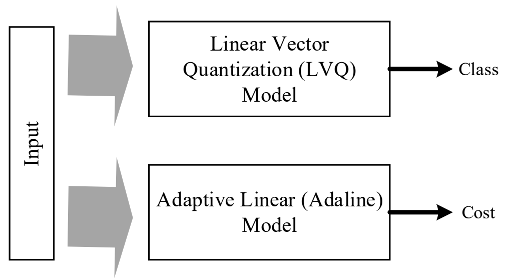

Fig. 2 Neural Network Model based on E Readiness

Adaline

ADALINE (Adaptive Linear Neuron or later Adaptive Linear Element) is an early single-layer artificial neural network, which is implemented as an algorithm to predict outputs with an automatic controller. Although the accuracy obtained is not satisfactory, the value still changes and becomes highly precise during more data analyses [23]. In the following equation, an input vector (K) is observed with the pattern.

$$X_k=[x_0, \quad x_{1k}, \quad x_{2k}, \quad \dots, \quad x_{nk}]^T \quad (1)$$

Where X_k = the components of the weights and coefficients. Moreover, a weight vector (Wk) is observed in the Eq. (2) as follows,

$$W_k = [\mathrm{w}x_0, w_{1k}, w_{2k}, \dots, w_{nk}]^T \quad (2),$$

where $y_K = W_K^T X_K$.

Output $y_k = \sum_{k=1}^{n} X_k W_k + \theta$

Adaptive learning rule

Learning is also known as the Least Mean Square (LMS), whose rules in this process are observed as follows,

$$W \leftarrow W + \eta(d - o)x \quad (3)$$

Linear Vector Quantization (LVQ) Model

This is one of the widely used ANN models (Artificial Neural Network), which emphasizes the prototype of a supervised learning classification algorithm and its network. These are trained through a competitive method similar to the Self-Organizing Map. The clustering technique is also used as a classifier to evaluate the deviations in the data sample through a random or specific density. This shows that performance remains the same with almost all combinations of training and testing [24]. Based on the following formula, learning is conducted by calculating the euclidian distance,

$$d(\vec{x}, \vec{w}_k) = \min d(\vec{x}, \vec{w}_k) \quad (4)$$

W_k (weight improvement) is also used to determine the weight (w) with the smallest distance value (d) as follows,

$\vec{w}_k \leftarrow \vec{w}_k + \eta.(\vec{x} - \vec{w}_k)$, when c_m =/≠ y, it is close to each other or part of the set, respectively.

METHODOLOGY

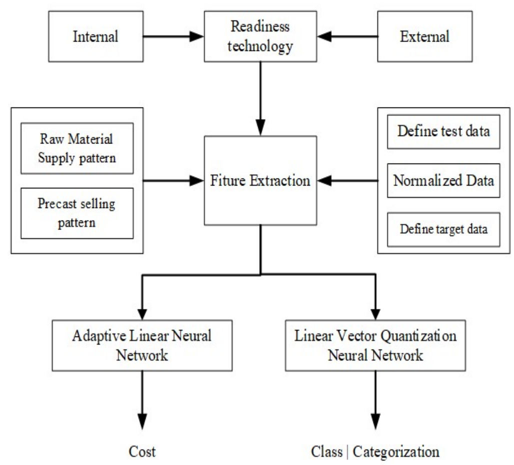

Fig. 3 Study Methodology

The e-readiness technology emphasized the following factors, (1) security, (2) technical issues, (3) software reliability, (4) digital operations for internet usage, and (5) technical skill utilization [25]. The concept of this technical influence also originated from internal and external organizations, as shown in Fig. 3.

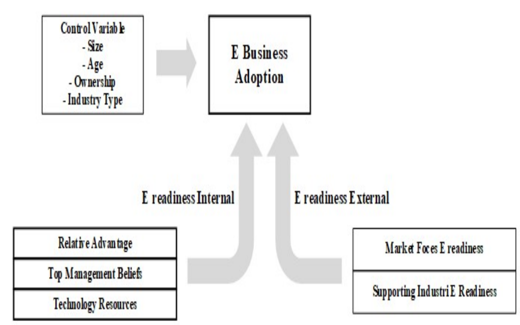

Fig. 4 The concept of e-readiness influence

Based on the external conditions, e-readiness emphasized many factors regarding the case perspective of each corporation in its respective business field. In this study, these factors were limited, including the IT technology infrastructure supporting the precast industry and the vendor market for raw materials. Meanwhile, the internal conditions of this technology focused on related technical improvements, using neural network methods for prediction processes.

Feature Extraction

The internal data sources were the direct measurement of the goods' receipts, regarding the yearly production of raw materials at precast organizations. In this condition, the raw material parameters included cement, sand, and gravel. In preparation for the precast products, a value extraction was also observed for the contributions of the materials and costs, as shown in Fig. 5. This showed that the cement and gravel costs and materials were the largest/lowest and smallest/highest contributions, respectively.

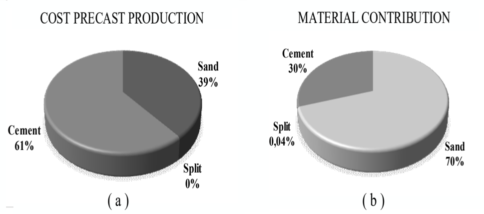

Fig. 5 Cost Contribution (a) production (m^3) and material contribution (b) precast product

The second parameter focused on the monthly-supply behaviour pattern of each raw material for a year, as shown in Fig. 6.

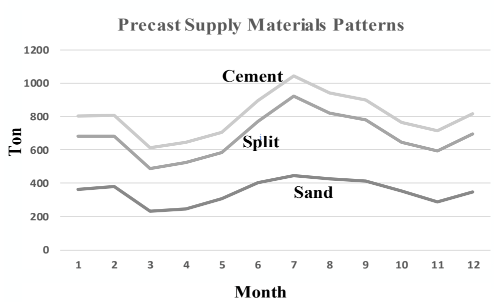

Fig. 6 Annual supply pattern of precast raw materials

Data Test

This emphasized the data of sand, gravel and cement, which were mixed based on the best quality standard of Indonesian concrete category K 500-K 600. These data were obtained according to the order for 12 months, as shown in Table 1.

Table 1 Precast raw material cost

No	Materials	Cost IDR (m^3)
1	Sand	242,000
2	Split	200,000
3	Cement	715,000

Normalized data

The nominal unit of numeric data was normalized to facilitate data processing in the neural network architecture. This indicated that normalization was carried out by mapping into numbers between 0 and 1, as shown in the following formula,

$$X_{Map} = \frac{X_{Original} - X_{\min}}{X_{\max} - X_{\min}} \tag{4}$$

Where :
X_{map} = Normalization Value
$X_{Original}$ = Original Value
X_{max} = Maksimum Value
X_{Min} = Minimum Value

In 2021, the normalization of input variables were also carried out on the price of raw materials, frequency of intermediaries, and volume of transaction costs. Moreover, the target data originated from the average total sales of precast products in the same year.

Target data

The target data contained three vectors, namely the minimum, maximum, and median sales values of the total cost, as shown in Fig. 7.

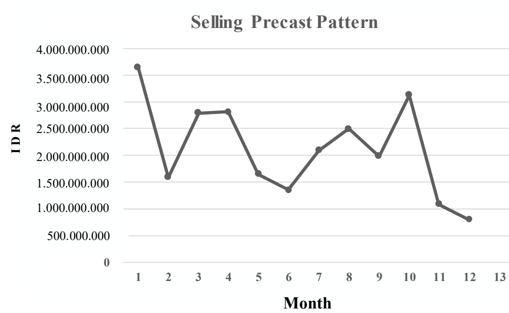

Fig.7 Total precast unit cost for the year.

Based on Fig 7, the optimization patterns of the raw material supply and sales profits were observed when the production target need to achieve 45,000 tons monthly with a minimum unit cost of IDR800 million.

DISCUSSION

Based on the external conditions, the system input parameters included the readiness of IT technology infrastructure, which supported the precast industry and market vendors providing raw materials. In this analysis, the final output was a value within a specified range. Meanwhile, the internal input factors included the monthly frequency of raw material supplies in a year (Tons). Table 2 shows the input and target variables of this analysis.

Table 2 Input Parameter Identification and Prediction

No	Input Parameter	Prediction Parameter	
		Adaline	LVQ
1.	IT Readiness Infrastructure	Monthly Precast Selling Patterns	Decision Classification Level
2.	Level Market Vendor		
3.	Cement Contributions (monthly)		
4.	Split Contributions (monthly)		
5.	Sand Contributions (monthly)		

Architecture Neural Network Adaline

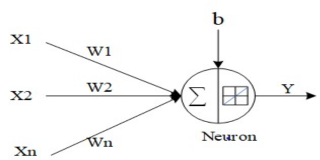

Fig. 8 Adaline Architecture

Based on Fig. 8, five defined input values were observed, indicating a linear activation function between 0 and 1.

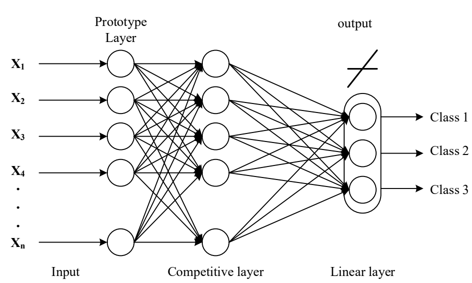

Fig. 9 Linear Vector Quantization Architecture

In Fig. 9. five defined input values were also observed, where a linear classification produced 3 cluster categories.

Simulation Result

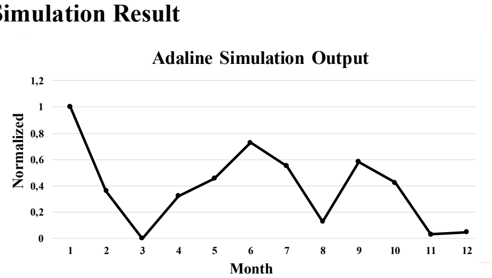

Fig. 10 Adaline Method simulation results

According to Fig. 10, the pattern of obtaining raw materials for precast products fluctuated based on the test data from 2020, through the Adaline method learning for a year. In this condition, the lowest orders were in the 3rd, 8th, 11th, and 12th months when 5 parameters were inputted into this method.

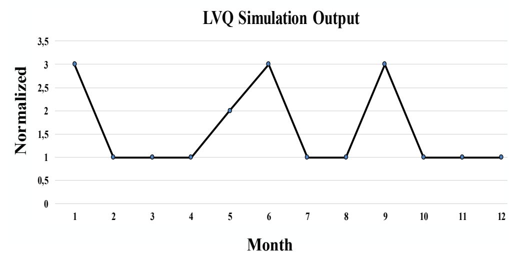

Fig. 11 LVQ Method Simulation Result

Based on Fig. 11, the pattern of obtaining raw materials for precast products also fluctuated regarding the test data from 2020, through the LVQ method learning for a year. This proved that the highest classes and the best values occurred in the 1st, 6th, and 9th months when 5 parameters were inputted into this method, with the lowest orders observed on the 2nd, 3rd, 4th, 7th, 8th, 10th, 11th, and 12th period. In the 5th month, the values obtained were also found not to be very high or low. These actions emphasized the option of maintaining existing raw materials or placing orders regarding the increment of the previous month.

Table 3. Class and Cost Relation

No.	Month	Classes	Cost (IDR)
1	Jan	3	3,644,810
2	Feb	1	1,829,060
3	Mar	1	804,661
4	Apr	1	1,724,870
5	May	2	2,097,578
6	Jun	3	2,872,875
7	Jul	1	2,370,019
8	Aug	1	1,170,018
9	Sep	3	2,464,231
10	Oct	1	2,010,972
11	Nov	1	895,467
12	Dec	1	942,555

According to Table 3, the second and third months had different advantages, although they were in class (1). This was in line with the eighth and eleventh months. The midpoint was also observed in class (2), which occurred in the 5th month. However, the 1st, 6th, and 9th months exhibited quite a large amount of transactions, leading to the significant effects on the order of raw materials and logistics financing considerations.

CONCLUSIONS

Based on these results, cost optimization was conducted by accepting and creating new orders when the conditions were found in class (2). This action was often carried out by observing the trend of the previous month. Due to the high-order rate, the classes also showed that the level of operations need be accelerated and periodically limited when the conditions were categorized in class (3). For class (2), the order for raw materials was only performed by observing the Adaline method simulation, since a tendency was found for the market to absorb precast products in the following month. Furthermore, the application of the neural network method was appropriately implemented when supported by external e-readiness factors, including the which include infrastructure preparedness and many material vendor options. The implementation of this conceptual technology also used 2 neural network models for precast products. This involved the processing and production of similar input values and different decision model simulation, respectively. Irrespective of these differences, a strong correlation was still observed with the time efficiency of the decision-making process. Therefore, bother LVQ and Adaline contributed 50% to this decision approach.

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REFERENCES

[1] D. H. Wisanggeni., Perbandingan Sistem Ditinjau Dari Segi Waktu dan Biaya Pada Proyek My Tower Apartement Surabaya, *Inst. Teknol. Sepuluh Nop.*, 2017.pp 39 - 67

[2] M. Abedi, N. Rawai, M. S. Fathi, and A. K. Mirasa., Cloud Computing Information System Architecture for Precast Supply Chain Management Pelat Konvensional dan Precast Half Slab, *Appl. Mech. Mater.*, 2015, pp. 773–774.

[3] K. S. Im, S. H. Han, B. Koo, and D. Y. Jung., Formulation of a pull production system for optimal inventory control of temporary rebar assembly plants, *Can. J. Civ. Eng.*, vol. 36, no. 9, 2009, pp. 1444-1458.

[4] Z. Yu, Y. Wei, and Z. Cao., The Design and Application of Information Management System Based on IOT for Precast Concrete Segments, in *IOP Conference Series: Earth and Environmental Science*, vol. 371, no. 3, 2019, pp. 1-7.

[5] F. Z. Benhamida, O. Kaddouri, T. Ouhrouche, M. Benaichouche, D. Casado-Mansilla, and D. López-De-Ipiña., Demand forecasting tool for inventory control smart systems, *J. Commun. Softw. Syst.*, 2021, vol. 17, no. 2, pp. 185 - 196

[6] A. Alwadi, A. Gawanmeh, S. Parvin, and J. N. Al-Karaki., Smart solutions for RFID based inventory management systems: A survey, *Scalable Comput.*, vol. 18, no. 4, 2017, pp. 347 - 360.

[7] P. De Giovanni., Smart Supply Chains with vendor managed inventory, coordination, and environmental performance, *Eur. J. Oper. Res.*, vol. 292, no. 2, 2021, pp. 1-42.

[8] C. Ntakolia, C. Kokkotis, P. Karlsson, and S. Moustakidis., An explainable machine learning model for material backorder prediction in inventory management, *Sensors*, vol. 21, no. 23, 2021, pp. 1 - 12.

[9] I. Sangadji, Y. Arvio, and Indrianto., Dynamic Segmentation of Behavior Patterns Based On Quantity Value Movement Using Fuzzy Subtractive Clustering Method, *Journal of Physics: Conference Series*, 2018, vol. 974, no. 1, 2018, pp. 1-7.

[10] A. Parasuraman and C. L. Colby., An Updated and Streamlined Technology Readiness Index: TRI 2.0, *J. Serv. Res.*, vol. 18, no. 1, 2015, pp. 1-16.

[11] A. Wahyudin, R. Desmayanti, Munir, H. B. Santoso, and Z. A. Hasibuan., Business-information systems strategic alignment readiness maturity level: Corporate and business-technology driver perspective, *J. Eng. Sci. Technol.*, vol. 14, no. 3, 2019, pp. 1260 - 1270.

[12] C. F. Motta Toledo, L. De Oliveira, R. De Freitas Pereira, P. M. França, and R. Morabito., A genetic algorithm/mathematical programming approach to solve a two-level soft drink production problem, *Comput. Oper. Res.*, vol. 48, 2014, pp. 40-52.

[13] Z. Citra, B. Susetyo, and P. Wibowo., Optimasi Kinerja Proyek dengan Penerapan Metode Crashing dan Linear Programming pada Proyek Bulk Godown, *Rekayasa Sipil*, vol. 7, no. 2, 2019, pp. 106 - 113.

[14] M. R. Bordón, J. M. Montagna, and G. Corsano., Mixed integer linear programming approaches for solving the raw material allocation, routing and scheduling problems in the forest industry, *Int. J. Ind. Eng. Comput.*, vol. 11, no. 4, 2020, pp. 525-548.

[15] V. Subotić, M. Eibl, and C. Hochenauer., Artificial intelligence for time-efficient prediction and optimization of solid oxide fuel cell performances, *Energy Convers. Manag.*, vol. 230, 2021, pp. 1-14.

[16] R. Hidayawanti, S. Legino, I. Sangadji, and R. P.

A. Widodo., The efficiency of fly ash and cement slag to development building,*Int. J. GEOMATE*, vol. 16, Issue. 57, 2019, pp. 95-100.

[17] R. Hidayawanti, Y. Latief, Y. Rahayu, F. I. Wachid, and R. P. A. Widodo., Utilization Of Ggbfs As Cement Substitute To Reduce Production Cost Of Construction Project, *Int. J. GEOMATE*, vol. 21, Issue. 86, 2021, pp 9-16.

[18] R. Hidayawanti, D. D. Purnama, T. Iduwin, S. Legino, and F. I. Wachid., The impact aggregate quality material as a linear regression study on mixture concrete, *Int. J. GEOMATE*, vol. 18, Issue. 70, 2020, pp. 23-29.

[19] L. Gu, Y. Han, C. Wang, G. Shu, J. Feng, and C. Wang., Inventory prediction based on backpropagation neural network," *NeuroQuantology*, vol. 16, no. 6, 2018, pp. 664-673.

[20] F. Bin Pan., Inventory prediction research based on the improved BP neural network algorithm, *Int. J. Grid Distrib. Comput.*, vol. 9, no. 9, 2016, pp. 307 - 316.

[21] L. Gao and H. Dou., Inventory management of railway logistics park based on artificial neural network, *J. Eur. des Syst. Autom.*, vol. 53, no. 5, 2020, pp. 715 - 723.

[22] M. Du, J. Luo, S. Wang, and S. Liu, Genetic algorithm combined with BP neural network in hospital drug inventory management system, *Neural Comput. Appl.*, vol. 32, no. 7, 2020, pp. 1-14.

[23] P. C. Siswipraptini, R. N. Aziza, I. Sangadji, and I. Indrianto., The design of a smart home controller based on ADALINE, *Telkomnika (Telecommunication Comput. Electron. Control.*, vol. 18, no. 4, 2020, pp. 2177 - 2185.

[24] S. Sahoo, S. Mishra, S. K. Mohapatra, and B. K. Mishra., Clustering deviation analysis on breast cancer using linear vector quantization technique, *Int. J. Control Theory Appl.*, vol. 9, no. 23, 2016, pp. 313 - 324.

[25] M. O. M. Baeuo, N. Z. B. Nor Zairah, and A. A. M. Alaraibi., Technology factors influencing e-government readiness, *J. Theor. Appl. Inf. Technol.*, vol. 95, no. 8, 2017, pp. 1637 - 1645.

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3. Authors' Contributions (Please write all authors' contribution here)

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Ranti Hidayawanti, S.T., M.M. : Conception, design, acquisition, simulate data, analysis , and interpretation of data and drafting the article.

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Thanks for your kind contribution. We have reviewers' comments on your paper (attached). Please send a revised paper for a maximum of 4 days. Please send responses to reviewers by authors in separate files (example attached). We appreciate online submission using the following link.
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Wednesday, June 29, 2022

GEOMATE2022 Bangkok Review & Evaluation

Paper ID	g12146
Paper Title	RAW MATERIAL OPTIMIZATION WITH NEURAL NETWORK METHOD IN CONCRETE PRODUCTION ON PRECAST INDUSTRY
i. Originality	5 (High)
ii. Quality	4
iii. Relevance	4
iv. Presentation	4
v. Recommendation	4
Total (sum of i to v)	21

General comments

It is very valuable as a research on the contents of this research and the system used at the actual construction site, and the system that predicts its utilization.

Mandatory changes

Since the numbers and letters written in some charts are small and difficult to read, it is better to correct them.

Suggested changes

The research results in this paper are based on forecast data throughout the year. In other words, the pattern of material usage during the year is known in advance, so it seems that there is not much difference in changes over time.
If so, I think that the factors that affect the unit price of precast can be predicted in advance, but I think it is necessary to explain the situation a little more carefully.

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Thanks. You have successfully submitted the revised paper. We would take necessary action as early as possible.

Best regards.

Prof. Dr. Zakaria Hossain

g12146: GEOMATE2022 Bangkok Revised Paper: Auto Responder

Paper ID number	g12146
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Revised Title	RAW MATERIAL OPTIMIZATION WITH NEURAL NETWORK METHOD IN CONCRETE PRODUCTION ON PRECAST INDUSTRY
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RAW MATERIAL OPTIMIZATION WITH NEURAL NETWORK METHOD IN CONCRETE PRODUCTION ON PRECAST INDUSTRY

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[1,2]Faculty of Engineering, University of Indonesia, Indonesia

ABSTRACT

The development of construction is presently experiencing rapid growth in Indonesia, leading to the requirement of the right materials for infrastructural enhancements, such as roads, bridges, high-rise residential buildings, and housing. From the existing infrastructure, concrete innovations such as precasts are needed with good quality materials, for the quick completion of constructions. This is because the need for good quality and smooth material helps to determine the success of a building project, with the use of technology through precast being a problem-solving process. Therefore, this study aims to analyze the patterns by which inventory procurement predictions produce precasts with good quality, using the e readiness framework concept of the neural network through appropriate decision-making processes. It also focuses on innovating technological products used in the Indonesian precast industry. The Neural Network was used to produce the best target quality time and precast commodities. The result indicated two outputs from 2 neural network models, using five similar input-value variables. Based on the Adaline neural network, the outputs were observed as the highest sales-cost predictions for precast products, which often occurred in 1, 5, 6 and 9 months. Besides this, production activities were also normally operated at level (1), with profit optimization being highly considered before months 1, 5, 6 and 9. For the LVQ neural network, the result was a predictive classification of class intensity levels, where fast decision-making processes occurred in months 1, 6 and 9. Cost optimization was also carried out by ordering raw materials several months in advance, considering the trend in material prices and logistics.

