DETERMINING THE BEST SUPPLIER BY USING ANALYTICAL HIERARCHY PROCESS (AHP) METHOD AND ORDINAL PRIORITY APPROACH (OPA) METHOD

UNDERGRADUATE FINAL PROJECT

Submitted as one of the requirements to obtain Sarjana Teknik (S.T.)

By
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ID No. 004201900027

FACULTY OF ENGINEERING
INDUSTRIAL ENGINEERING STUDY PROGRAM
CIKARANG
JUNE, 2023

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The Panel of Examiners declare that the undergraduate thesis entitled **Determining the Best Supplier by Using Analytical Hierarchy Process (AHP) Method and Ordinal Priority Approach (OPA) Method** that was submitted by Nabila Alyssa Yasmin majoring in Industrial Engineering from the Faculty of Engineering was assessed and approved to have passed the Oral Examination on June 15th, 2023.

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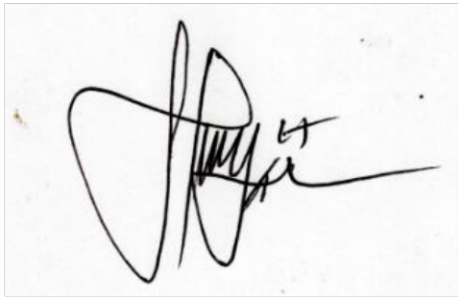

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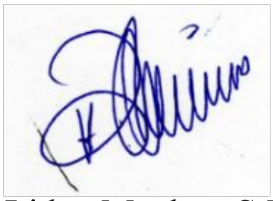

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This final project entitled **"DETERMINING THE BEST SUPPLIER BY USING ANALYTICAL HIERARCHY PROCESS (AHP) METHOD AND ORDINAL PRIORITY APPROACH (OPA) METHOD"** prepared and submitted by **Nabila Alyssa Yasmin** in partial fulfillment of the requirements for the degree of Bachelor Degree in the Faculty of Engineering has been reviewed and found to have satisfied the requirements for a final project fit to be examined. I therefore recommend this final project for Oral Defense.

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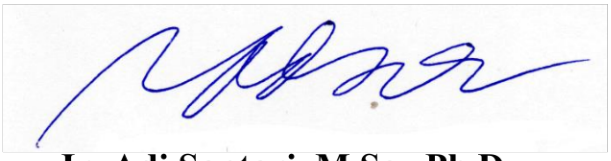

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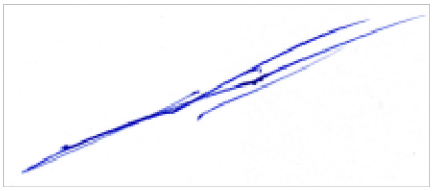

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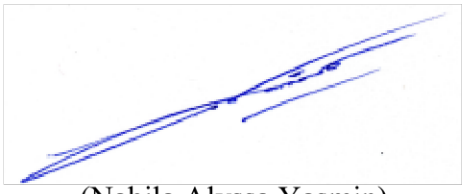

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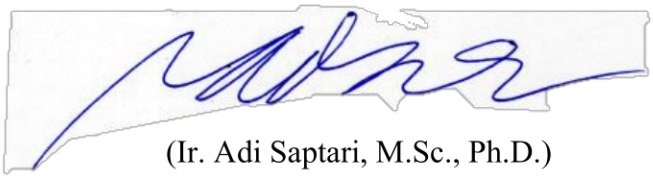

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By

Nabila Alyssa Yasmin
ID No. 004201900027

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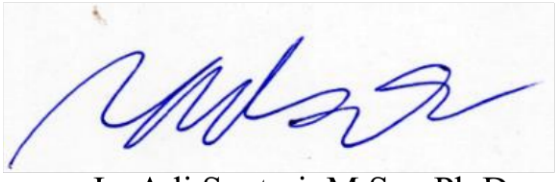

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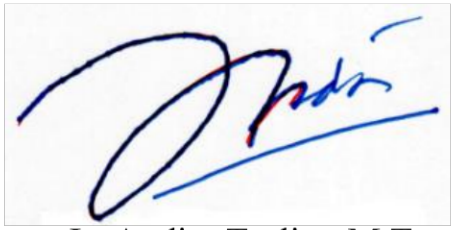

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