Keywords: Raw Material, Neural Network, Concrete, Precast.

INTRODUCTION

The Indonesian government has been undergoing massive infrastructural development since 2019, with an effect observed in the significant increase in precast products' demand in 2022. Based on these data, precast production was carried out by 76 registered factories, which were distributed throughout the country. Each factory had an increase in production, which varied between 210,000-500,000 tons yearly, to serve the increasing demand. This indicated that the average monthly production of each organization needs to reach 45,000 tons.

In Indonesia, efficiency is often measured from a cost and time perspective, showing that the use of precast concrete is more efficient than conventional methods [1]. Although this utilization is more efficient, technology-based precast supply chain parameters still need to become effective support. This supply chain is classified into various phases, namely planning, designing, manufacturing, transportation, installation, and construction. To achieve an integrated construction, the parties in these phases need to have efficient communication and effective collaboration in providing accurate and up-to-date information. According to the governmental data, the main problems in the precast supply chain phases began from the following, (1) poor planning, (2) ineffective communication between designers and manufacturers, (3) incompetent employees/workers, (4) damage to raw materials, and (5) large sizes and heavy precast components and coordination in the bad project site. Besides these conditions, the key issues also contributed to negative consequences on the efficiency, productivity and effectiveness of precast delivery [2]. After procurement, the damages to raw materials are often found to affect the quality of the process and precast production during the inventory phase (initial stage). This explains that the procurement division needs to be able to provide the certainty of scheduling receipts for efficient project completion when ordering raw materials. Ordering of raw materials is carried out by considering the best price pattern for each item including cement, gravel and sand from several different vendors. Time Prediction of determining the peak sales pattern of precast products is carried out to find margins based on the difference in price patterns which will affect management's decision to choose the right vendor partner at the right time. Irrespective of these conditions, practical raw material orders and assembly time have still not been highly considered, leading to the probable effects and implications of excess inventory occurrences and additional project-financing increment, respectively. Therefore, a methodology should be determined for the effective, efficient, and economical control of precast plants' inventory management [3].

The utilization of technology has reportedly been implemented widely, to support the management of raw materials during the inventory processes. This was in line with the raw material control for precast tunnelling projects in China [4], where many businesses were leveraging historical sales and demand data to implement intelligent inventory management systems. Demand forecasting involves predicting/ensuring the consumption/collection of precast raw materials. This plays an important role in the area of inventory control and supply chain, due to enabling production and distribution planning. It is also conditioned to reduce raw material delivery times and optimize decisions on the supply chain [5]. This is to help the developers and operators of inventory management systems in improving efficiency, maximizing productivity, and minimizing material losses [6].

Many studies have also evaluated smart inventory implementation, namely the dynamic brick-and-mortar supply chain analysis. This evaluated the benefits of implementing smart applications and systems to improve Vendor Managed Inventory (VMI) efficiency. In the supply chain mechanism, the manufacturer configured the production level and replenished the inventory at the retailer's store, where prices were set up to affect sales and inventory. In this condition, the company also shared the revenue and inventory costs through an agreement. This condition was very dynamic when inventory increased and decreased at production and sales levels respectively, with periodical variations observed according to several stochastic errors [7]. In this case, the need for accurate predictions led to a more effective and cheap supply chain, as well as allowed companies to provide quality, quantity, periodical, and low-production cost products [8]. Many studies also used other machine learning approaches to map prediction patterns, such as fuzzy subtractive clustering [9].Therefore, this study aims to analyze the patterns by which inventory procurement predictions produce precast products with good quality, using the e-readiness framework concept of the neural network method through appropriate decision-making processes. In this condition, prediction modelling was prepared as part of the application of e-readiness in raw material management. The pattern of obtaining these materials was also used as the best test data, to assess the management model in smart inventory.

LITERATURE REVIEW

E-Readiness

Technology Readiness Index (TRI) 1.0 is constructed based on four-dimensional aspects, namely Optimism, Innovation, Discomfort, and Insecurity [10], as shown in Fig. 1. This is often applied to a company with the Strategic Alignment Maturity Model (SAMM), to determine the utilization level of information systems in all business operations [11]. It is also one of the innovative references used in managing highly efficient logistics. In addition, TRI is related to the Global Competitiveness and Logistics Performance Indexes (GCI & LPI), as well as other similar supportive dimensions.

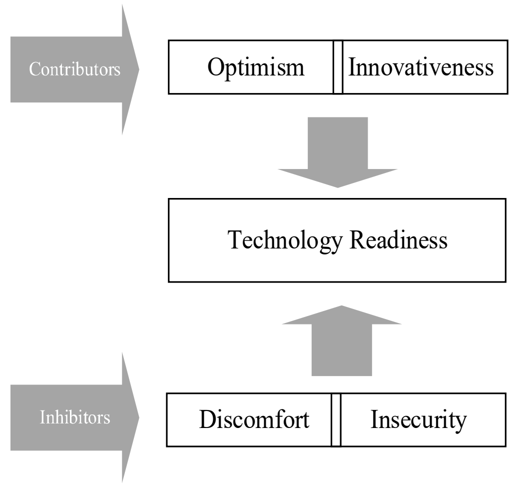

Fig. 1 E-Readiness Technology

In precast manufacturing companies, technology is also used in raw material management, by arranging and using a very suitable procedural schedule and method, respectively. Using linear programming methods, Markov models, and genetic algorithms, scheduling often emphasizes the management of time to handle and obtain raw materials [12]–[14]. In this condition, a good inventory receipt system is needed to provide more value during the prediction process, where efficient and periodical systematic performance is a function of operational activities. This helps to reduce time consumption in determining optimal operations in various parameters [15]. Additionally, process quality problems and production cost efficiency are adequately maintained [16]–[18].

Neural Network Utilization

The amount of inventory is often related to the company's profit and the entire supply chain's survival. This indicates that prediction processes need to increase the company's ability to prevent risks, improve profits, and reduce losses during the acquisition of inventory, using the backpropagation neural network (BP) method [19]-[20]. Some reports were also observed based on the development of technology readiness, such as [21]-[22]. This emphasized determining the optimization value of material handling, using a neural network with 2 algorithm methods, namely ALN and LVQ (Adaptive Linear Neuron and Linear Vector Quantization). These methods led to the prediction of cost-benefit into 3 categorical levels, namely high, medium, and low demand, as shown in Fig. 2.

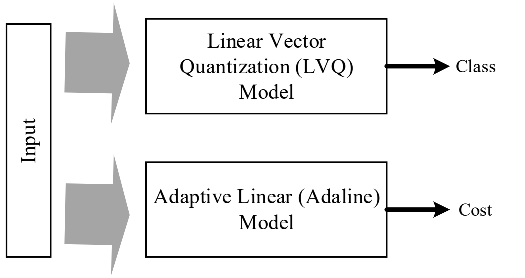

Fig. 2 Neural Network Model based on E Readiness

Adaline

ADALINE (Adaptive Linear Neuron or later Adaptive Linear Element) is an early single-layer artificial neural network, which is implemented as an algorithm to predict outputs with an automatic controller. Although the accuracy obtained is not satisfactory, the value still changes and becomes highly precise during more data analyses [23]. In the following equation, an input vector (K) is observed with the pattern.

$$X_k=[x_0, \quad x_{1k}, \quad x_{2k}, \quad \ldots, \quad x_{nk}]^T \qquad (1)$$

Where X_k = the components of the weights and coefficients. Moreover, a weight vector (Wk) is observed in the Eq. (2) as follows,

$$W_k = [wx_0, w_{1k}, w_{2k}, \ldots, w_{nk}]^T \qquad (2),$$

where $y_K = W_K^T X_K$.

Output $y_k = \sum_{k=1}^{n} X_k W_k + \theta$

Adaptive learning rule

Learning is also known as the Least Mean Square (LMS), whose rules in this process are observed as follows,

$$W \leftarrow W + \eta(d - o)x \qquad (3)$$

Linear Vector Quantization (LVQ) Model

This is one of the widely used ANN models (Artificial Neural Network), which emphasizes the prototype of a supervised learning classification algorithm and its network. These are trained through a competitive method similar to the Self-Organizing Map. The clustering technique is also used as a classifier to evaluate the deviations in the data sample through a random or specific density. This shows that performance remains the same with almost all combinations of training and testing [24]. Based on the following formula, learning is conducted by calculating the euclidian distance,

$$d(\vec{x}, \vec{w_k}) = \min d(\vec{x}, \vec{w_k}) \qquad (4)$$

W_k (weight improvement) is also used to determine the weight (w) with the smallest distance value (d) as follows,

$\vec{w_k} \leftarrow \vec{w_k} + \eta.(\vec{x} - \vec{w_k})$, when $c_m = / \neq$ y, it is close to each other or part of the set, respectively.

METHODOLOGY

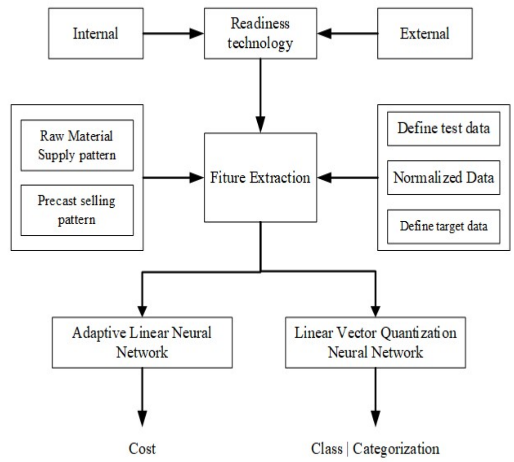

Fig. 3 Study Methodology

The e-readiness technology emphasized the following factors, (1) security, (2) technical issues, (3) software reliability, (4) digital operations for internet usage, and (5) technical skill utilization [25]. The concept of this technical influence also originated from internal and external organizations, as shown in Fig. 3.

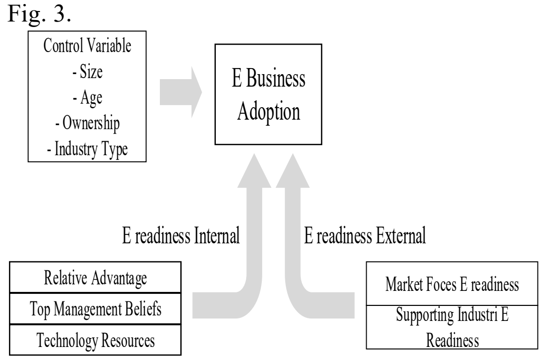

Fig. 4 The concept of e-readiness influence

Based on the external conditions, e-readiness emphasized many factors regarding the case perspective of each corporation in its respective business field. In this study, these factors were limited, including the IT technology infrastructure supporting the precast industry and the vendor market for raw materials. Meanwhile, the internal conditions of this technology focused on related technical improvements, using neural network methods for prediction processes.

Feature Extraction

The internal data sources were the direct measurement of the goods' receipts, regarding the yearly production of raw materials at precast organizations. In this condition, the raw material parameters included cement, sand, and gravel. In preparation for the precast products, a value extraction was also observed for the contributions of the materials and costs, as shown in Fig. 5. This showed that the cement and gravel costs and materials were the largest/lowest and smallest/highest contributions, respectively.

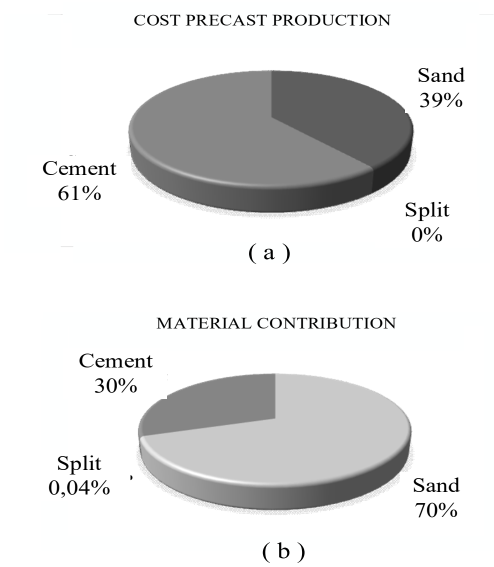

Fig. 5 Cost Contribution (a) production (m^3) and material contribution (b) precast product

The second parameter focused on the monthly-supply behaviour pattern of each raw material for a year, as shown in Fig. 6.

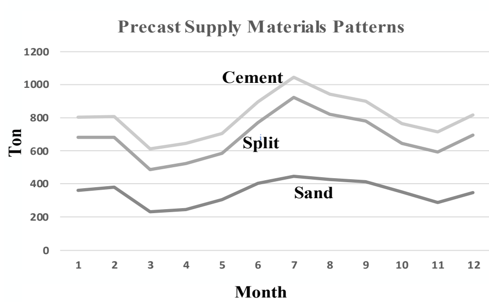

Fig. 6 Annual supply pattern of precast raw materials

Data Test

This emphasized the data of sand, gravel and cement, which were mixed based on the best quality standard of Indonesian concrete category K 500-K 600. These data were obtained according to the order for 12 months, as shown in Table 1.

Table 1 Precast raw material cost

No	Materials	Cost IDR (m^3)
1	Sand	242,000
2	Split	200,000
3	Cement	715,000

Normalized data

The nominal unit of numeric data was normalized to facilitate data processing in the neural network architecture. This indicated that normalization was carried out by mapping into numbers between 0 and 1, as shown in the following formula,

$$X_{Map} = \frac{X_{Original} - X_{\min}}{X_{\max} - X_{\min}} \quad (4)$$

Where :

X_{map} = Normalization Value
$X_{Original}$ = Original Value
X_{max} = Maksimum Value
X_{Min} = Minimum Value

In 2021, the normalization of input variables were also carried out on the price of raw materials, frequency of intermediaries, and volume of transaction costs. Moreover, the target data originated from the average total sales of precast products in the same year.

Target data

The target data contained three vectors, namely the minimum, maximum, and median sales values of the total cost, as shown in Fig. 7.

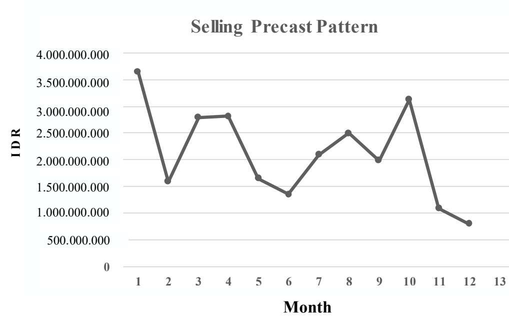

Fig.7 Total precast unit cost for the year.

Based on Fig 7, the optimization patterns of the raw material supply and sales profits were observed when the production target need to achieve 45,000 tons monthly with a minimum unit cost of IDR800 million.

DISCUSSION

Based on the external conditions, the system input parameters included the readiness of IT technology infrastructure, which supported the precast industry and market vendors providing raw materials. In this analysis, the final output was a value within a specified range. Meanwhile, the internal input factors included the monthly frequency of raw material supplies in a year (Tons). Table 2 shows the input and target variables of this analysis.

Table 2 Input Parameter Identification and Prediction

No	Input Parameter	Prediction Parameter	
		Adaline	LVQ
1.	IT Readiness Infrastructure	Monthly Precast Selling Patterns	Decision Classification Level
2.	Level Market Vendor		
3.	Cement Contributions (monthly)		
4.	Split Contributions (monthly)		
5.	Sand Contributions (monthly)		

Architecture Neural Network Adaline

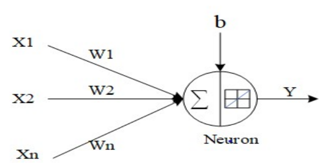

Fig. 8 Adaline Architecture

Based on Fig. 8, five defined input values were observed, indicating a linear activation function between 0 and 1.

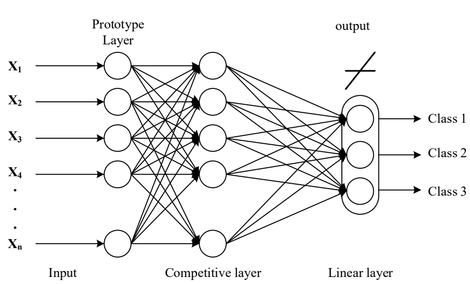

Fig. 9 Linear Vector Quantization Architecture

In Fig. 9. five defined input values were also observed, where a linear classification produced 3 cluster categories.

Simulation Result

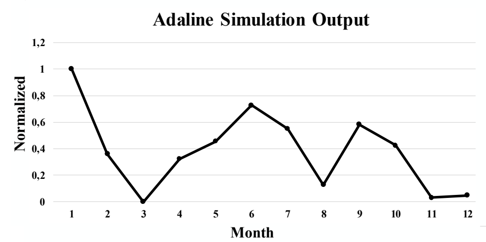

Fig. 10 Adaline Method simulation results

According to Fig. 10, the pattern of obtaining raw materials for precast products fluctuated based on the test data from 2020, through the Adaline method learning for a year. In this condition, the lowest orders were in the 3rd, 8th, 11th, and 12th months when 5 parameters were inputted into this method.

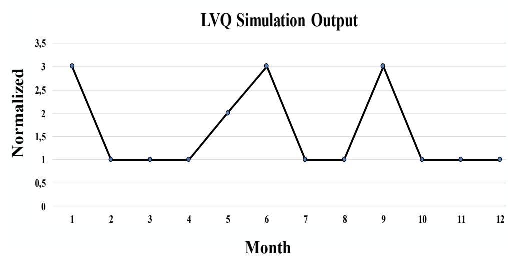

Fig. 11 LVQ Method Simulation Result

Based on Fig. 11, the pattern of obtaining raw materials for precast products also fluctuated regarding the test data from 2020, through the LVQ method learning for a year. This proved that the highest classes and the best values occurred in the 1st, 6th, and 9th months when 5 parameters were inputted into this method, with the lowest orders observed on the 2nd, 3rd, 4th, 7th, 8th, 10th, 11th, and 12th period. In the 5th month, the values obtained were also found not to be very high or low. These actions emphasized the option of maintaining existing raw materials or placing orders regarding the increment of the previous month.

Table 3. Class and Cost Relation

No.	Month	Classes	Cost (IDR)
1	Jan	3	3,644,810
2	Feb	1	1,829,060
3	Mar	1	804,661
4	Apr	1	1,724,870
5	May	2	2,097,578

6	Jun	3	2,872,875
7	Jul	1	2,370,019
8	Aug	1	1,170,018
9	Sep	3	2,464,231
10	Oct	1	2,010,972
11	Nov	1	895,467
12	Dec	1	942,555

According to Table 3, the second and third months had different advantages, although they were in class (1). This was in line with the eighth and eleventh months. The midpoint was also observed in class (2), which occurred in the 5th month. However, the 1st, 6th, and 9th months exhibited quite a large amount of transactions, leading to the significant effects on the order of raw materials and logistics financing considerations.

CONCLUSIONS

Based on these results, cost optimization was conducted by accepting and creating new orders when the conditions were found in class (2). This action was often carried out by observing the trend of the previous month. Due to the high-order rate, the classes also showed that the level of operations need be accelerated and periodically limited when the conditions were categorized in class (3). For class (2), the order for raw materials was only performed by observing the Adaline method simulation, since a tendency was found for the market to absorb precast products in the following month. Furthermore, the application of the neural network method was appropriately implemented when supported by external e-readiness factors, including the which include infrastructure preparedness and many material vendor options. The implementation of this conceptual technology also used 2 neural network models for precast products. This involved the processing and production of similar input values and different decision model simulation, respectively. Irrespective of these differences, a strong correlation was still observed with the time efficiency of the decision-making process. Therefore, bother LVQ and Adaline contributed 50% to this decision approach.

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REFERENCES

[1] D. H. Wisanggeni., Perbandingan Sistem Ditinjau Dari Segi Waktu dan Biaya Pada Proyek My Tower Apartement Surabaya, *Inst. Teknol. Sepuluh Nop.*, 2017.pp 39 - 67

[2] M. Abedi, N. Rawai, M. S. Fathi, and A. K. Mirasa., Cloud Computing Information System Architecture for Precast Supply Chain Management Pelat Konvensional dan Precast Half Slab, *Appl. Mech. Mater.*, 2015, pp. 773–774.

[3] K. S. Im, S. H. Han, B. Koo, and D. Y. Jung., Formulation of a pull production system for optimal inventory control of temporary rebar assembly plants, *Can. J. Civ. Eng.*, vol. 36, no. 9, 2009, pp. 1444-1458.

[4] Z. Yu, Y. Wei, and Z. Cao., The Design and Application of Information Management System Based on IOT for Precast Concrete Segments, in *IOP Conference Series: Earth and Environmental Science*, vol. 371, no. 3, 2019, pp. 1-7.

[5] F. Z. Benhamida, O. Kaddouri, T. Ouhrouche, M. Benaichouche, D. Casado-Mansilla, and D. López-De-Ipiña., Demand forecasting tool for inventory control smart systems, *J. Commun. Softw. Syst.*, 2021, vol. 17, no. 2, pp. 185 - 196

[6] A. Alwadi, A. Gawanmeh, S. Parvin, and J. N. Al-Karaki., Smart solutions for RFID based inventory management systems: A survey, *Scalable Comput.*, vol. 18, no. 4, 2017, pp. 347 - 360.

[7] P. De Giovanni., Smart Supply Chains with vendor managed inventory, coordination, and environmental performance, *Eur. J. Oper. Res.*, vol. 292, no. 2, 2021, pp. 1-42.

[8] C. Ntakolia, C. Kokkotis, P. Karlsson, and S. Moustakidis., An explainable machine learning model for material backorder prediction in inventory management, *Sensors*, vol. 21, no. 23, 2021, pp. 1 - 12.

[9] I. Sangadji, Y. Arvio, and Indrianto., Dynamic Segmentation of Behavior Patterns Based On Quantity Value Movement Using Fuzzy Subtractive Clustering Method, *Journal of Physics: Conference Series*, 2018, vol. 974, no. 1, 2018, pp. 1-7.

[10] A. Parasuraman and C. L. Colby., An Updated and Streamlined Technology Readiness Index: TRI 2.0, *J. Serv. Res.*, vol. 18, no. 1, 2015, pp. 1-16.

[11] A. Wahyudin, R. Desmayanti, Munir, H. B. Santoso, and Z. A. Hasibuan., Business-information systems strategic alignment readiness maturity level: Corporate and business-technology driver perspective, *J. Eng. Sci. Technol.*, vol. 14, no. 3, 2019, pp. 1260 - 1270.

[12] C. F. Motta Toledo, L. De Oliveira, R. De Freitas Pereira, P. M. França, and R. Morabito., A genetic algorithm/mathematical programming approach to solve a two-level soft drink production problem, *Comput. Oper. Res.*, vol. 48, 2014, pp. 40-52.

[13] Z. Citra, B. Susetyo, and P. Wibowo., Optimasi Kinerja Proyek dengan Penerapan Metode

Crashing dan Linear Programming pada Proyek Bulk Godown, *Rekayasa Sipil*, vol. 7, no. 2, 2019, pp. 106 - 113.

[14] M. R. Bordón, J. M. Montagna, and G. Corsano., Mixed integer linear programming approaches for solving the raw material allocation, routing and scheduling problems in the forest industry, *Int. J. Ind. Eng. Comput.*, vol. 11, no. 4, 2020, pp. 525-548.

[15] V. Subotić, M. Eibl, and C. Hochenauer., Artificial intelligence for time-efficient prediction and optimization of solid oxide fuel cell performances, *Energy Convers. Manag.*, vol. 230, 2021, pp. 1-14.

[16] R. Hidayawanti, S. Legino, I. Sangadji, and R. P. A. Widodo., The efficiency of fly ash and cement slag to development building,*Int. J. GEOMATE*, vol. 16, Issue. 57, 2019, pp. 95-100.

[17] R. Hidayawanti, Y. Latief, Y. Rahayu, F. I. Wachid, and R. P. A. Widodo., Utilization Of Ggbfs As Cement Substitute To Reduce Production Cost Of Construction Project, *Int. J. GEOMATE*, vol. 21, Issue. 86, 2021, pp 9-16.

[18] R. Hidayawanti, D. D. Purnama, T. Iduwin, S. Legino, and F. I. Wachid., The impact aggregate quality material as a linear regression study on mixture concrete, *Int. J. GEOMATE*, vol. 18, Issue. 70, 2020, pp. 23-29.

[19] L. Gu, Y. Han, C. Wang, G. Shu, J. Feng, and C. Wang., Inventory prediction based on backpropagation neural network," *NeuroQuantology*, vol. 16, no. 6, 2018, pp. 664-673.

[20] F. Bin Pan., Inventory prediction research based on the improved BP neural network algorithm, *Int. J. Grid Distrib. Comput.*, vol. 9, no. 9, 2016, pp. 307 - 316.

[21] L. Gao and H. Dou., Inventory management of railway logistics park based on artificial neural network, *J. Eur. des Syst. Autom.*, vol. 53, no. 5, 2020, pp. 715 - 723.

[22] M. Du, J. Luo, S. Wang, and S. Liu, Genetic algorithm combined with BP neural network in hospital drug inventory management system, *Neural Comput. Appl.*, vol. 32, no. 7, 2020, pp. 1-14.

[23] P. C. Siswipraptini, R. N. Aziza, I. Sangadji, and I. Indrianto., The design of a smart home controller based on ADALINE, *Telkomnika (Telecommunication Comput. Electron. Control.*, vol. 18, no. 4, 2020, pp. 2177 - 2185.

[24] S. Sahoo, S. Mishra, S. K. Mohapatra, and B. K. Mishra., Clustering deviation analysis on breast cancer using linear vector quantization technique, *Int. J. Control Theory Appl.*, vol. 9, no. 23, 2016, pp. 313 - 324.

[25] M. O. M. Baeuo, N. Z. B. Nor Zairah, and A. A. M. Alaraibi., Technology factors influencing e-government readiness, *J. Theor. Appl. Inf. Technol.*, vol. 95, no. 8, 2017, pp. 1637 - 1645.

Response by Authors to Reviewer's Remarks/Comments

Raw Material Optimization with Neural Network Method in Concrete Production

Authors: Ranti Hidayawanti and Yusuf Latief

No.	Reviewers A-Coments	Authors Response
1.	Numbers and letters written in some charts are small and difficult to read, it is better to correct them.	The authors appreciate the comments from the reviewer, and this has been fixed in high resolution for all figures.
2.	The research results in this paper are based on forecast data throughout the year. In other words, the pattern of material usage during the year is known in advance, so it seems that there is not much difference in changes over time. If so, I think that the factors that affect the unit price of precast can be predicted in advance.	The authors appreciate the comments from the reviewer, that the sentence has been clarified in the 2nd paragraph before the last sentence to avoid bias.

The authors appreciate the valuable comments from the Reviewers.

Ranti Hidayawanti., ST., MM

From:	Prof. Dr. Zakaria Hossain <zakaria@bio.mie-u.ac.jp>
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Dear Colleagues,

Thanks. I am attaching the Receipt GEOMATE 2022 Bangkok (g1).

Best regards.

Prof. Zakaria Hossain
Conference Chairman

INTERNATIONAL CONFERENCE
GEOMATE

22 November 2022

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Attached is a copy of the e-Nametag (Electronic Nametag) for attending The 12th International Conference on Geotechnique, Construction Materials & Environment (GEOMATE2022), Bangkok, Thailand. Please set the e-Nametag as your Zoom background image for ease of identification.

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International Journal of GEOMATE

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Dear Colleagues,

Good morning. Please have a look at the program details attached and submit your presentation file (pdf, ppt, pptx, poster) using the following link. If the file size is too large (bigger than 20MB), convert the ppt file into pdf (Deadline: Nov. 8, 2022).

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Please check the CONFERENCE WEBSITE regularly for any changes in the program and also for announcements.

Best regards.

Professor Dr. Zakaria Hossain
Conference Chairman

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GEOMATE 2022 Program

November 22–24, 2022
Swissôtel Bangkok
Rachada, Thailand

Edited by
Zakaria Hossain
Suksun Horpibulsuk

Welcome Participants

Welcome to the GEOMATE 2022 - The Twelveth International Conference on Geotechnique, Construction Materials and Environment, GEOMATE 2022, Bangkok, Thailand, organized by School of Civil Engineering, Suranaree University of Technology, The GEOMATE International Society, Useful Plant Spread Society, Glorious International, AOI Engineering, HOJUN, JCK, CosmoWinds and Beppu Construction, Japan.

We would like to thank you for your participation, especially the authors who have submitted significant and eventful papers, with most of them here to share their valuable experiences with fellow participants. We appreciate the contribution of session chairpersons, conference advisors, and all those who helped in one way or another to ensure the success of this conference.

The Secretariat desk has been set up to serve you and ensure you participate actively in the deliberations. Please get in touch with any secretariat staff for any assistance you may require during these three days of the conference.

Please wear your name badge at all times during the conference and the associated events, as it will create a friendlier atmosphere where fellow participants can address you by your name. This will also serve as an identification for your participation in the conference activities.

Kindly identify all materials and documentation handed to you or sent by post with your name so that we can return them to you if you have inadvertently forgotten to take them with you. Please regularly check the CONFERENCE WEBSITE and NOTICE BOARD for program changes and announcements.

On behalf of the organizing committee, we invite you to stay on after the conference to enjoy discussions, sights of Bangkok, and the nearby places of interest.

Yours Sincerely,

Professor Dr. Zakaria Hossain
Conference Chairman

22 November 2022

GEOMATE 2022 Program Summary with ID

Day 1: Tuesday, 22 November 2022

14:00-17:00 Registrations

18:00-20:00 Welcome Dinner

Day 2 (Onsite & ZOOM): Wednesday, 23 November 2022

"All online & onsite meeting times are in Thailand time"

08:30-17:00 Registration

09:00-09:10 Opening and Welcome Address

Welcome address by Prof. Dr. Zakaria Hossain

09:10-10:00 Keynote Session

Chair: Prof. Dr. Shinya Inazumi

Speaker: Prof. Dr. Suksun Horpibulsuk

Title: IMPROVED MECHANISTIC PERFORMANCE OF CEMENT- NATURAL RUBBER LATEX STABILIZED SOILS AT VARIOUS TEMPERATURES

Speaker: Prof. Dr. Bashir Ahmed Mir

Title: SOIL BIO-ENGINEERING: A SUSTAINABLE GROUND IMPROVEMENT TECHNIQUE FOR STABILIZATION OF MARGINAL SOILS

10:00-10:30 Morning Refreshments

ROOM A (Moderator 2)	**ROOM B** (Moderator 2)	**ROOM C** (Moderator 2)
08:30-17:00 Registration	**10:30-11:30 Oral/Poster Session 1** Chair: Prof. Radhi Alzubaidi g12105, g12106, g12114, g12121, g12124, g12126	**10:30-11:30 Oral/Poster Session 2** Chair: Dr. Rossy Armyn Machfudiyanto g12112, g12146, g12156, g12157, g12161, g12214
	11:30-12:30 Oral/Poster Session 3 Chair: Prof. Vuttichai Chatpattananan g12130, g12133, g12138, g12140, g12141, g12142	**11:30-12:30 Oral/Poster Session 4** Chair: Dr. Sitthiphat Eua-apiwatch g12221, g12223, g12244, g12250, g12251, g12254
	12:30-13:30 Lunch	**12:30-13:30 Lunch**
	13:30-14:30 Oral/Poster Session 5 Chair: Prof. Cheeming Chan g12148, g12150, g12151, g12154, g12158, g12159	**13:30-14:30 Oral/Poster Session 6** Chair: Prof. Takahiro Nishida g12266, g12267, g12275, g12276, g12302, g12173
	14:30-15:30 Oral/Poster Session 7 Chair: Dr. Osama Daoud g12162, g12169, g12171, g12177, g12184, g12201	**14:30-15:30 Oral/Poster Session 8** Chair: Prof. Takaaki Wajima g12104, g12109, g12116, g12120, g12231, g12286
15:30-16:00	**Journal Publication Guidance (ROOM B)**	
16:00-16:30	**Afternoon Refreshments, Group Photo**	
18:30-20:30	**Banquet & Awards Ceremony**	
20:30	**Adjournment for the Day**	

GEOMATE 2022 Program Summary with ID

Day 3 (Onsite & ZOOM): Thursday, 24 November 2022

"All online & onsite meeting times are in Thailand time"

08:30-17:00 Registration

ROOM A (Moderator 2)	ROOM B (Moderator 2)	ROOM C (Moderator 2)
08:30-17:00 Registration	**09:30-10:30 Oral/Poster Session 9** Chair: Prof. Ryan Ramirez g12205, g12208, g12209, g12225, g12211, g12212 **10:30-11:00: Morning Refreshments** **11:00-12:00 Oral/Poster Session 11** Chair: Prof. Ramanathan Ayothiraman g12215, g12303, g12217, g12218, g12219, g12220 **12:00-13:00 Lunch** **13:00-14:00 Oral/Poster Session 13** Chair: Prof. Salem Alsanusi g12224, g12236, g12237, g12252, g12260, g12261 **14:00-15:50 Oral/Poster Session 15** Chair: Prof. Visa Maria g12264, g12131, g12269, g12243, g12277, g12279, g12280, g12284, g12288, g12311, g12312	**09:30-10:30 Oral/Poster Session 10** Chair: Dr. Ahmad Sana g12137, g12139, g12143, g12152, g12153, g12155 **10:30-11:00: Morning Refreshments** **11:00-12:00 Oral/Poster Session 12** Chair: Dr. Beti Nurbaiti g12165, g12167, g12168, g12172, g12175, g12176 **12:00-13:00 Lunch** **13:00-14:00 Oral/Poster Session 14** Chair: Dr. Achmad Wicaksono g12180, g12185, g12186, g12193, g12194, g12196 **14:00-15:50 Oral/Poster Session 16** Chair: Dr. Vidit Singh g12197, g12203, g12216, g12222, g12238, g12239, g12242, g12293, g12297, g12300, g12310
15:50-16:20	**Journal Publication Guidance (Room B)**	
16:20-16:50	**Afternoon Refreshments, Group Photo**	
16:50	**Closure of Conference**	

Day 4: Friday, 25 November 2022

13:00-17:00 Technical Tour

GEOMATE 2022 – PROGRAM DETAILS

Day 1: Tuesday, 22 November 2022	
14:00-17:00	Registrations
18:00-20:00	Welcome Dinner
Day 2 (Onsite & ZOOM): Wednesday, 23 November 2022 **All online & onsite meeting times are in Thailand time**	
08:30-17:00	Registration **(ROOM A)**
09:00-16:00	**Opening, Keynote and Technical Sessions (ROOM B and C)**
09:10-10:00	**09:00-9:10 Opening and Welcome address** Welcome address by Professor Dr. Zakaria Hossain, Mie University, Japan **09:10-10:00 Keynote Session** **Chair: Prof. Dr. Shinya Inazumi** **Speaker:** Prof. Dr. Suksun Horpibulsuk **Title:** IMPROVED MECHANISTIC PERFORMANCE OF CEMENT- NATURAL RUBBER LATEX STABILIZED SOILS AT VARIOUS TEMPERATURES **Speaker:** Prof. Dr. Bashir Ahmed Mir **Title:** SOIL BIO-ENGINEERING: A SUSTAINABLE GROUND IMPROVEMENT TECHNIQUE FOR STABILIZATION OF MARGINAL SOILS
10:00-10:30	**Morning Refreshments**

Day 2 (Onsite & ZOOM): Wednesday, 23 November 2022 All online & onsite meeting times are in Thailand time	
10:30-11:30	**10:30-11:30 Oral/Poster Session 1 (ROOM B) Wednesday, 23 November 2022** **Chair: Prof. Radhi Alzubaidi** g12105, g12106, g12114, g12121, g12124, g12126 g12105 FINITE ELEMENT ANALYSIS OF BEAM RESTING ON FOOTING Radhi Alzubaidi, Husain M Husain and Samir Shukur g12106 ANALYSIS AND DESIGN ON VARYING THE OFFSET DISTANCES IN SUPERIMPOSED MECHANICALLY STABILIZED EARTH WALLS Vuttichai Chatpattananan and Vatanavongs Ratanavaraha g12114 NUMERICAL ANALYSIS FOR ESTIMATING PULL-OUT RESISTANCE OF FLIP-TYPE GROUND ANCHORS IN SAND GROUNDS Shota Yoshida, Xi Xiong and Tatsunori Matsumoto g12121 SATELLITE-BASED GROUND DEFORMATION MONITORING IN NAGA CITY, CEBU ISLAND IN THE PHILIPPINES Ryan A. Ramirez, Rajiv Eldon E. Abdullah and Christabel Jane P. Rubio g12124 FINITE ELEMENT PARAMETRIC STUDY OF CONTIGUOUS PILE WALL REINFORCEMENT IN A DEEP EXCAVATION Fachrizal Naufal Indrawan, Fikri Faris and Akhmad Aminullah g12126 NUMERICAL ANALYSIS OF INTERSECTING URBAN METRO TUNNELS IN ROCK MASS Isan Dey and Ramanathan Ayothiraman

GEOMATE 2022 – PROGRAM DETAILS

10:30-11:30	**10:30-11:30 Oral/Poster Session 2 (ROOM C) Wednesday, 23 November 2022** **Chair: Dr. Rossy Armyn Machfudiyanto** g12112, g12146, g12156, g12157, g12161, g12214 g12112 PARAMETRIC MODELING OF RECYCLED BRICK AGGREGATE CONCRETE (RBAC) USING ARTIFICIAL NEURAL NETWORK (ANN) AND MULTIPLE LINEAR REGRESSION (MLR) Albert Jr Griño g12146 RAW MATERIAL OPTIMIZATION WITH NEURAL NETWORK METHOD IN CONCRETE PRODUCTION ON PRECAST INDUSTRY Ranti Hidayawanti and Yusuf Latief g12156 EFFECT OF ADMIXED POLYPROPYLENE FIBERS ON CONCRETE PROPERTIES AND SHEAR STRENGTH OF REINFORCED CONCRETE BEAMS Osama Daoud and Reham Ibrahim Ahmed Ibrahim g12157 ADDITION OF SEWAGE SLUDGE ASH TO CONCRETE AS SUBSTITUTE FOR PORTLAND CEMENT Jean-Frank Wagner g12161 STUDY OF THE HEAT EQUATION AND THE EFFECT OF TEMPERATURE INSIDE AN ELECTRIC CABLE CONSISTING OF ALUMINUM AND COPPER METALS Dalal Adnan Maturi g12214 ANALYSIS OF RESOURCE REQUIREMENTS IN A CONSTRUCTION SAFETY PROGRAM TO ESTIMATE COST OF ARCHITECTURAL WORK IN FLATS BUILDING Rossy Armyn Machfudiyanto, Yusuf Latief, Ratih Fitriani and Amira Syifa
11:30-12:30	**11:30-12:30 Oral/Poster Session 3 (ROOM B) Wednesday, 23 November 2022** **Chair: Prof. Vuttichai Chatpattananan** g12130, g12133, g12138, g12140, g12141, g12142 g12130 SLOPE STABILITY DURING EXTREME DAILY RAINFALL: A COMPARATIVE STUDY USING STATIONARY AND NON-STATIONARY GENERALIZED EXTREME VALUE MODEL Thapthai Chaithong g12133 ESTIMATION OF THE ALLOWABLE BEARING CAPACITY OF SOIL IN SOME MUNICIPALITIES OF THE PROVINCE OF PAMPANGA USING NEURAL NETWORKS Carmela Marie A. Lingad and Erica Elice S. Uy g12138 DYNAMIC CENTRIFUGE MODEL TESTS FOR SOIL-BENTONITE VERTICAL CUTOFF WALLS WITH EARTHQUAKE-PROOF PERFOMANCE Koji Watanabe, Daisuke Ueno and Masaaki Hasegawa g12140 REPRODUCTION OF DYNAMIC BEHAVIOUR AND CLASSIFICATION OF FAILURE PATTERNS OF STONEWALLS BY DISTINCT ELEMENT METHOD SIMULATION Satoshi Sugimoto, Kosuke Yamaguchi and Maho Yamaguchi g12141 MPS-CAE SIMULATION FOR JET-GROUTING TECHNIQUE IN GROUND IMPROVEMENTS Sudip Shakya and Shinya Inazumi g12142 PROSPECTS AND MERITS OF USING CALCIUM PHOSPHATE COMPOUNDS FOR SOIL IMPROVEMENT: A REVIEW Maksym Avramenko, Kazunori Nakashima and Satoru Kawasaki

<table>
<tr><td>11:30-12:30</td><td><u>11:30-12:30 Oral/Poster Session 4 (ROOM C) Wednesday, 23 November 2022</u>
Chair: Dr. Sitthiphat Eua-apiwatch
g12221, g12223, g12244, g12250, g12251, g12254

g12221 EXPERIMENTAL STUDY ON SURFACE PROTECTION OF RESTORATIVE BRICK FOR CULTURAL PROPERTIES IN AYUTTHAYA
Yuko Ishida, Masaru Koemoto, Mika Yamada and Hajime Ito

g12223 SELECTION OF RAILWAY BALLAST BASED ON CEMENTING POTENTIAL: A CASE STUDY IN THAILAND
Phitsanu Pholkainuwatra, Sitthiphat Eua-apiwatch and Siam Yimsiri

g12244 RECOVERY AND VALORIZATION OF DEMOLITION AND CONSTRUCTION WASTES SPREAD OVER ALL THE CITY OF CASABLANCA (MOROCCO)
Mourad Morsli, Mohamed Tahiri, Youssef Halimi and Mehdi Maanane

g12250 THE EFFECT OF LDPE PLASTIC WASTE ON THE COMPRESSIVE STRENGTH OF PAVING BLOCKS
Fauzan, Rani Fahmi Zakaria, Dyan Adhitya Nugraha M and Zev Al Jauhari

g12251 FRAGILITY CURVE DEVELOPMENT OF SCHOOL BUILDING IN PADANG CITY WITH AND WITHOUT RETROFITTING DUE TO EARTHQUAKE AND TSUNAMI LOADS
Fauzan, Ruddy Kurniawan, Nandaria Syahdiza and Zev Al Jauhari

g12254 REMEDIATION OF AL-QATIF EXPANSIVE CLAY USING CEMENT KILN DUST, INITIAL ASSESSMENT
Sultan Abdulaziz Almuaythir and Mohamed Farid Abbas</td></tr>
<tr><td>12:30-13:30</td><td>Lunch</td></tr>
<tr><td>13:30-14:30</td><td><u>13:30-14:30 Oral/Poster Session 5 (ROOM B) Wednesday, 23 November 2022</u>
Chair: Prof. Cheeming Chan
g12148, g12150, g12151, g12154, g12158, g12159

g12148 EXPERIMENTAL STUDY ON STATE BOUNDARY SURFACE OF COMPACTED SILTY SOIL
Tufail Ahmad, Riko Kato and Jiro Kuwano

g12150 PERFORMANCE AND BEHAVIOR OF DIAPHRAGM WALL OF UNDERGROUND AUTOMATIC CAR PARK PROJECT IN BANGKOK SUBSOIL
Jirat Teparaksa

g12151 NATURALLY DERIVED CEMENTS FOR CONSTRUCTION AND BUILDING MATERIALS LEARNED FROM THE WISDOM OF ANCESTORS: A LITERATURE REVIEW
Su Zhan, Kazunori Nakashima and Satoru Kawasaki

g12154 EFFECTIVENESS OF SAND COMPACTION PILE AND PREFABRICATED VERTICAL DRAINS IN IMPROVING SOFT SOIL FOR PAVEMENT SUBGRADE
Tanim Shahriar and Shah Md Muniruzzaman

g12158 XRD PATTERNS OF TURBIDITY IN SEEPAGE WATER THROUGH TWO SOIL LAYERS
Shota Takano, Motoyuki Suzuki, Taichi Ishimaru and Asahi Komori

g12159 ESTIMATION OF SUBSURFACE STRUCTURES AND GROUND MOTION CHARACTERISTICS OF ARTIFICIALLY IMPROVED LAND FROM MICROTREMOR OBSERVATIONS – CASE STUDY IN TOTTORI CITY, JAPAN
Isamu Nishimura, Tatsuya Noguchi and Takao Kagawa</td></tr>
</table>

GEOMATE 2022 – PROGRAM DETAILS

13:30-14:30	**13:30-14:30 Oral/Poster Session 6 (ROOM C) Wednesday, 23 November 2022** **Chair: Prof. Takahiro Nishida** g12266, g12267, g12275, g12276, g12302, g12173 g12266 EFFECT OF MACRO-SYNTHETIC POLYPROPYLENE FIBER ON DRYING SHRINKAGE OF SELF-CONSOLIDATING CONCRETE Aris Aryanto and Andy Muliohardjo g12267 ACTIVATION ENERGIES OF CHLORIDE INDUCED CORROSION OF STEEL IN CONCRETE Takahiro Nishida, Keiyu Kawaai and Nobuaki Otsuki g12275 APPLICATION OF DIGITAL IMAGE CORRELATION METHOD IN RC AND FRC BEAMS UNDER BENDING TEST Messa Revolis, Aris Aryanto, Yuki Oribe and Hibino Yo g12276 A STUDY ON METHODS OF SELF-HEALING ASPHALT PAVEMENT Enohmbey Chubisong Moses and Yoshitaka Kajita g12302 PRODUCING VALUABLE 'SAND-LIKE' MATERIAL FROM EXCAVATED MARINE CLAY USING MID-SIZED ROTARY KILN Sathya Subramnian, Juan Wei Koh, Soon Hoe Chew, Y. C. Tan, C. S. Teo, M. Y. C. Koh, T. H. H. Cheung and H.B. G. Foo g12173 CEMENT SOLIDIFICATION CHARACTERISTICS OF COAL CINDERS-MIXED SOIL Shoji Kamao, Kentaro Ishii, Satoshi Shigemura and Yuta Murakami
14:30-15:30	**14:30-15:30 Oral/Poster Session 7 (ROOM B) Wednesday, 23 November 2022** **Chair: Dr. Osama Daoud** g12162, g12169, g12171, g12177, g12184, g12201 g12162 EVALUATION OF VERTICAL BEARING CHARACTERISTICS FOR SOIL-CEMENT COMPOSITE PILES Shohei Koga, Koji Watanabe and Tadahisa Yamamoto g12169 REVIEW ON CONCEPTS, RESEARCH, AND CHALLENGES FOR THE ADOPTION OF PERMEABLE PAVEMENT SYSTEM IN VIETNAM Van Nam Pham, Hoang Giang Nguyen, Tien Dung Nguyen and Ken Kawamoto g12171 INFLUENCE OF FOOTING SIZE AND RELATIVE DENSITY IN ULTIMATE BEARING CAPACITY FORMULA OF STRIP FOOTING ON SANDY SOILS Tahir Iqbal, Satoru Ohtsuka, Koichi Isobe, Yutaka Fukumoto and Kazuhiro Kaneda g12177 SUSTAINABLE SOLUTION TO EXPANSIVE SUBGRADE AND EXISTING PAVEMENT USING GEOCONFINEMENT SYSTEM Lokanantham Logitharan and Umar Ali g12184 EXPERIMENTAL STUDY ON DATA TRANSMISSION USED FOR CONSTRUCTION QUALITY CONFIRMATION OF EMBEDDED PILE CONSTRUCTION METHOD Yasuhide Mochida and Tatsuki Maniwa g12201 NUMERICAL SIMULATION FOR SEDIMENTATION OF SAND PARTICLES IN EXCAVATION STABILIZERS Hiroya Asano, Koki Nakao, Tomotaka Morishita, Toshihiko Miura, Yasuharu Wachi, Kazuhiro Watanabe and Shinya Inazumi

14:30-15:30	**14:30-15:30 Oral/Poster Session 8 (ROOM C) Wednesday, 23 November 2022** **Chair: Prof. Takaaki Wajima** g12104, g12109, g12116, g12120, g12231, g12286 g12104 MATERIAL SOURCE OF MUARAJAMBI TEMPLES, INDONESIA Sondang Martini Siregar, Edy Sutriyono, Ari Siswanto and Agus Aris Munandar g12109 DESALINATION BEHAVIORS FROM SEAWATER USING NATURAL ZEOLITE AND CALCINED CA-FE LAYERED DOUBLE HYDROXIDE FOR CULTIVATION Takaaki Wajima and Fumika Sekihata g12116 MEASUREMENT OF CRACK DISPLACEMENT USING DIGITAL PHOTOGRAMMETRY Afia S. Boney, Satoshi Nishiyama and Teruyuki Kikuchi g12120 STABILITY OF THE MUNICIPAL SOLID WASTE LANDFILL ON SLOPING LAND IN BATU CITY, EAST JAVA, INDONESIA A Rachmansyah, A P Putra, A Darmawan and Harimurti g12231 WASTE TO PRODUCT: POTENTIAL OF MG-RICH GYPSUM ADDITIVE FOR IMPROVEMENT OF PEAT SOIL Ayah Almsedeen, Nurmunira Muhammad and Mohd Fakhrurrazi Ishak g12286 URBAN HEAT SIGNATURE AS MONITORING OF ENVIRONMENTAL HEALTH Adi Wibowo, Iqbal Putut Ash Sidiq, Mariney Binti Mohd Yusoff and Tengku Adeline Adura Binti Tengku Hamzah
15:30-16:00	**Journal Publication Guidance (ROOM B)**
16:00-16:30	**Afternoon Refreshments, Group Photo**
18:30-20:30	**Banquet & Awards Ceremony**
20:30	**Adjournment for the Day**

Day 3 (Onsite & ZOOM): Thursday, 24 November 2022 **All online & onsite meeting times are in Thailand time**	
08:30-17:00	**Registration (ROOM A)**
09:30-10:30	**09:30-10:30 Oral/Poster Session 9 (ROOM B): Thursday, 24 November 2022** **Chair: Prof. Ryan Ramirez** g12205, g12208, g12209, g12225, g12211, g12212 g12205 STRENGTH PROPERTES OF BENTONITE SUBJECTED TO CYCLIC LOADING STRESS Tomoyoshi Nishimura, Seiichi Narushima, Yasunori Arai and Yuki Sakoda g12208 PROPERTIES AND PERFORMANCES OF SOIL CEMENT MODIFIED WITH CONCENTRATED PARA-RUBBER Supathinee Kowsura, Susit Chaiprakaikeow, Apiniti Jotisankasa, Suphawut Malaikrisanachalee, Supakij Nontananandh, Korakod Nusit, Auckpath Sawangsuriya and Shinya Inazumi g12209 NUMERICAL STUDY OF A HYBRID COUNTERMEASURE FOR RIVER EMBANKMENT IN ACTUAL FIELD CASE Kakuta Fujiwara and Enayat Mallyar

	g12225 FLASH CALCINATED SEDIMENT USED IN THE CEM III CEMENT PRODUCTION AND THE POTENTIAL PRODUCTION OF HYDRAULIC BINDER FOR THE ROAD CONSTRUCTION – PART I: CHARACTERIZATION OF CEM III CEMENTS Mahfoud Benzerzour, Duc Chinh Chu, Joelle Kleib, Mouhamadou Amar, Nor-Edine Abriak and Jaouad Nadah g12211 FAILURE INITIATION AND MODES OF HOEK-BROWN ROCK MASSES SURROUNDING UNDERGROUND STORAGE WITH HIGH INTERNAL PRESSURE Apiwish Thongraksa and Pornkasem Jongpradist g12212 EVALATION OF DISPLACEMENT AT GROUND SURFACE DURING GROUNDWATER RECOVERY Sutasinee Intui, Jittiphan Jindawutthiphan, Apinya Rungrueang, Choknimit Leelananthawong, Thanapatsa Srisarn Trpkovski, Kearkkeart Apischotecawankit and Shinya Inazumi
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10:30-11:00	**Morning Refreshments**
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15:50-16:20	**Journal Publication Guidance and Closing Remarks (Room B)**
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16:50	**Closure of Conference**

Day 4: Friday, 25 November 2022	
13:00-17:00	**Technical Tour**

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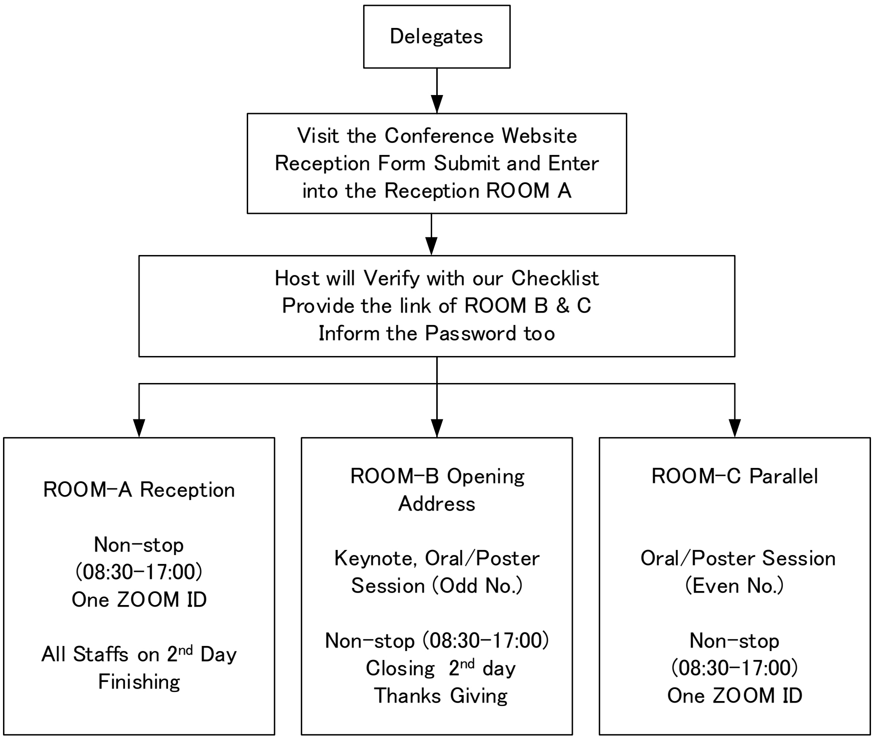

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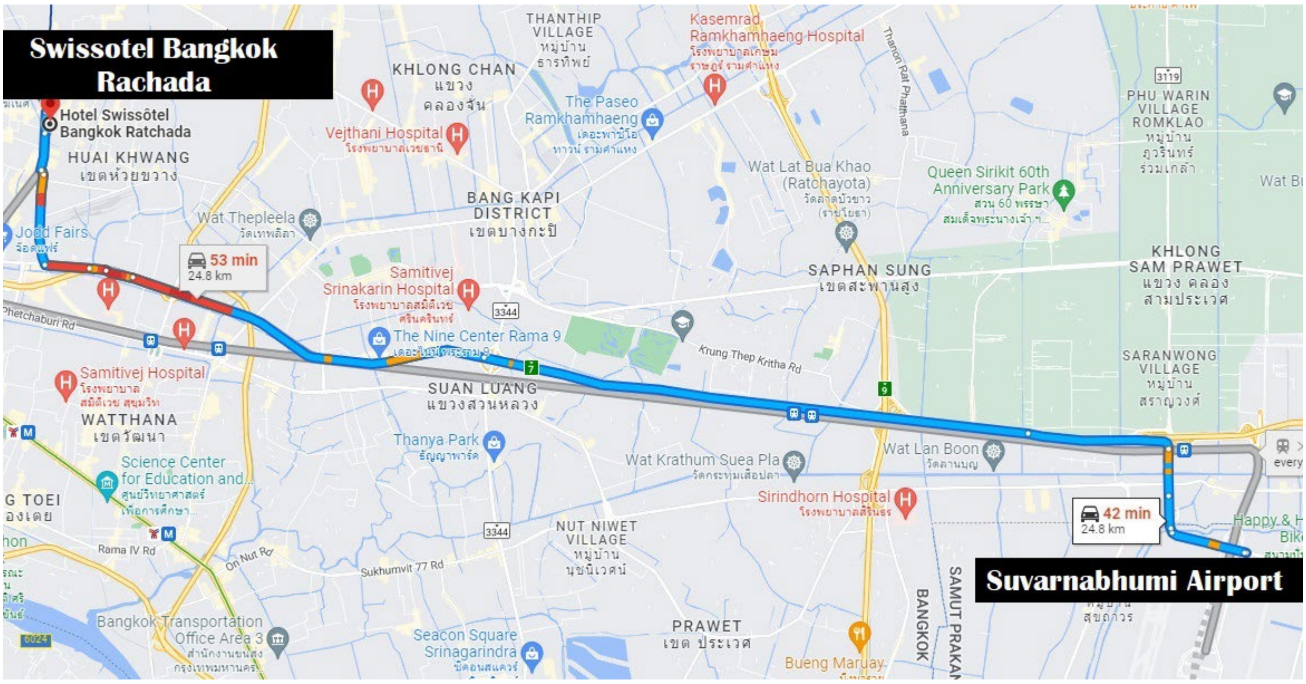

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November 2023

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g12146: Journal Revised paper

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RAW MATERIAL OPTIMIZATION WITH NEURAL NETWORK METHOD IN CONCRETE PRODUCTION ON PRECAST INDUSTRY

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ABSTRACT: The development of construction is presently experiencing rapid growth in Indonesia, leading to the requirement of the right materials for infrastructural enhancements. From the existing infrastructure, concrete innovations such as precasts are needed with good quality materials, for the quick completion of constructions. This is because the need for good quality and smooth material helps to determine the success of a building project, with the use of technology through precast being a problem-solving process. Therefore, this study aims to analyze the patterns by which inventory procurement predictions produce precasts with good quality, using the e readiness framework concept of the neural network through appropriate decision-making processes. It also focuses on innovating technological products used in the Indonesian precast industry. The Methodology Neural Network was used to produce the best target quality time and precast commodities. The result indicated two outputs from 2 neural network models, using five similar input-value variables. Based on the Adaline neural network, the outputs were observed as the highest sales-cost predictions for precast products, which often occurred in 1, 5, 6 and 9 months. Besides this, production activities were also normally operated at level (1), with profit optimization being highly considered before months 1, 5, 6 and 9. For the LVQ neural network, the result was a predictive classification of class intensity levels, where fast decision-making processes occurred in months 1, 6 and 9. Cost optimization was also carried out by ordering raw materials several months in advance, considering the trend in material prices and logistics.

Keywords: Raw Material, Neural Network, Concrete, Precast

1. INTRODUCTION

Concrete is formed by raw material components, namely cement, aggregates, sand and admixture [1] . In its development, concrete technology continues to innovate and develop. The use of cast concrete in place is common, along with its development concrete can be cast elsewhere and when it is formed it is used in buildings according to their needs or what is better known as precast. According to the 2847:2019 standard [2], precast concrete is a structural concrete element that is cast elsewhere from its final position in the structure. In other words, precast is a concrete component with reinforcement that has been printed in a factory and the assembly is carried out at the project site. The use of precast concrete can reduce the duration of work 3,94% - 72,97%, the number of workers 51,33% - 87,45%, budget plan 3,05% - 37,57%, the use of wood as formwork and scaffolding 90,11% -98,81% [3]. Examples of using precast are spunpile used for high-rise building foundations, girders for bridges, facades used for building walls, lining used for retaining walls in rivers. U-Ditch is used for drainage or irrigation channels and Box Culvert is used in waterway construction, so it is often refered to as a sewer.

Currently precast is needed to speed up the execution time, so it doesn’t affect the weather factors, this usage is also eco friendly.

Fig.1 Precast Product Spunpile

The figure above is an example of a precast product, namely a spunpile which is used as a foundation for high-rise buildings. There is also a spunpile type that is in a box form depending on the designation needed in a construction project.

The Indonesian government has been undergoing massive infrastructural development since 2019, with an effect observed in the significant increase in precast products' demand in 2022. Based on these data, precast production was carried out by 76 registered factories, which were distributed throughout the country. Each factory had an increase in production, which varied between 210,000-500,000 tons yearly, to serve the increasing demand.

This indicated that the average monthly production of each organization needs to reach 45,000 tons.

In Indonesia, efficiency is often measured from a cost and time perspective, showing that the use of precast concrete is more efficient than conventional methods [4]. Although this utilization is more efficient, technology-based precast supply chain parameters still need to become effective support. This supply chain is classified into various phases, namely planning, designing, manufacturing, transportation, installation, and construction. To achieve an integrated construction, the parties in these phases need to have efficient communication and effective collaboration in providing accurate and up-to-date information. According to the governmental data, the main problems in the precast supply chain phases began from the following, (1) poor planning, (2) ineffective communication between designers and manufacturers, (3) incompetent employees/workers, (4) damage to raw materials, and (5) large sizes and heavy precast components and coordination in the bad project site. Besides these conditions, the key issues also contributed to negative consequences on the efficiency, productivity and effectiveness of precast delivery [5]. After procurement, the damages to raw materials are often found to affect the quality of the process and precast production during the inventory phase (initial stage). This explains that the procurement division needs to be able to provide the certainty of scheduling receipts for efficient project completion when ordering raw materials. Irrespective of these conditions, practical raw material orders and assembly time have still not been highly considered, leading to the probable effects and implications of excess inventory occurrences and additional project-financing increment, respectively. Therefore, a methodology should be determined for the effective, efficient, and economical control of precast plants' inventory management [6].

The utilization of technology has reportedly been implemented widely, to support the management of raw materials during the inventory processes. This was in line with the raw material control for precast tunnelling projects in China [7], where many businesses were leveraging historical sales and demand data to implement intelligent inventory management systems. Demand forecasting involves predicting/ensuring the consumption/collection of precast raw materials. This plays an important role in the area of inventory control and supply chain, due to enabling production and distribution planning. It is also conditioned to reduce raw material delivery times and optimize decisions on the supply chain [8]. This is to help the developers and operators of inventory management systems in improving efficiency, maximizing productivity, and minimizing material losses [9].

Many studies have also evaluated smart inventory implementation, namely the dynamic brick-and-mortar supply chain analysis. This evaluated the benefits of implementing smart applications and systems to improve Vendor Managed Inventory (VMI) efficiency. In the supply chain mechanism, the manufacturer configured the production level and replenished the inventory at the retailer's store, where prices were set up to affect sales and inventory. In this condition, the company also shared the revenue and inventory costs through an agreement. This condition was very dynamic when inventory increased and decreased at production and sales levels respectively, with periodical variations observed according to several stochastic errors [10]. In this case, the need for accurate predictions led to a more effective and cheap supply chain, as well as allowed companies to provide quality, quantity, periodical, and low-production cost products [11]. Many studies also used other machine learning approaches to map prediction patterns, such as fuzzy subtractive clustering [12].Therefore, this study aims to analyze the patterns by which inventory procurement predictions produce precast products with good quality, using the e-readiness framework concept of the neural network method through appropriate decision-making processes. In this condition, prediction modelling was prepared as part of the application of e-readiness in raw material management. The pattern of obtaining these materials was also used as the best test data, to assess the management model in smart inventory.

2. RESEARCH SIGNIFICANCE

Integration and utilization in the field of precast manufacturing is still not widely found. Integration requires redefining for adjustments in corporate culture in precast companies. The redefinition was carried out for reasons of planning the preparation of raw materials as precast making materials. Optimal material ordering must match the project schedule, raw material repository and technology. Order optimization is carried out with strict monitoring supported by customized e-readiness technology selection. Customize technology selection by implementing 2 neural network models namely; adaptive linear (Adaline) and linear vector quantization (LVQ) are still not common.

3. LITERATURE REVIEW

3.1 E-Readiness

Technology Readiness Index (TRI) 1.0 is constructed based on four-dimensional aspects, namely Optimism, Innovation, Discomfort, and Insecurity [13], as shown in Fig. 1. This is often applied to a company with the Strategic Alignment Maturity Model (SAMM), to determine the utilization level of information systems in all business operations [14]. It is also one of the innovative

references used in managing highly efficient logistics. In addition, TRI is related to the Global Competitiveness and Logistics Performance Indexes (GCI & LPI), as well as other similar supportive dimensions.

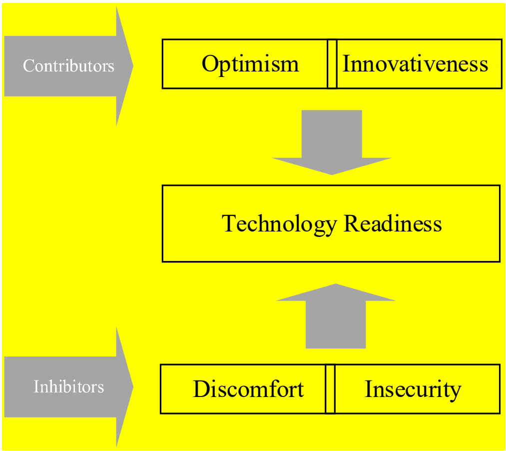

Fig.2 E-Readiness Technology

In precast manufacturing companies, technology is also used in raw material management, by arranging and using a very suitable procedural schedule and method, respectively. Using linear programming methods, Markov models, and genetic algorithms, scheduling often emphasizes the management of time to handle and obtain raw materials [15]–[17]. In this condition, a good inventory receipt system is needed to provide more value during the prediction process, where efficient and periodical systematic performance is a function of operational activities. This helps to reduce time consumption in determining optimal operations in various parameters [18]. Additionally, process quality problems and production cost efficiency are adequately maintained [1], [19], [20].

3.2 Neural Network

The amount of inventory is often related to the company's profit and the entire supply chain's survival. This indicates that prediction processes need to increase the company's ability to prevent risks, improve profits, and reduce losses during the acquisition of inventory, using the backpropagation neural network (BP) method [21], [22]. Some reports were also observed based on the development of technology readiness, such as [23], [24]. This emphasized determining the optimization value of material handling, using a neural network with 2 algorithm methods, namely ALN and LVQ (Adaptive Linear Neuron and Linear Vector Quantization). These methods led to the prediction of cost-benefit into 3 categorical levels, namely high, medium, and low demand, as shown in Fig. 3.

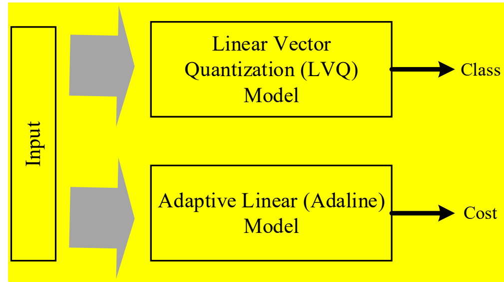

Fig.3 Neural Network Model based on E Readiness

Based on the figure above, even though it uses 2 (two) models, namely the adaptive linear model and Linear vector quantization, both have the same input. Inputs come from Raw material receiving, vendor level and regional and enterprise technology infrastructure.

3.3 Adaline

ADALINE (Adaptive Linear Neuron or later Adaptive Linear Element) is an early single-layer artificial neural network, which is implemented as an algorithm to predict outputs with an automatic controller. Although the accuracy obtained is not satisfactory, the value still changes and becomes highly precise during more data analyses [25]. In the following equation, an input vector (K) is observed with the pattern.

$$X_k=[x_0,\ x_{1k},\ x_{2k},\ \ldots,\ x_{nk}]^T \quad (1)$$

Where X_k = the components of the weights and coefficients. Moreover, a weight vector (Wk) is observed in the Eq. (2) as follows,

$$W_k = [wx_0, w_{1k}, w_{2k}, \ldots, w_{nk}]^T \quad (2),$$

where $y_K = W_K^T X_K$.

Output $$y_k = \sum_{k=1}^{n} X_k W_k + \theta$$

Adaptive learning rule

Learning is also known as the Least Mean Square (LMS), whose rules in this process are observed as follows,

$$W \leftarrow W + \eta(d - o)x \quad (3)$$

3.4 Linear Vektor Equations Quantization (LVQ) Model

This is one of the widely used ANN models (Artificial Neural Network), which emphasizes the prototype of a supervised learning classification algorithm and its network. These are trained through a competitive method similar to the Self-Organizing Map. The clustering technique is also used as a classifier to evaluate the deviations in the data sample through a random or specific density. This shows that performance remains the same with almost all combinations of training and testing [26]. Based on the following formula, learning is conducted by calculating the euclidian distance,

$$d(\vec{x}, \vec{w_k}) = \min d(\vec{x}, \vec{w_k}) \quad (4)$$

W_k (weight improvement) is also used to determine the weight (w) with the smallest distance value (d) as follows,

$\vec{w_k} \leftarrow \vec{w_k} + \eta.(\vec{x} - \vec{w_k})$, when c_m =/≠ y, it is close to each other or part of the set, respectively.

4. METHODOLOGY

Research scenarios or methodologies must be carried out in order to achieve valid and accurate research results. In general, this research was conducted according to the methodology as shown in figure 3 below. Input from the system is in the form of monitoring data from e-readiness technology, processes and neural network learning carried out to achieve cost results and decision classes.

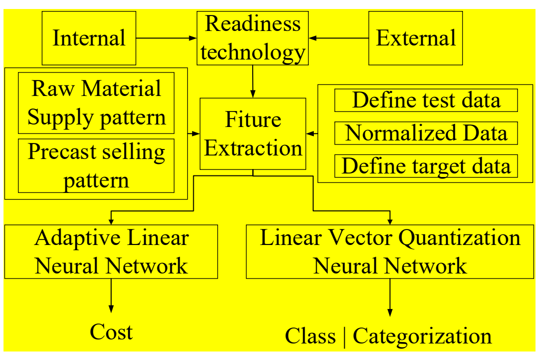

Fig.4 Study Methodology

The e-readiness technology emphasized the following factors, (1) security, (2) technical issues, (3) software reliability, (4) digital operations for internet usage, and (5) technical skill utilization [27]. The concept of this technical influence also originated from internal and external organizations, as shown in Fig.4. Feature Extraction serves to normalize raw material pattern data, precast selling pattern. In addition to also performing categories of data functions and training both neural network architecture models in used. Test data is used as inputs and targets based on monthly data patterns that occur. Internal data e readiness is an advantage to be achieved by making improvements by improving the quality and quantity of company resources. External e readiness is intended to look at competing companies that have the same core business and available infrastructure and can support company performance.

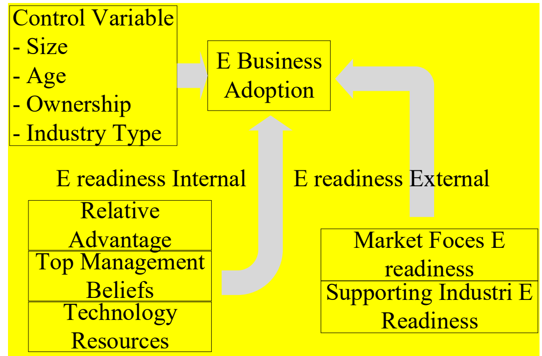

Fig.5 The concept of e-readiness influence

Based on the external conditions, e-readiness emphasized many factors regarding the case perspective of each corporation in its respective business field. In this study, these factors were limited, including the IT technology infrastructure supporting the precast industry and the vendor market for raw materials. Meanwhile, the internal conditions of this technology focused on related technical improvements, using neural network methods for prediction processes.

4.1 Feature Extraction

The internal data sources were the direct measurement of the goods' receipts, regarding the yearly production of raw materials at precast organizations. In this condition, the raw material parameters included cement, sand, and aggregate. In preparation for the precast products, a value extraction was also observed for the contributions of the materials and costs, as shown in Fig.6. This showed that the cement and aggregate costs and materials were the largest/lowest and smallest/highest contributions, respectively.

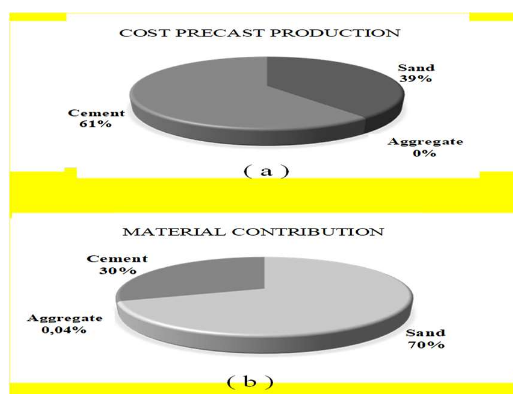

Fig.6 Cost Contribution (a) production (m^3) and material contribution (b) precast product

The second parameter focused on the monthly-supply behaviour pattern of each raw material for a year, as shown in Fig.7.

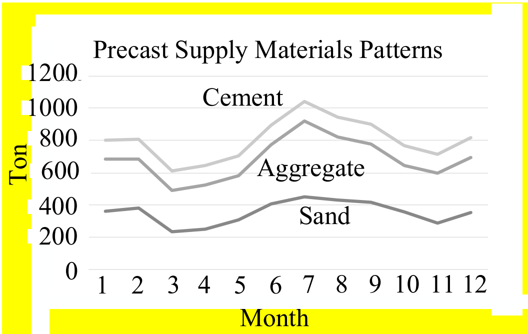

Fig.7 Annual supply pattern of precast raw materials

Based on the pattern that occurs as can be seen in Figure 7, it can be seen that the pattern of each raw material (cement, aggregate and sand) has the same correlation even though it differs in the volume of orders. The data comes from ordering raw materials for a year (12 months). The highest order is cement, aggregate then sand.

4.2 Data Test

This emphasized the data of sand, aggregate and cement, which were mixed based on the best quality standard of Indonesian concrete category K 500-K 600. These data were obtained according to the order for 12 months, as shown in Table 1.

Table 1 Precast raw material cost

No	Materials	Cost IDR (m^3)
1	Sand	242,000
2	Aggregate	200,000
3	Cement	715,000

4.3 Normalized Data

The nominal unit of numeric data was normalized to facilitate data processing in the neural network architecture. This indicated that normalization was carried out by mapping into numbers between 0 and 1, as shown in the following formula,

$$X_{Map} = \frac{X_{Original} - X_{\min}}{X_{\max} - X_{\min}} \quad (4)$$

Where :
X_{map} = Normalization Value
$X_{Original}$ = Original Value
X_{max} = Maksimum Value
X_{Min} = Minimum Value

In 2021, the normalization of input variables were also carried out on the price of raw materials, frequency of intermediaries, and volume of transaction costs. Moreover, the target data originated from the average total sales of precast products in the same year.

4.4 Target Data

The target data contained three vectors, namely the minimum, maximum, and median sales values of the total cost, as shown in Fig.8.

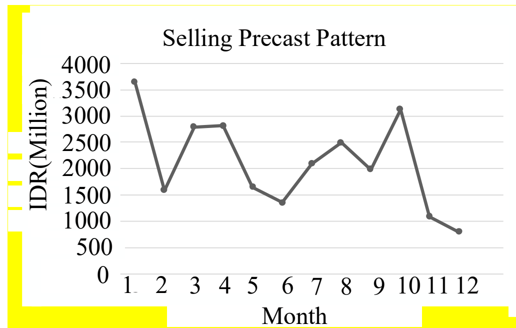

Fig.8 Total precast unit cost for the year.

Based on Fig.8, the optimization patterns of the raw material supply and sales profits were observed when the production target need to achieve 45,000 tons monthly with a minimum unit cost of IDR800 million.

5. DISCUSSION

Based on the external conditions, the system input parameters included the readiness of IT technology infrastructure, which supported the precast industry and market vendors providing raw materials. In this analysis, the final output was a value within a specified range. Meanwhile, the internal input factors included the monthly frequency of raw material supplies in a year (Tons). Table 2 shows the input and target variables of this analysis.

Table 2 Input Parameter Identification and Prediction

No	Input Parameter	Prediction Parameter	
		Adaline	LVQ
1.	IT Readiness Infrastructure	Monthly Precast Selling Patterns	Decision Classification Level
2.	Level Market Vendor		
3.	Cement Contributions (monthly)		
4.	Aggregate Contributions (monthly)		
5.	Sand Contributions (monthly)		

5.1 Architecture Neural Network Adaline

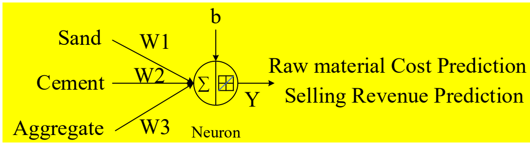

Fig.9 Adaline Architecture

Based on Fig.9, five defined input values were observed, indicating a linear activation function between 0 and 1. The figure describes the neural network architecture of the adaline model. This model uses a single layer of neurons and will carry out the learning process to achieve optimal architectural weights. The optimal architectural weight will produce a number that can be calibrated against the precast sales data pattern.

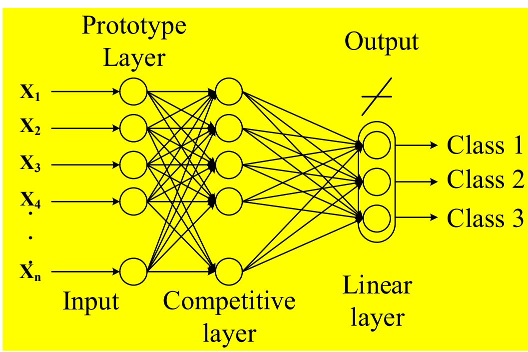

Fig.10 Linear Vector Quantization Architecture

In Fig.10 five defined input values were also observed, where a linear classification produced 3 cluster categories. The figure explains the neural network architecture of the Linear vector quantization model. This model uses competitive layer and linear layer neurons as its output. This architecture will carry out the learning process to achieve optimal architectural weight. Optimal architectural weight will result in a class classification of precast sales data patterns.

5.2 Simulation Result

The final stage of the process in a neural network model is to produce the final result. Simulations are carried out to measure whether the model is functioning as expected. The input parameters, the weights of the neural network learning outcomes to the output parameters will be tested according to their respective functions on the results. The model is declared good if several data scenarios until the output has been achieved.

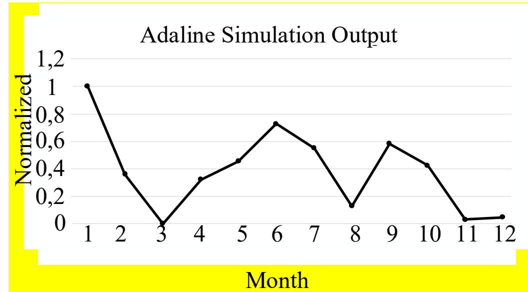

Fig.11 Adaline Method simulation results

According to Fig.11, the pattern of obtaining raw materials for precast products fluctuated based on the test data from 2021, through the Adaline method learning for a year. In this condition, the lowest orders were in the 3rd, 8th, 11th, and 12th months when 5 parameters were inputted into this method.

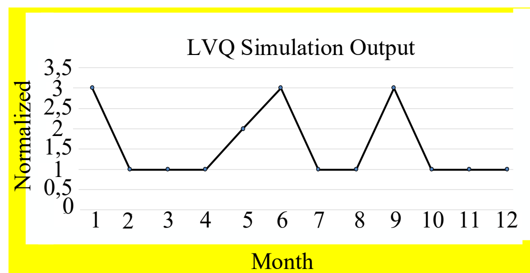

Fig.12 LVQ Method Simulation Result

Based on Fig.12, the pattern of obtaining raw materials for precast products also fluctuated regarding the test data from 2021, through the LVQ method learning for a year. This proved that the highest classes and the best values occurred in the 1st, 6th, and 9th months when 5 parameters were inputted into this method, with the lowest orders observed on the 2nd, 3rd, 4th, 7th, 8th, 10th, 11th, and 12th period. In the 5th month, the values obtained were also found not to be very high or low. These actions emphasized the option of maintaining existing raw materials or placing orders regarding the increment of the previous month.

Table 3 Class and Cost Relation

No.	Month	Classes	Cost (IDR)
1	Jan	3	3,644,810
2	Feb	1	1,829,060
3	Mar	1	804,661
4	Apr	1	1,724,870
5	May	2	2,097,578
6	Jun	3	2,872,875
7	Jul	1	2,370,019

8	Aug	1	1,170,018
9	Sep	3	2,464,231
10	Oct	1	2,010,972
11	Nov	1	895,467
12	Dec	1	942,555

According to Table 3, the second and third months had different advantages, although they were in class (1). This was in line with the eighth and eleventh months. The midpoint was also observed in class (2), which occurred in the 5th month. However, the 1st, 6th, and 9th months exhibited quite a large amount of transactions, leading to the significant effects on the order of raw materials and logistics financing considerations.

6. CONCLUSION

Based on these results, cost optimization was conducted by accepting and creating new orders when the conditions were found in class (2). This action was often carried out by observing the trend of the previous month. Due to the high-order rate, the classes also showed that the level of operations need be accelerated and periodically limited when the conditions were categorized in class (3). For class (2), the order for raw materials was only performed by observing the Adaline method simulation, since a tendency was found for the market to absorb precast products in the following month. Furthermore, the application of the neural network method was appropriately implemented when supported by external e-readiness factors, including the which include infrastructure preparedness and many material vendor options. The implementation of this conceptual technology also used 2 neural network models for precast products. This involved the processing and production of similar input values and different decision model simulation, respectively. Irrespective of these differences, a strong correlation was still observed with the time efficiency of the decision-making process. Therefore, bother LVQ and Adaline contributed 50% to this decision approach.

7. ACKNOWLEDGMENTS

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8. REFERENCES

[1] Hidayawanti R., Legino S., Sangadji I., and Widodo R. P. A., The efficiency of fly ash and cement slag to development building. International Journal of GEOMATE, Vol. 16, Issue 57, 2019, pp 95-100.

[2] Badan Standarisasi Nasional Indonesia, SNI 2847-2019 : Persyaratan Beton Struktural untuk Bangunan Gedung, *Standar Nas. Indones.*, No. 8, 2019, pp. 1-720.

[3] Adiasa A.M., Prakosa D.K. P., Hatmoko J.U.D., Santoso, T.D., Evaluasi Penggunaan Beton Precast di Proyek Konstruksi. Jurnal Karya Tek. Sipil, Vol. 4, No. 1, 2015, pp126-134.

[4] Wisanggeni D.H., Perbandingan Sistem Pelat Konvensional dan Precast Half Slab Ditinjau Dari Segi Waktu dan Biaya Pada Proyek My Tower Apartement Surabaya. Inst. Teknol. Sepuluh Nop., 2017, pp. 39 - 67.

[5] Abedi M., Rawai N., Fathi M.S., and Mirasa A.K., Cloud Computing Information System Architecture for Precast Supply Chain Management. Appl. Mech. Mater., 2015, pp. 773–774.

[6] Im K.S., Han S.H., Koo B., and Do Jung Y., Formulation of a pull production system for optimal inventory control of temporary rebar assembly plants. Canadian. Journal of Civil Engineering., Vol. 36, No. 9, 2009, pp. 1444-1458.

[7] Yu Z., Wei Y., and Cao Z., The Design and Application of Information Management System Based on IOT for Precast Concrete Segments. in *IOP Conference Series: Earth and Environmental Science*, 2019, Vol. 371, No. 3, pp. 1-7.

[8] Benhamida F.Z., Kaddouri O., Ouhrouche T., Benaichouche M., Mansilla D.C., and López-De-Ipiña D., Demand forecasting tool for inventory control smart systems. J. Commun. Softw. Syst., Vol. 17, No. 2, 2021, pp.185 - 196.

[9] Alwaladi A., Gawanmeh A., Parvin S., and Al-Karaki J.N., Smart solutions for RFID based inventory management systems: A survey. Scalable Comput., Vol. 18, No. 4, 2017, pp. 347 - 360.

[10] Giovani P.D., Smart Supply Chains with vendor managed inventory, coordination, and environmental performance. European Journal of Operational Reserarch., Vol. 292, Issue 2, 2021, pp. 1-42.

[11] Ntakolia C., Kokotis C., Karlsson P., and Moustakidis S., An explainable machine learning model for material backorder prediction in inventory management. Sensors, Vol. 21, Issue. 23, 2021, pp 1 - 12.

[12] Sangadji I., Arvio Y., and Indrianto., Dynamic Segmentation of Behavior Patterns Based On Quantity Value Movement Using Fuzzy Subtractive Clustering Method, in Journal of Physics: Conference Series, 2018, Vol. 974, No. 1, pp. 1-7.

[13] Parasuraman A and Colby C.L., An Updated and Streamlined Technology Readiness Index: TRI 2.0. Journal of Service Research.,

Vol. 18, No. 1, 2015, pp. 1-16.
[14] Wahyudin A., Desmayanti R., Santoso H.B., and Hasibuan Z.A., Business-Information Systems Strategic Alignment Readiness Maturity Level: Corporate and Business-Technology Driver Perspective, J. Eng. Sci. Technol., Vol. 14, No. 3, 2019, pp. 1260 - 1270.
[15] Motta Toledo C. F., De Oliveira L., R. De Freitas Pereira R., França P. M., and Morabito R., A genetic algorithm/mathematical programming approach to solve a two-level soft drink production problem. Journal Computers & Operation Reserach., Vol. 48, 2014, pp. 40-52.
[16] Citra Z., Susetyo B., and Wibowo P., Optimasi Kinerja Proyek dengan Penerapan Metode Crashing dan Linear Programming pada Proyek Bulk Godown. Rekayasa Sipil, Vol. 7, No. 2, 2019, pp. 106-113.
[17] Bordón M. R., Montagna J. M., and Corsano C, Mixed integer linear programming approaches for solving the raw material allocation, routing and scheduling problems in the forest industry. Int. J. Ind. Eng. Comput., Vol. 11, Issue 4, 2020, pp. 525 - 548.
[18] Subotić V., Eibl M., and Hochenauer C., Artificial intelligence for time-efficient prediction and optimization of solid oxide fuel cell performances. Energy Convers. Manag., Vol. 230, 2021, pp. 1-14.
[19] Hidayawanti R., Latief Y., Rahayu Y., Wachid F. I, and Widodo R.P.A., Utilization Of GGBFS As Cement Substitute To Reduce Production Cost Of Construction Project. International Journal of GEOMATE, Vol. 21, Issue 86, 2021, pp 9-16.
[20] Hidayawanti R., Purnama D. D., Iduwin T., Legino S., and Wachid F. I., The impact aggregate quality material as a linear regression study on mixture concrete. International Journal of GEOMATE, Vol. 18, Issue 70, 2020, pp. 23-29.
[21] Gu L., Han Y., Wang C., Shu G., Feng J., and Wang C., Inventory Prediction Based on Backpropagation Neural Network. *NeuroQuantology*, Vol. 16, No. 6, 2018, pp. 664-673.
[22] Bin Pan F., Inventory Prediction Research Based on the Improved BP Neural Network Algorithm. Int. J. Grid Distrib. Comput., Vol. 9, No. 9, 2016, pp. 307 - 316.
[23] Gao L. and Dou H., Inventory Management of Railway Logistics Park Based on Artificial Neural Network. J. Eur. des Syst. Autom., Vol. 53, No. 5, 2020, pp. 715 - 723.
[24] Du M., Luo J., Wang S., and Liu S., Genetic algorithm combined with BP neural network in hospital drug inventory management system. Neural Comput. Appl., Vol. 32, No. 7, 2020, pp. 1-14.
[25] Siswipraptini P. C., Aziza N., Sangadji I., and Indrianto., The design of a smart home controller based on ADALINE. *Telkomnika* Vol. 18, No. 4, 2020, pp. 2177 - 2185.
[26] Sahoo S., Mishra S., Mohapatra S. K., and Mishra B. K., Clustering deviation analysis on breast cancer using linear vector quantization technique. Int. J. Control Theory Appl., Vol. 9, No. 23, 2016. pp. 313 - 324.
[27] Baeuo M. O. M., Rahim N. Z. B., and Alaraibi A. A. M., Technology factors influencing e-government readiness. J. Theor. Appl. Inf. Technol., Vol. 95, No. 8, 2017, pp. 1637 - 1645.

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3. Authors' Contributions (Please write all authors' contributions here)

Ranti Hidayawanti : Conception, design, acquisition, analysis, and interpretation of data and drafting the article.

Prof. Yusuf Latief: Critical reviewing and final approval of the version to be submitted.

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Raw Material Optimization with Neural Network Method in Concrete Production

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1.	Numbers and letters written in some charts are small and difficult to read, it is better to correct them.	The authors appreciate the comments from the reviewer, and this has been fixed in high resolution for all figures.
2.	The research results in this paper are based on forecast data throughout the year. In other words, the pattern of material usage during the year is known in advance, so it seems that there is not much difference in changes over time. If so, I think that the factors that affect the unit price of precast can be predicted in advance.	The authors appreciate the comments from the reviewer, that the sentence has been clarified in the 5th paragraph in the third sentence to avoid bias.

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RAW MATERIAL OPTIMIZATION WITH NEURAL NETWORK METHOD IN CONCRETE PRODUCTION ON PRECAST INDUSTRY

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ABSTRACT: The development of construction is presently experiencing rapid growth in Indonesia, leading to the requirement of the right materials for infrastructural enhancements. From the existing infrastructure, concrete innovations such as precasts are needed with good quality materials, for the quick completion of constructions. This is because the need for good quality and smooth material helps to determine the success of a building project, with the use of technology through precast being a problem-solving process. Therefore, this study aims to analyze the patterns by which inventory procurement predictions produce precasts with good quality, using the e readiness framework concept of the neural network through appropriate decision-making processes. It also focuses on innovating technological products used in the Indonesian precast industry. The Methodology Neural Network was used to produce the best target quality time and precast commodities. The result indicated two outputs from 2 neural network models, using five similar input-value variables. Based on the Adaline neural network, the outputs were observed as the highest sales-cost predictions for precast products, which often occurred in 1, 5, 6 and 9 months. Besides this, production activities were also normally operated at level (1), with profit optimization being highly considered before months 1, 5, 6 and 9. For the LVQ neural network, the result was a predictive classification of class intensity levels, where fast decision-making processes occurred in months 1, 6 and 9. Cost optimization was also carried out by ordering raw materials several months in advance, considering the trend in material prices and logistics.

Keywords: Raw Material, Neural Network, Concrete, Precast

1. INTRODUCTION

Concrete is formed by raw material components, namely cement, aggregates, sand and admixture [1]. In its development, concrete technology continues to innovate and develop. The use of cast concrete in place is common, along with its development concrete can be cast elsewhere and when it is formed it is used in buildings according to their needs or what is better known as precast. According to the 2847:2019 standard [2], precast concrete is a structural concrete element that is cast elsewhere from its final position in the structure. In other words, precast is a concrete component with reinforcement that has been printed in a factory and the assembly is carried out at the project site. The use of precast concrete can reduce the duration of work 3,94% - 72,97%, the number of workers 51,33% - 87,45%, budget plan 3,05% - 37,57%, the use of wood as formwork and scaffolding 90,11% -98,81% [3]. Examples of using precast are spunpile used for high-rise building foundations, girders for bridges, facades used for building walls, lining used for retaining walls in rivers. U-Ditch is used for drainage or irrigation channels and Box Culvert is used in waterway construction, so it is often refered to as a sewer.

Currently precast is needed to speed up the execution time, so it doesn't affect the weather factors, this usage is also eco friendly.

Fig. 1 Precast Product Spunpile

The figure above is an example of a precast product, namely a spunpile which is used as a foundation for high-rise buildings. There is also a spunpile type that is in a box form depending on the designation needed in a construction project.

The Indonesian government has been undergoing massive infrastructural development since 2019, with an effect observed in the significant increase in precast products' demand in 2022. Based on these data, precast production was carried out by 76 registered factories, which were distributed throughout the country. Each factory had an increase in production, which varied between 210,000-500,000 tons yearly, to serve the increasing demand.

This indicated that the average monthly production of each organization needs to reach 45,000 tons.

In Indonesia, efficiency is often measured from a cost and time perspective, showing that the use of precast concrete is more efficient than conventional methods [4]. Although this utilization is more efficient, technology-based precast supply chain parameters still need to become effective support. This supply chain is classified into various phases, namely planning, designing, manufacturing, transportation, installation, and construction. To achieve an integrated construction, the parties in these phases need to have efficient communication and effective collaboration in providing accurate and up-to-date information. According to the governmental data, the main problems in the precast supply chain phases began from the following, (1) poor planning, (2) ineffective communication between designers and manufacturers, (3) incompetent employees/workers, (4) damage to raw materials, and (5) large sizes and heavy precast components and coordination in the bad project site. Besides these conditions, the key issues also contributed to negative consequences on the efficiency, productivity and effectiveness of precast delivery [5]. After procurement, the damages to raw materials are often found to affect the quality of the process and precast production during the inventory phase (initial stage). This explains that the procurement division needs to be able to provide the certainty of scheduling receipts for efficient project completion when ordering raw materials. Irrespective of these conditions, practical raw material orders and assembly time have still not been highly considered, leading to the probable effects and implications of excess inventory occurrences and additional project-financing increment, respectively. Therefore, a methodology should be determined for the effective, efficient, and economical control of precast plants' inventory management [6].

The utilization of technology has reportedly been implemented widely, to support the management of raw materials during the inventory processes. This was in line with the raw material control for precast tunnelling projects in China [7], where many businesses were leveraging historical sales and demand data to implement intelligent inventory management systems. Demand forecasting involves predicting/ensuring the consumption/collection of precast raw materials. This plays an important role in the area of inventory control and supply chain, due to enabling production and distribution planning. It is also conditioned to reduce raw material delivery times and optimize decisions on the supply chain [8]. This is to help the developers and operators of inventory management systems in improving efficiency, maximizing productivity, and minimizing material losses [9].

Many studies have also evaluated smart inventory implementation, namely the dynamic brick-and-mortar supply chain analysis. This evaluated the benefits of implementing smart applications and systems to improve Vendor Managed Inventory (VMI) efficiency. In the supply chain mechanism, the manufacturer configured the production level and replenished the inventory at the retailer's store, where prices were set up to affect sales and inventory. In this condition, the company also shared the revenue and inventory costs through an agreement. This condition was very dynamic when inventory increased and decreased at production and sales levels respectively, with periodical variations observed according to several stochastic errors [10]. In this case, the need for accurate predictions led to a more effective and cheap supply chain, as well as allowed companies to provide quality, quantity, periodical, and low-production cost products [11]. Many studies also used other machine learning approaches to map prediction patterns, such as fuzzy subtractive clustering [12].Therefore, this study aims to analyze the patterns by which inventory procurement predictions produce precast products with good quality, using the e-readiness framework concept of the neural network method through appropriate decision-making processes. In this condition, prediction modelling was prepared as part of the application of e-readiness in raw material management. The pattern of obtaining these materials was also used as the best test data, to assess the management model in smart inventory.

2. RESEARCH SIGNIFICANCE

Integration and utilization in the field of precast manufacturing is still not widely found. Integration requires redefining for adjustments in corporate culture in precast companies. The redefinition was carried out for reasons of planning the preparation of raw materials as precast making materials. Optimal material ordering must match the project schedule, raw material repository and technology. Order optimization is carried out with strict monitoring supported by customized e-readiness technology selection. Customize technology selection by implementing 2 neural network models namely; adaptive linear (Adaline) and linear vector quantization (LVQ) are still not common.

3. LITERATURE REVIEW

3.1 E-Readiness

Technology Readiness Index (TRI) 1.0 is constructed based on four-dimensional aspects, namely Optimism, Innovation, Discomfort, and Insecurity [13], as shown in Fig. 1. This is often applied to a company with the Strategic Alignment Maturity Model (SAMM), to determine the utilization level of information systems in all business operations [14]. It is also one of the innovative

references used in managing highly efficient logistics. In addition, TRI is related to the Global Competitiveness and Logistics Performance Indexes (GCI & LPI), as well as other similar supportive dimensions.

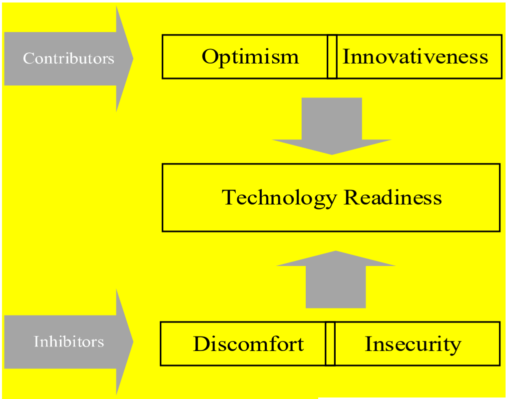

Fig. 2 E-Readiness Technology

In precast manufacturing companies, technology is also used in raw material management, by arranging and using a very suitable procedural schedule and method, respectively. Using linear programming methods, Markov models, and genetic algorithms, scheduling often emphasizes the management of time to handle and obtain raw materials [15]–[17].

In this condition, a good inventory receipt system is needed to provide more value during the prediction process, where efficient and periodical systematic performance is a function of operational activities. This helps to reduce time consumption in determining optimal operations in various parameters [18]. Additionally, process quality problems and production cost efficiency are adequately maintained [1], [19], [20].

3.2 Neural Network

The amount of inventory is often related to the company's profit and the entire supply chain's survival. This indicates that prediction processes need to increase the company's ability to prevent risks, improve profits, and reduce losses during the acquisition of inventory, using the backpropagation neural network (BP) method [21], [22]. Some reports were also observed based on the development of technology readiness, such as [23], [24]. This emphasized determining the optimization value of material handling, using a neural network with 2 algorithm methods, namely ADALINE (Adaptive Lenear Neuron) and LVQ (Linear Vector Quantization). ADALINE network functions to perform cost projection. LVQ model function led to the prediction of cost-benefit into 3 categorical levels, namely high, medium, and low demand, as shown in figure 3.

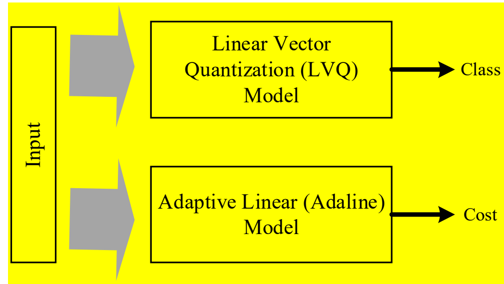

Fig. 3 Neural Network Model based on E Readiness

Based on the figure above, even though it uses 2 (two) models, namely the adaptive linear model and Linear vector quantization, both have the same input. Inputs come from Raw material receiving, vendor level and regional and enterprise technology infrastructure.

3.3 Adaline

ADALINE (Adaptive Linear Neuron or later Adaptive Linear Element) is an early single-layer artificial neural network, which is implemented as an algorithm to predict outputs with an automatic controller. Although the accuracy obtained is not satisfactory, the value still changes and becomes highly precise during more data analyses [25]. In the following equation, an input vector (K) is observed with the pattern.

$$X_k=[x_0, \quad x_{1k}, \quad x_{2k}, \quad \ldots, \quad x_{nk}]^T \quad (1)$$

Where X_k = the components of the weights and coefficients. Moreover, a weight vector (Wk) is observed in the Eq. (2) as follows,

$$W_k = [wx_0, w_{1k}, w_{2k}, \ldots, w_{nk}]^T \quad (2),$$

where $y_K = W_K^T X_K$.

Output $$y_k = \sum_{k=1}^{n} X_k W_k + \theta$$

Adaptive learning rule

Learning is also known as the Least Mean Square (LMS), whose rules in this process are observed as follows,

$$W \leftarrow W + \eta(d - o)x \quad (3)$$

3.4 Linear Vektor Equations Quantization (LVQ) Model

This is one of the widely used ANN models (Artificial Neural Network), which emphasizes the prototype of a supervised learning classification algorithm and its network. These are trained through a competitive method similar to the Self-Organizing Map. The clustering technique is also used as a classifier to evaluate the deviations in the data sample through a random or specific density. This shows that performance remains the same with almost all combinations of training and testing [26]. Based on the following formula, learning is conducted by calculating the euclidian distance,

$$d(\vec{x}, \vec{w}_k) = \min d(\vec{x}, \vec{w}_k) \quad (4)$$

W_k (weight improvement) is also used to determine the weight (w) with the smallest distance value (d) as follows,

$\vec{w}_k \leftarrow \vec{w}_k + \eta.(\vec{x} - \vec{w}_k)$, when $c_m =/\neq$ y, it is close to each other or part of the set, respectively.

4. METHODOLOGY

Research scenarios or methodologies must be carried out in order to achieve valid and accurate research results. In general, this research was conducted according to the methodology as shown in figure 4 below. Input from the system is in the form of monitoring data from e-readiness technology, processes and neural network learning carried out to achieve cost results and decision classes.

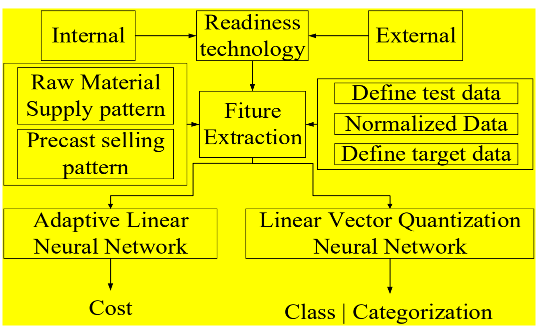

Fig. 4 Study Methodology

The e-readiness technology emphasized the following factors, (1) security, (2) technical issues, (3) software reliability, (4) digital operations for internet usage, and (5) technical skill utilization [27]. The concept of this technical influence also originated from internal and external organizations, as shown in figure 4. Feature Extraction serves to normalize raw material pattern data, precast selling pattern. In addition to also performing categories of data functions and training both neural network architecture models in used. Test data is used as inputs and targets based on monthly data patterns that occur. Internal data e readiness is an advantage to be achieved by making improvements by improving the quality and quantity of company resources. External e readiness is intended to look at competing companies that have the same core business and available infrastructure and can support company performance.

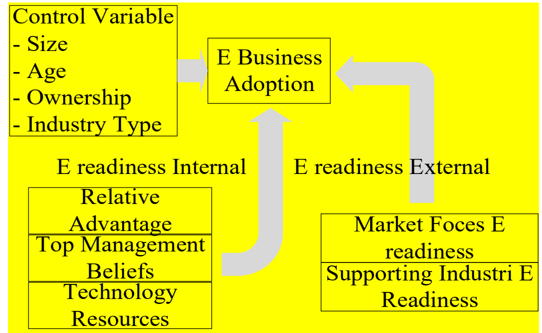

Fig. 5 The concept of e-readiness influence

Based on the external conditions, e-readiness emphasized many factors regarding the case perspective of each corporation in its respective business field. In this study, these factors were limited, including the IT technology infrastructure supporting the precast industry and the vendor market for raw materials. Meanwhile, the internal conditions of this technology focused on related technical improvements, using neural network methods for prediction processes.

4.1 Feature Extraction

The internal data sources were the direct measurement of the goods' receipts, regarding the yearly production of raw materials at precast organizations. In this condition, the raw material parameters included cement, sand, and aggregate. In preparation for the precast products, a value extraction was also observed for the contributions of the materials and costs, as shown in figure 6. This showed that the cement and aggregate costs and materials were the largest/lowest and smallest/highest contributions, respectively.

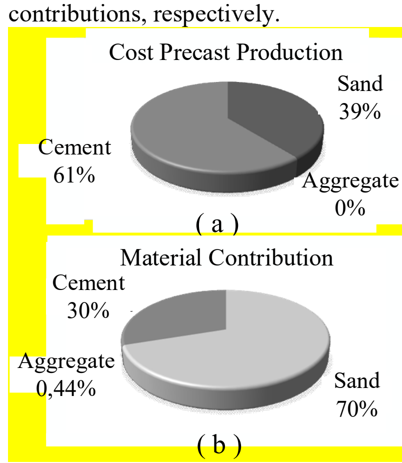

Fig. 6 Cost Contribution (a) production (m^3) and material contribution (b) precast product

The second parameter focused on the monthly-supply behaviour pattern of each raw material for a year, as shown in figure 7.

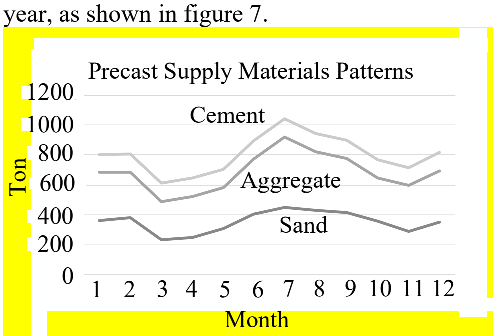

Fig. 7 Annual supply pattern of precast raw materials

Based on the pattern that occurs as can be seen in Figure 7, it can be seen that the pattern of each raw material (cement, aggregate and sand) has the same correlation even though it differs in the volume of orders. The data comes from ordering raw materials for a year (12 months). The highest order is cement, aggregate then sand.

4.2 Data Test

This emphasized the data of sand, aggregate and cement, which were mixed based on the best quality standard of Indonesian concrete category K 500-K 600. These data were obtained according to the order for 12 months, as shown in table 1.

Table 1 Precast raw material cost

No	Materials	Cost IDR (m^3)
1	Sand	242,000
2	Aggregate	200,000
3	Cement	715,000

4.3 Normalized Data

The nominal unit of numeric data was normalized to facilitate data processing in the neural network architecture. This indicated that normalization was carried out by mapping into numbers between 0 and 1, as shown in the following formula,

$$X_{Map} = \frac{X_{Original} - X_{\min}}{X_{\max} - X_{\min}} \quad (4)$$

Where :
X_{map} = Normalization Value
$X_{Original}$ = Original Value
X_{max} = Maksimum Value
X_{Min} = Minimum Value

In 2021, the normalization of input variables were also carried out on the price of raw materials, frequency of intermediaries, and volume of transaction costs. Moreover, the target data originated from the average total sales of precast products in the same year.

4.4 Target Data

The target data contained three vectors, namely the minimum, maximum, and median sales values of the total cost, as shown in figure 8.

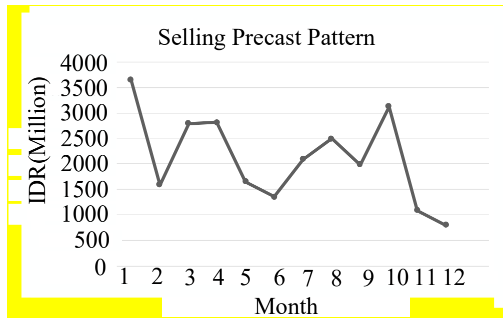

Fig. 8 Total precast unit cost for the year.

Based on figure 8, the optimization patterns of the raw material supply and sales profits were observed when the production target need to achieve 45,000 tons monthly with a minimum unit cost of IDR800 million.

5. DISCUSSION

Based on the external conditions, the system input parameters included the readiness of IT technology infrastructure, which supported the precast industry and market vendors providing raw materials. In this analysis, the final output was a value within a specified range. Meanwhile, the internal input factors included the monthly frequency of raw material supplies in a year (Tons). Table 2 shows the input and target variables of this analysis.

Table 2 Input Parameter Identification and Prediction

No	Input Parameter	Prediction Parameter	
		Adaline	LVQ
1.	IT Readiness Infrastructure	Monthly Precast Selling Patterns	Decision Classification Level
2.	Level Market Vendor		
3.	Cement Contributions (monthly)		
4.	Aggregate Contributions (monthly)		
5.	Sand Contributions (monthly)		

5.1 Architecture Neural Network Adaline

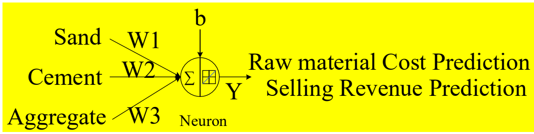

Fig. 9 Adaline Architecture

Based on figure 9, five defined input values were observed, indicating a linear activation function between 0 and 1. The figure describes the neural network architecture of the adaline model. This model uses a single layer of neurons and will carry out the learning process to achieve optimal architectural weights. The optimal architectural weight will produce a number that can be calibrated against the precast sales data pattern.

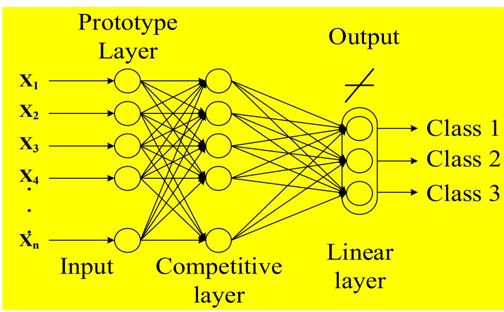

Fig. 10 Linear Vector Quantization Architecture

In figure 10 five defined input values were also observed, where a linear classification produced 3 cluster categories. The figure explains the neural network architecture of the Linear vector quantization model. This model uses competitive layer and linear layer neurons as its output. This architecture will carry out the learning process to achieve optimal architectural weight. Optimal architectural weight will result in a class classification of precast sales data patterns.

5.2 Simulation Result

The final stage of the process in a neural network model is to produce the final result. Simulations are carried out to measure whether the model is functioning as expected. The input parameters, the weights of the neural network learning outcomes to the output parameters will be tested according to their respective functions on the results. The model is declared good if several data scenarios until the output has been achieved.

Scenarios from the data will be tested according of the upper limit value and lower limit value of the data pattern.

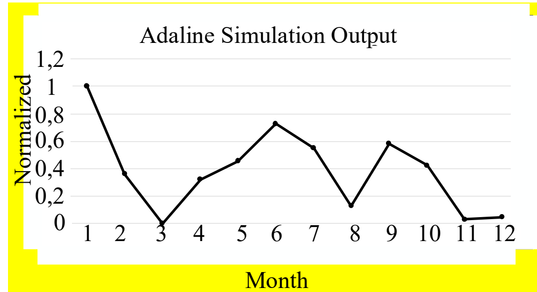

Fig. 11 Adaline Method simulation results

According to figure 11, the pattern of obtaining raw materials for precast products fluctuated based on the test data from 2021, through the Adaline method learning for a year. In this condition, the lowest orders were in the 3rd, 8th, 11th, and 12th months when 5 parameters were inputted into this method.

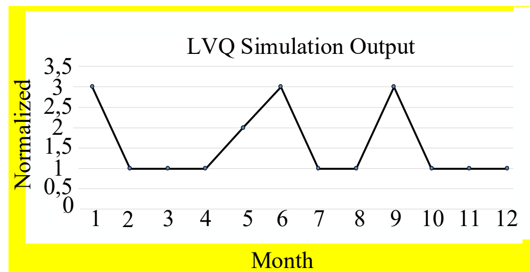

Fig. 12 LVQ Method Simulation Result

Based on figure 12, the pattern of obtaining raw materials for precast products also fluctuated regarding the test data from 2021, through the LVQ method learning for a year. This proved that the highest classes and the best values occurred in the 1st, 6th, and 9th months when 5 parameters were inputted into this method, with the lowest orders observed on the 2nd, 3rd, 4th, 7th, 8th, 10th, 11th, and 12th period. In the 5th month, the values obtained were also found not to be very high or low. These actions emphasized the option of maintaining existing raw materials or placing orders regarding the increment of the previous month.

Table 3 Class and Cost Relation

No.	Month	Classes	Cost (IDR)
1	Jan	3	3,644,810
2	Feb	1	1,829,060
3	Mar	1	804,661
4	Apr	1	1,724,870
5	May	2	2,097,578
6	Jun	3	2,872,875
7	Jul	1	2,370,019

8	Aug	1	1,170,018
9	Sep	3	2,464,231
10	Oct	1	2,010,972
11	Nov	1	895,467
12	Dec	1	942,555

According to table 3, the second and third months had different advantages, although they were in class (1). This was in line with the eighth and eleventh months. The midpoint was also observed in class (2), which occurred in the 5th month. However, the 1st, 6th, and 9th months exhibited quite a large amount of transactions, leading to the significant effects on the order of raw materials and logistics financing considerations.

6. CONCLUSION

Based on these results, cost optimization was conducted by accepting and creating new orders when the conditions were found in class (2). This action was often carried out by observing the trend of the previous month. Due to the high-order rate, the classes also showed that the level of operations need be accelerated and periodically limited when the conditions were categorized in class (3). For class (2), the order for raw materials was only performed by observing the Adaline method simulation, since a tendency was found for the market to absorb precast products in the following month. Furthermore, the application of the neural network method was appropriately implemented when supported by external e-readiness factors, including the which include infrastructure preparedness and many material vendor options. The implementation of this conceptual technology also used 2 neural network models for precast products. This involved the processing and production of similar input values and different decision model simulation, respectively. Irrespective of these differences, a strong correlation was still observed with the time efficiency of the decision-making process. Therefore, bother LVQ and Adaline contributed 50% to this decision approach.

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8. REFERENCES

[1] Hidayawanti R., Legino S., Sangadji I., and Widodo R. P. A., The efficiency of fly ash and cement slag to development building. International Journal of GEOMATE, Vol. 16, Issue 57, 2019, pp 95-100.

[2] Badan Standarisasi Nasional Indonesia, SNI 2847-2019 : Persyaratan Beton Struktural untuk Bangunan Gedung, *Standar Nas. Indones.*, No. 8, 2019, pp. 1-720.

[3] Adiasa A.M., Prakosa D.K. P., Hatmoko J.U.D., Santoso, T.D., Evaluasi Penggunaan Beton Precast di Proyek Konstruksi. Jurnal Karya Tek. Sipil, Vol. 4, No. 1, 2015, pp126-134.

[4] Wisanggeni D.H., Perbandingan Sistem Pelat Konvensional dan Precast Half Slab Ditinjau Dari Segi Waktu dan Biaya Pada Proyek My Tower Apartement Surabaya. Inst. Teknol. Sepuluh Nop., 2017, pp. 39 - 67.

[5] Abedi M., Rawai N., Fathi M.S., and Mirasa A.K., Cloud Computing Information System Architecture for Precast Supply Chain Management. Appl. Mech. Mater., 2015, pp. 773–774.

[6] Im K.S., Han S.H., Koo B., and Do Jung Y., Formulation of a pull production system for optimal inventory control of temporary rebar assembly plants. Canadian. Journal of Civil Engineering., Vol. 36, No. 9, 2009, pp. 1444-1458.

[7] Yu Z., Wei Y., and Cao Z., The Design and Application of Information Management System Based on IOT for Precast Concrete Segments. in *IOP Conference Series: Earth and Environmental Science*, 2019, Vol. 371, No. 3, pp. 1-7.

[8] Benhamida F.Z., Kaddouri O., Ouhrouche T., Benaichouche M., Mansilla D.C., and López-De-Ipiña D., Demand forecasting tool for inventory control smart systems. J. Commun. Softw. Syst., Vol. 17, No. 2, 2021, pp.185 - 196.

[9] Alwaladi A., Gawanmeh A., Parvin S., and Al-Karaki J.N., Smart solutions for RFID based inventory management systems: A survey. Scalable Comput., Vol. 18, No. 4, 2017, pp. 347 - 360.

[10] Giovani P.D., Smart Supply Chains with vendor managed inventory, coordination, and environmental performance. European Journal of Operational Reserarch., Vol. 292, Issue 2, 2021, pp. 1-42.

[11] Ntakolia C., Kokotis C., Karlsson P., and Moustakidis S., An explainable machine learning model for material backorder prediction in inventory management. Sensors, Vol. 21, Issue. 23, 2021, pp 1 - 12.

[12] Sangadji I., Arvio Y., and Indrianto., Dynamic Segmentation of Behavior Patterns Based On Quantity Value Movement Using Fuzzy Subtractive Clustering Method, in Journal of Physics: Conference Series, 2018, Vol. 974, No. 1, pp. 1-7.

[13] Parasuraman A and Colby C.L., An Updated and Streamlined Technology Readiness Index: TRI 2.0. Journal of Service Research.,

Vol. 18, No. 1, 2015, pp. 1-16.
[14] Wahyudin A., Desmayanti R., Santoso H.B., and Hasibuan Z.A., Business-Information Systems Strategic Alignment Readiness Maturity Level: Corporate and Business-Technology Driver Perspective, J. Eng. Sci. Technol., Vol. 14, No. 3, 2019, pp. 1260 - 1270.
[15] Motta Toledo C. F., De Oliveira L., R. De Freitas Pereira R., França P. M., and Morabito R., A genetic algorithm/mathematical programming approach to solve a two-level soft drink production problem. Journal Computers & Operation Reserach., Vol. 48, 2014, pp. 40-52.
[16] Citra Z., Susetyo B., and Wibowo P., Optimasi Kinerja Proyek dengan Penerapan Metode Crashing dan Linear Programming pada Proyek Bulk Godown. Rekayasa Sipil, Vol. 7, No. 2, 2019, pp. 106-113.
[17] Bordón M. R., Montagna J. M., and Corsano C, Mixed integer linear programming approaches for solving the raw material allocation, routing and scheduling problems in the forest industry. Int. J. Ind. Eng. Comput., Vol. 11, Issue 4, 2020, pp. 525 - 548.
[18] Subotić V., Eibl M., and Hochenauer C., Artificial intelligence for time-efficient prediction and optimization of solid oxide fuel cell performances. Energy Convers. Manag., Vol. 230, 2021, pp. 1-14.
[19] Hidayawanti R., Latief Y., Rahayu Y., Wachid F. I, and Widodo R.P.A., Utilization Of GGBFS As Cement Substitute To Reduce Production Cost Of Construction Project. International Journal of GEOMATE, Vol. 21, Issue 86, 2021, pp 9-16.
[20] Hidayawanti R., Purnama D. D., Iduwin T., Legino S., and Wachid F. I., The impact aggregate quality material as a linear regression study on mixture concrete. International Journal of GEOMATE, Vol. 18, Issue 70, 2020, pp. 23-29.
[21] Gu L., Han Y., Wang C., Shu G., Feng J., and Wang C., Inventory Prediction Based on Backpropagation Neural Network. *NeuroQuantology*, Vol. 16, No. 6, 2018, pp. 664-673.
[22] Bin Pan F., Inventory Prediction Research Based on the Improved BP Neural Network Algorithm. Int. J. Grid Distrib. Comput., Vol. 9, No. 9, 2016, pp. 307 - 316.
[23] Gao L. and Dou H., Inventory Management of Railway Logistics Park Based on Artificial Neural Network. J. Eur. des Syst. Autom., Vol. 53, No. 5, 2020, pp. 715 - 723.
[24] Du M., Luo J., Wang S., and Liu S., Genetic algorithm combined with BP neural network in hospital drug inventory management system. Neural Comput. Appl., Vol. 32, No. 7, 2020, pp. 1-14.
[25] Siswipraptini P. C., Aziza N., Sangadji I., and Indrianto., The design of a smart home controller based on ADALINE. *Telkomnika* Vol. 18, No. 4, 2020, pp. 2177 - 2185.
[26] Sahoo S., Mishra S., Mohapatra S. K., and Mishra B. K., Clustering deviation analysis on breast cancer using linear vector quantization technique. Int. J. Control Theory Appl., Vol. 9, No. 23, 2016. pp. 313 - 324.
[27] Baeuo M. O. M., Rahim N. Z. B., and Alaraibi A. A. M., Technology factors influencing e-government readiness. J. Theor. Appl. Inf. Technol., Vol. 95, No. 8, 2017, pp. 1637 - 1645.

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RAW MATERIAL OPTIMIZATION WITH NEURAL NETWORK METHOD IN CONCRETE PRODUCTION ON PRECAST INDUSTRY

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ABSTRACT: The development of construction is presently experiencing rapid growth in Indonesia, leading to the requirement of the right materials for infrastructural enhancements. From the existing infrastructure, concrete innovations such as precasts are needed with good quality materials, for the quick completion of construction. This is because the need for good quality and smooth material helps to determine the success of a building project, with the use of technology through precast being a problem-solving process. Therefore, this study aims to analyze the patterns by which inventory procurement predictions produce precasts with good quality, using the e-readiness framework concept of the neural network through appropriate decision-making processes. It also focuses on innovating technological products used in the Indonesian precast industry. The Methodology Neural Network was used to produce the best target quality time and precast commodities. The result indicated two outputs from 2 neural network models, using five similar input-value variables. Based on the Adaline neural network, the outputs were observed as the highest sales-cost predictions for precast products, which often occurred in 1, 5, 6 and 9 months. Besides this, production activities were also normally operated at level (1), with profit optimization being highly considered before months 1, 5, 6 and 9. For the LVQ neural network, the result was a predictive classification of class intensity levels, where fast decision-making processes occurred in months 1, 6 and 9. Cost optimization was also carried out by ordering raw materials several months in advance, considering the trend in material prices and logistics.

Keywords: Raw material, Neural network, Concrete, Precast

1. INTRODUCTION

Concrete is formed by raw material components, namely cement, aggregates, sand and admixture [1]. In its development, concrete technology continues to innovate and develop. The use of cast concrete in place is common, along with its development concrete can be cast elsewhere and when it is formed it is used in buildings according to their needs or what is better known as precast. According to the 2847:2019 standard [2], precast concrete is a structural concrete element that is cast elsewhere from its final position in the structure. In other words, precast is a concrete component with reinforcement that has been printed in a factory and the assembly is carried out at the project site. The use of precast concrete can reduce the duration of work 3,94% - 72,97%, the number of workers 51,33% - 87,45%, budget plan 3,05% - 37,57%, the use of wood as formwork and scaffolding 90,11% -98,81% [3]. Examples of using precast are spunpile used for high-rise building foundations, girders for bridges, facades used for building walls, lining used for retaining walls in rivers. U-Ditch is used for drainage or irrigation channels and Box Culvert is used in waterway construction, so it is often refered to as a sewer.

Currently, precast is needed to speed up the execution time, so it doesn't affect the weather factors, this usage is also eco-friendly.

Fig. 1 Precast Product Spunpile

The figure above is an example of a precast product, namely a spunpile which is used as a foundation for high-rise buildings. There is also a spunpile type that is in a box form depending on the designation needed in a construction project.

The Indonesian government has been undergoing massive infrastructural development since 2019, with an effect observed in the significant increase in precast product demand in 2022. Based on these data, precast production was carried out by 76 registered factories, which were distributed throughout the country. Each factory had an increase in production, which varied between 210,000-500,000 tons yearly, to serve the increasing demand. This indicated that the average monthly production of each organization needs to reach 45,000 tons.

In Indonesia, efficiency is often measured from a cost and time perspective, showing that the use of precast concrete is more efficient than conventional methods [4]. Although this utilization is more efficient, technology-based precast supply chain parameters still need to become effective support. This supply chain is classified into various phases, namely planning, designing, manufacturing, transportation, installation, and construction. To achieve an integrated construction, the parties in these phases need to have efficient communication and effective collaboration in providing accurate and up-to-date information. According to the governmental data, the main problems in the precast supply chain phases began from the following, (1) poor planning, (2) ineffective communication between designers and manufacturers, (3) incompetent employees/workers, (4) damage to raw materials, and (5) large sizes and heavy precast components and coordination in the bad project site. Besides these conditions, the key issues also contributed to negative consequences on the efficiency, productivity and effectiveness of precast delivery [5]. After procurement, the damages to raw materials are often found to affect the quality of the process and precast production during the inventory phase (initial stage). This explains that the procurement division needs to be able to provide the certainty of scheduling receipts for efficient project completion when ordering raw materials. Irrespective of these conditions, practical raw material orders and assembly time have still not been highly considered, leading to the probable effects and implications of excess inventory occurrences and additional project-financing increment, respectively. Therefore, a methodology should be determined for the effective, efficient, and economical control of precast plants' inventory management [6].

The utilization of technology has reportedly been implemented widely, to support the management of raw materials during the inventory processes. This was in line with the raw material control for precast tunnelling projects in China [7], where many businesses were leveraging historical sales and demand data to implement intelligent inventory management systems. Demand forecasting involves predicting/ensuring the consumption/collection of precast raw materials. This plays an important role in the area of inventory control and supply chain, due to enabling production and distribution planning. It is also conditioned to reduce raw material delivery times and optimize decisions on the supply chain [8]. This is to help the developers and operators of inventory management systems in improving efficiency, maximizing productivity, and minimizing material losses [9].

Many studies have also evaluated smart inventory implementation, namely the dynamic brick-and-mortar supply chain analysis. This evaluated the benefits of implementing smart applications and systems to improve Vendor Managed Inventory (VMI) efficiency. In the supply chain mechanism, the manufacturer configured the production level and replenished the inventory at the retailer's store, where prices were set up to affect sales and inventory. In this condition, the company also shared the revenue and inventory costs through an agreement. This condition was very dynamic when inventory increased and decreased at production and sales levels respectively, with periodical variations observed according to several stochastic errors [10]. In this case, the need for accurate predictions led to a more effective and cheap supply chain, as well as allowed companies to provide quality, quantity, periodical, and low-production cost products [11]. Many studies also used other machine learning approaches to map prediction patterns, such as fuzzy subtractive clustering [12].Therefore, this study aims to analyze the patterns by which inventory procurement predictions produce precast products with good quality, using the e-readiness framework concept of the neural network method through appropriate decision-making processes. In this condition, prediction modelling was prepared as part of the application of e-readiness in raw material management. The pattern of obtaining these materials was also used as the best test data, to assess the management model in smart inventory.

2. RESEARCH SIGNIFICANCE

Integration and utilization in the field of precast manufacturing is still not widely found. Integration requires redefining for adjustments in corporate culture in precast companies. The redefinition was carried out for reasons of planning the preparation of raw materials as precast making materials. Optimal material ordering must match the project schedule, raw material repository and technology. Order optimization is carried out with strict monitoring supported by customized e-readiness technology selection. Customize technology selection by implementing 2 neural network models namely; adaptive linear (Adaline) and linear vector quantization (LVQ) are still not common.

3. LITERATURE REVIEW

3.1 E-Readiness

Technology Readiness Index (TRI) 1.0 is constructed based on four-dimensional aspects, namely Optimism, Innovation, Discomfort, and Insecurity [13], as shown in Fig. 1. This is often applied to a company with the Strategic Alignment Maturity Model (SAMM), to determine the utilization level of information systems in all business operations [14]. It is also one of the innovative

references used in managing highly efficient logistics. In addition, TRI is related to the Global Competitiveness and Logistics Performance Indexes (GCI & LPI), as well as other similar supportive dimensions.

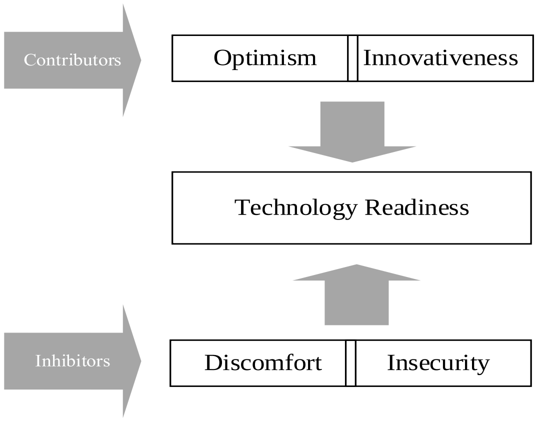

Fig. 2 E-Readiness Technology

In precast manufacturing companies, technology is also used in raw material management by arranging and using a very suitable procedural schedule and method, respectively. Using linear programming methods, Markov models, and genetic algorithms, scheduling often emphasizes the management of time to handle and obtain raw materials [15]–[17].

In this condition, a good inventory receipt system is needed to provide more value during the prediction process, where efficient and periodical systematic performance is a function of operational activities. This helps to reduce time consumption in determining optimal operations in various parameters [18]. Additionally, process quality problems and production cost efficiency are adequately maintained [1], [19], [20].

3.2 Neural Network

The amount of inventory is often related to the company's profit and the entire supply chain's survival. This indicates that prediction processes need to increase the company's ability to prevent risks, improve profits, and reduce losses during the acquisition of inventory, using the backpropagation neural network (BP) method [21], [22]. Some reports were also observed based on the development of technology readiness, such as [23], [24]. This emphasized determining the optimization value of material handling, using a neural network with 2 algorithm methods, namely ADALINE (Adaptive Lenear Neuron) and LVQ (Linear Vector Quantization). ADALINE network functions to perform cost projection. LVQ model function led to the prediction of cost-benefit into 3 categorical levels, namely high, medium, and low demand, as shown in figure 3.

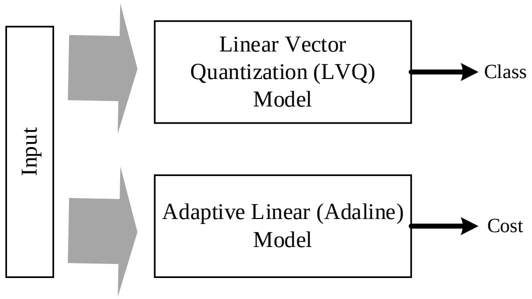

Fig. 3 Neural Network Model based on E Readiness

Based on the figure above, even though it uses 2 (two) models, namely the adaptive linear model and Linear vector quantization, both have the same input. Inputs come from Raw material receiving, vendor level and regional and enterprise technology infrastructure.

3.3 Adaline

ADALINE (Adaptive Linear Neuron or later Adaptive Linear Element) is an early single-layer artificial neural network, which is implemented as an algorithm to predict outputs with an automatic controller. Although the accuracy obtained is not satisfactory, the value still changes and becomes highly precise during more data analyses [25]. In the following equation, an input vector (K) is observed with the pattern.

$$X_k=[x_0,\quad x_{1k},\quad x_{2k},\quad \ldots,\quad x_{nk}]^T \qquad (1)$$

Where X_k = the components of the weights and coefficients. Moreover, a weight vector (Wk) is observed in the Eq. (2) as follows,

$$W_k = [wx_0, w_{1k}, w_{2k}, \ldots, w_{nk}]^T \qquad (2),$$

where $y_K = W_K^T X_K$.

Output $$y_k = \sum_{k=1}^{n} X_k W_k + \theta$$

Adaptive learning rule

Learning is also known as the Least Mean Square (LMS), whose rules in this process are observed as follows,

$$W \leftarrow W + \eta(d - o)x \qquad (3)$$

3.4 Linear Vector Equations Quantization (LVQ) Model

This is one of the widely used ANN models (Artificial Neural Network), which emphasizes the prototype of a supervised learning classification algorithm and its network. These are trained through a competitive method similar to the Self-Organizing Map. The clustering technique is also used as a classifier to evaluate the deviations in the data sample through a random or specific density. This shows that performance remains the same with almost all combinations of training and testing [26]. Based on the following formula, learning is conducted by calculating the euclidian distance,

$$d(\vec{x}, \vec{w}_k) = \min d(\vec{x}, \vec{w}_k) \qquad (4)$$

W_k (weight improvement) is also used to determine the weight (w) with the smallest distance value (d) as follows,

$\vec{w}_k \leftarrow \vec{w}_k + \eta.(\vec{x} - \vec{w}_k)$, when c_m =/≠ y, it is close to each other or part of the set, respectively.

4. METHODOLOGY

Research scenarios or methodologies must be carried out in order to achieve valid and accurate research results. In general, this research was conducted according to the methodology as shown in figure 4 below. Input from the system is in the form of monitoring data from e-readiness technology, processes and neural network learning carried out to achieve cost results and decision classes.

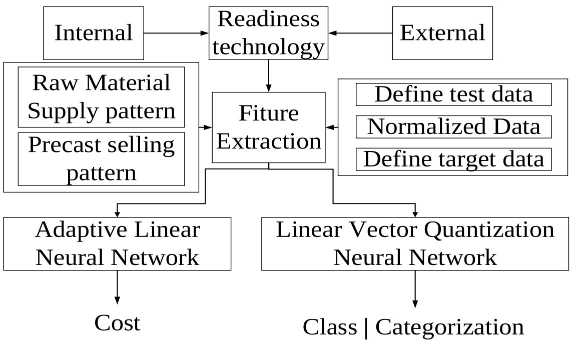

Fig. 4 Study Methodology

The e-readiness technology emphasized the following factors, (1) security, (2) technical issues, (3) software reliability, (4) digital operations for internet usage, and (5) technical skill utilization [27]. The concept of this technical influence also originated from internal and external organizations, as shown in figure 4. Feature Extraction serves to normalize raw material pattern data, precast selling pattern. In addition to also performing categories of data functions and training both neural network architecture models in used. Test data is used as inputs and targets based on monthly data patterns that occur. Internal data e readiness is an advantage to be achieved by making improvements by improving the quality and quantity of company resources. External e readiness is intended to look at competing companies that have the same core business and available infrastructure and can support company performance.

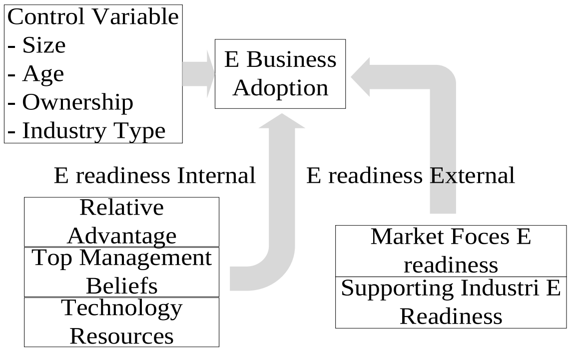

Fig. 5 The concept of e-readiness influence

Based on the external conditions, e-readiness emphasized many factors regarding the case perspective of each corporation in its respective business field. In this study, these factors were limited, including the IT technology infrastructure supporting the precast industry and the vendor market for raw materials. Meanwhile, the internal conditions of this technology focused on related technical improvements, using neural network methods for prediction processes.

4.1 Feature Extraction

The internal data sources were the direct measurement of the goods' receipts, regarding the yearly production of raw materials at precast organizations. In this condition, the raw material parameters included cement, sand, and aggregate. In preparation for the precast products, a value extraction was also observed for the contributions of the materials and costs, as shown in figure 6. This showed that the cement and aggregate costs and materials were the largest/lowest and smallest/highest contributions, respectively.

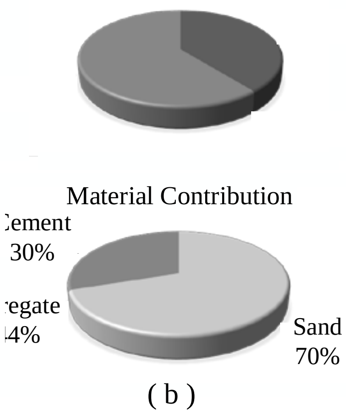

Fig. 6 Cost Contribution (a) production (m^3) and material contribution (b) precast product

The second parameter focused on the monthly-supply behaviour pattern of each raw material for a year, as shown in figure 7.

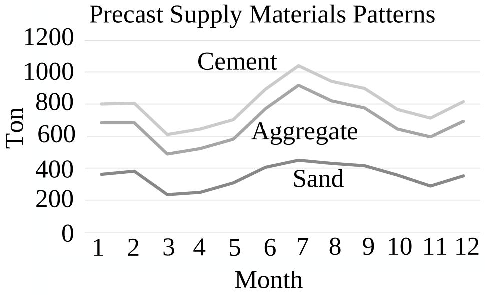

Fig. 7 Annual supply pattern of precast raw materials

Based on the pattern that occurs as can be seen in Figure 7, it can be seen that the pattern of each raw material (cement, aggregate and sand) has the same correlation even though it differs in the volume of orders. The data comes from ordering raw materials for a year (12 months). The highest order is cement, aggregate then sand.

4.2 Data Test

This emphasized the data of sand, aggregate and cement, which were mixed based on the best quality standard of Indonesian concrete category K 500-K 600. These data were obtained according to the order for 12 months, as shown in table 1.

Table 1 Precast raw material cost

No	Materials	Cost IDR (m^3)
1	Sand	242,000
2	Aggregate	200,000
3	Cement	715,000

4.3 Normalized Data

The nominal unit of numeric data was normalized to facilitate data processing in the neural network architecture. This indicated that normalization was carried out by mapping into numbers between 0 and 1, as shown in the following formula,

$$X_{Map} = \frac{X_{Original} - X_{\min}}{X_{\max} - X_{\min}} \quad (4)$$

Where :
X_{map} = Normalization Value
$X_{Original}$ = Original Value
X_{max} = Maksimum Value
X_{Min} = Minimum Value

In 2021, the normalization of input variables were also carried out on the price of raw materials, frequency of intermediaries, and volume of transaction costs. Moreover, the target data originated from the average total sales of precast products in the same year.

4.4 Target Data

The target data contained three vectors, namely the minimum, maximum, and median sales values of the total cost, as shown in figure 8.

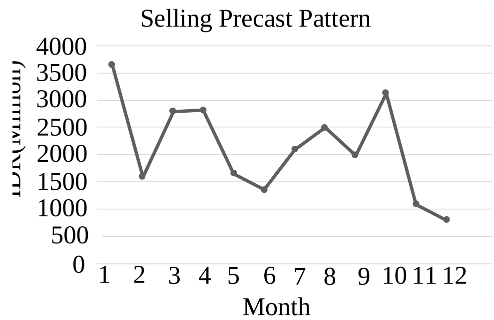

Fig. 8 Total precast unit cost for the year.

Based on figure 8, the optimization patterns of the raw material supply and sales profits were observed when the production target need to achieve 45,000 tons monthly with a minimum unit cost of IDR800 million.

5. DISCUSSION

Based on the external conditions, the system input parameters included the readiness of IT technology infrastructure, which supported the precast industry and market vendors providing raw materials. In this analysis, the final output was a value within a specified range. Meanwhile, the internal input factors included the monthly frequency of raw material supplies in a year (Tons). Table 2 shows the input and target variables of this analysis.

Table 2 Input Parameter Identification and Prediction

No	Input Parameter	Prediction Parameter	
		Adaline	LVQ
1.	IT Readiness Infrastructure	Monthly Precast Selling Patterns	Decision Classification Level
2.	Level Market Vendor		
3.	Cement Contributions (monthly)		
4.	Aggregate Contributions (monthly)		
5.	Sand Contributions (monthly)		

5.1 Architecture Neural Network Adaline

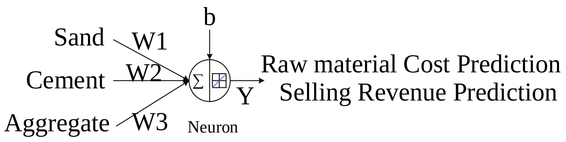

Fig. 9 Adaline Architecture

Based on figure 9, five defined input values were observed, indicating a linear activation function between 0 and 1. The figure describes the neural network architecture of the adaline model. This model uses a single layer of neurons and will carry out the learning process to achieve optimal architectural weights. The optimal architectural weight will produce a number that can be calibrated against the precast sales data pattern.

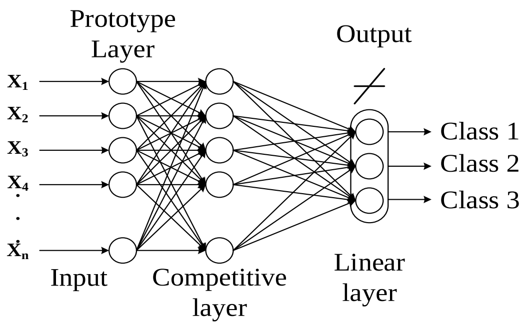

Fig. 10 Linear Vector Quantization Architecture

In figure 10 five defined input values were also observed, where a linear classification produced 3 cluster categories. The figure explains the neural network architecture of the Linear vector quantization model. This model uses competitive layer and linear layer neurons as its output. This architecture will carry out the learning process to achieve optimal architectural weight. Optimal architectural weight will result in a class classification of precast sales data patterns.

5.2 Simulation Result

The final stage of the process in a neural network model is to produce the final result. Simulations are carried out to measure whether the model is functioning as expected. The input parameters, the weights of the neural network learning outcomes to the output parameters will be tested according to their respective functions on the results. The model is declared good if several data scenarios until the output have been achieved.

Scenarios from the data will be tested according of the upper limit value and the lower limit value of the data pattern.

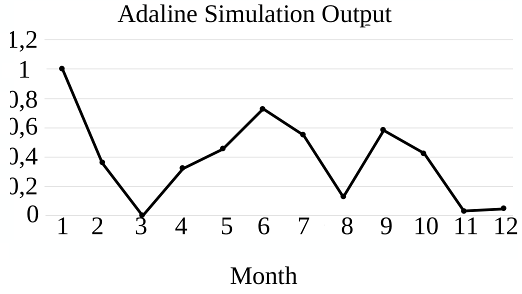

Fig. 11 Adaline Method simulation results

According to figure 11, the pattern of obtaining raw materials for precast products fluctuated based on the test data from 2021, through the Adaline method of learning for a year. In this condition, the lowest orders were in the 3rd, 8th, 11th, and 12th months when 5 parameters were inputted into this method.

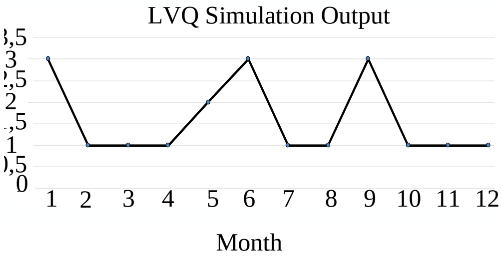

Fig. 12 LVQ Method Simulation Result

Based on figure 12, the pattern of obtaining raw materials for precast products also fluctuated regarding the test data from 2021, through the LVQ method learning for a year. This proved that the highest classes and the best values occurred in the 1st, 6th, and 9th months when 5 parameters were inputted into this method, with the lowest orders observed on the 2nd, 3rd, 4th, 7th, 8th, 10th, 11th, and 12th periods. In the 5th month, the values obtained were also found not to be very high or low. These actions emphasized the option of maintaining existing raw materials or placing orders regarding the increment of the previous month.

Table 3 Class and Cost Relation

No.	Month	Classes	Cost (IDR)
1	Jan	3	3,644,810
2	Feb	1	1,829,060
3	Mar	1	804,661
4	Apr	1	1,724,870
5	May	2	2,097,578
6	Jun	3	2,872,875
7	Jul	1	2,370,019

8	Aug	1	1,170,018
9	Sep	3	2,464,231
10	Oct	1	2,010,972
11	Nov	1	895,467
12	Dec	1	942,555

According to table 3, the second and third months had different advantages, although they were in class (1). This was in line with the eighth and eleventh months. The midpoint was also observed in class (2), which occurred in the 5th month. However, the 1st, 6th, and 9th months exhibited quite a large amount of transactions, leading to significant effects on the order of raw materials and logistics financing considerations.

6. CONCLUSION

Based on these results, cost optimization was conducted by accepting and creating new orders when the conditions were found in class (2). This action was often carried out by observing the trend of the previous month. Due to the high-order rate, the classes also showed that the level of operations need be accelerated and periodically limited when the conditions were categorized in class (3). For class (2), the order for raw materials was only performed by observing the Adaline method simulation, since a tendency was found for the market to absorb precast products in the following month. Furthermore, the application of the neural network method was appropriately implemented when supported by external e-readiness factors, including the which include infrastructure preparedness and many material vendor options. The implementation of this conceptual technology also used 2 neural network models for precast products. This involved the processing and production of similar input values and different decision model simulation, respectively. Irrespective of these differences, a strong correlation was still observed with the time efficiency of the decision-making process. Therefore, bother LVQ and Adaline contributed 50% to this decision approach.

7. ACKNOWLEDGMENTS

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8. REFERENCES

[1] Hidayawanti R., Legino S., Sangadji I., and Widodo R. P. A., The efficiency of fly ash and cement slag to development building. International Journal of GEOMATE, Vol. 16, Issue 57, 2019, pp 95-100.

[2] Badan Standarisasi Nasional Indonesia, SNI 2847-2019 : Persyaratan Beton Struktural untuk Bangunan Gedung, *Standar Nas. Indones.*, No. 8, 2019, pp. 1-720.

[3] Adiasa A.M., Prakosa D.K. P., Hatmoko J.U.D., Santoso, T.D., Evaluasi Penggunaan Beton Precast di Proyek Konstruksi. Jurnal Karya Tek. Sipil, Vol. 4, No. 1, 2015, pp126-134.

[4] Wisanggeni D.H., Perbandingan Sistem Pelat Konvensional dan Precast Half Slab Ditinjau Dari Segi Waktu dan Biaya Pada Proyek My Tower Apartement Surabaya. Inst. Teknol. Sepuluh Nop., 2017, pp. 39 - 67.

[5] Abedi M., Rawai N., Fathi M.S., and Mirasa A.K., Cloud Computing Information System Architecture for Precast Supply Chain Management. Appl. Mech. Mater., 2015, pp. 773–774.

[6] Im K.S., Han S.H., Koo B., and Do Jung Y., Formulation of a pull production system for optimal inventory control of temporary rebar assembly plants. Canadian. Journal of Civil Engineering., Vol. 36, No. 9, 2009, pp. 1444-1458.

[7] Yu Z., Wei Y., and Cao Z., The Design and Application of Information Management System Based on IOT for Precast Concrete Segments. in *IOP Conference Series: Earth and Environmental Science*, 2019, Vol. 371, No. 3, pp. 1-7.

[8] Benhamida F.Z., Kaddouri O., Ouhrouche T., Benaichouche M., Mansilla D.C., and López-De-Ipiña D., Demand forecasting tool for inventory control smart systems. J. Commun. Softw. Syst., Vol. 17, No. 2, 2021, pp.185 - 196.

[9] Alwaladi A., Gawanmeh A., Parvin S., and Al-Karaki J.N., Smart solutions for RFID based inventory management systems: A survey. Scalable Comput., Vol. 18, No. 4, 2017, pp. 347 - 360.

[10] Giovani P.D., Smart Supply Chains with vendor managed inventory, coordination, and environmental performance. European Journal of Operational Reserarch., Vol. 292, Issue 2, 2021, pp. 1-42.

[11] Ntakolia C., Kokotis C., Karlsson P., and Moustakidis S., An explainable machine learning model for material backorder prediction in inventory management. Sensors, Vol. 21, Issue. 23, 2021, pp 1 - 12.

[12] Sangadji I., Arvio Y., and Indrianto., Dynamic Segmentation of Behavior Patterns Based On Quantity Value Movement Using Fuzzy Subtractive Clustering Method, in Journal of Physics: Conference Series, 2018, Vol. 974, No. 1, pp. 1-7.

[13] Parasuraman A and Colby C.L., An Updated and Streamlined Technology Readiness Index: TRI 2.0. Journal of Service Research.,

Vol. 18, No. 1, 2015, pp. 1-16.

[14] Wahyudin A., Desmayanti R., Santoso H.B., and Hasibuan Z.A., Business-Information Systems Strategic Alignment Readiness Maturity Level: Corporate and Business-Technology Driver Perspective, J. Eng. Sci. Technol., Vol. 14, No. 3, 2019, pp. 1260 - 1270.

[15] Motta Toledo C. F., De Oliveira L., R. De Freitas Pereira R., França P. M., and Morabito R., A genetic algorithm/mathematical programming approach to solve a two-level soft drink production problem. Journal Computers & Operation Reserach., Vol. 48, 2014, pp. 40-52.

[16] Citra Z., Susetyo B., and Wibowo P., Optimasi Kinerja Proyek dengan Penerapan Metode Crashing dan Linear Programming pada Proyek Bulk Godown. Rekayasa Sipil, Vol. 7, No. 2, 2019, pp. 106-113.

[17] Bordón M. R., Montagna J. M., and Corsano C, Mixed integer linear programming approaches for solving the raw material allocation, routing and scheduling problems in the forest industry. Int. J. Ind. Eng. Comput., Vol. 11, Issue 4, 2020, pp. 525 - 548.

[18] Subotić V., Eibl M., and Hochenauer C., Artificial intelligence for time-efficient prediction and optimization of solid oxide fuel cell performances. Energy Convers. Manag., Vol. 230, 2021, pp. 1-14.

[19] Hidayawanti R., Latief Y., Rahayu Y., Wachid F. I, and Widodo R.P.A., Utilization Of GGBFS As Cement Substitute To Reduce Production Cost Of Construction Project. International Journal of GEOMATE, Vol. 21, Issue 86, 2021, pp 9-16.

[20] Hidayawanti R., Purnama D. D., Iduwin T., Legino S., and Wachid F. I., The impact aggregate quality material as a linear regression study on mixture concrete. International Journal of GEOMATE, Vol. 18, Issue 70, 2020, pp. 23-29.

[21] Gu L., Han Y., Wang C., Shu G., Feng J., and Wang C., Inventory Prediction Based on Backpropagation Neural Network. *NeuroQuantology*, Vol. 16, No. 6, 2018, pp. 664-673.

[22] Bin Pan F., Inventory Prediction Research Based on the Improved BP Neural Network Algorithm. Int. J. Grid Distrib. Comput., Vol. 9, No. 9, 2016, pp. 307 - 316.

[23] Gao L. and Dou H., Inventory Management of Railway Logistics Park Based on Artificial Neural Network. J. Eur. des Syst. Autom., Vol. 53, No. 5, 2020, pp. 715 - 723.

[24] Du M., Luo J., Wang S., and Liu S., Genetic algorithm combined with BP neural network in hospital drug inventory management system. Neural Comput. Appl., Vol. 32, No. 7, 2020, pp. 1-14.

[25] Siswipraptini P. C., Aziza N., Sangadji I., and Indrianto., The design of a smart home controller based on ADALINE. *Telkomnika* Vol. 18, No. 4, 2020, pp. 2177 - 2185.

[26] Sahoo S., Mishra S., Mohapatra S. K., and Mishra B. K., Clustering deviation analysis on breast cancer using linear vector quantization technique. Int. J. Control Theory Appl., Vol. 9, No. 23, 2016. pp. 313 - 324.

[27] Baeuo M. O. M., Rahim N. Z. B., and Alaraibi A. A. M., Technology factors influencing e-government readiness. J. Theor. Appl. Inf. Technol., Vol. 95, No. 8, 2017, pp. 1637 - 1645.

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RAW MATERIAL OPTIMIZATION WITH NEURAL NETWORK METHOD IN CONCRETE PRODUCTION ON PRECAST INDUSTRY

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Abstract

The development of construction is presently experiencing rapid growth in Indonesia, leading to the requirement of the right materials for infrastructural enhancements. From the existing infrastructure, concrete innovations such as precasts are needed with good quality materials, for the quick completion of construction. This is because the need for good quality and smooth material helps to determine the success of a building project, with the use of technology through precast being a problem-solving process. Therefore, this study aims to analyze the patterns by which inventory procurement predictions produce precasts with good quality, using the e-readiness framework concept of the neural network through appropriate decision-making processes. It also focuses on innovating technological products used in the Indonesian precast industry. The Methodology Neural Network was used to produce the best target quality time and precast commodities. The result indicated two outputs from 2 neural network models, using five similar input-value variables. Based on the Adaline neural network, the outputs were observed as the highest sales-cost predictions for precast products, which often occurred in 1, 5, 6 and 9 months. Besides this, production activities were also normally operated at level (1), with profit optimization being highly considered before months 1, 5, 6 and 9. For the LVQ neural network, the result was a predictive classification of class intensity levels, where fast decision-making processes occurred in months 1, 6 and 9. Cost

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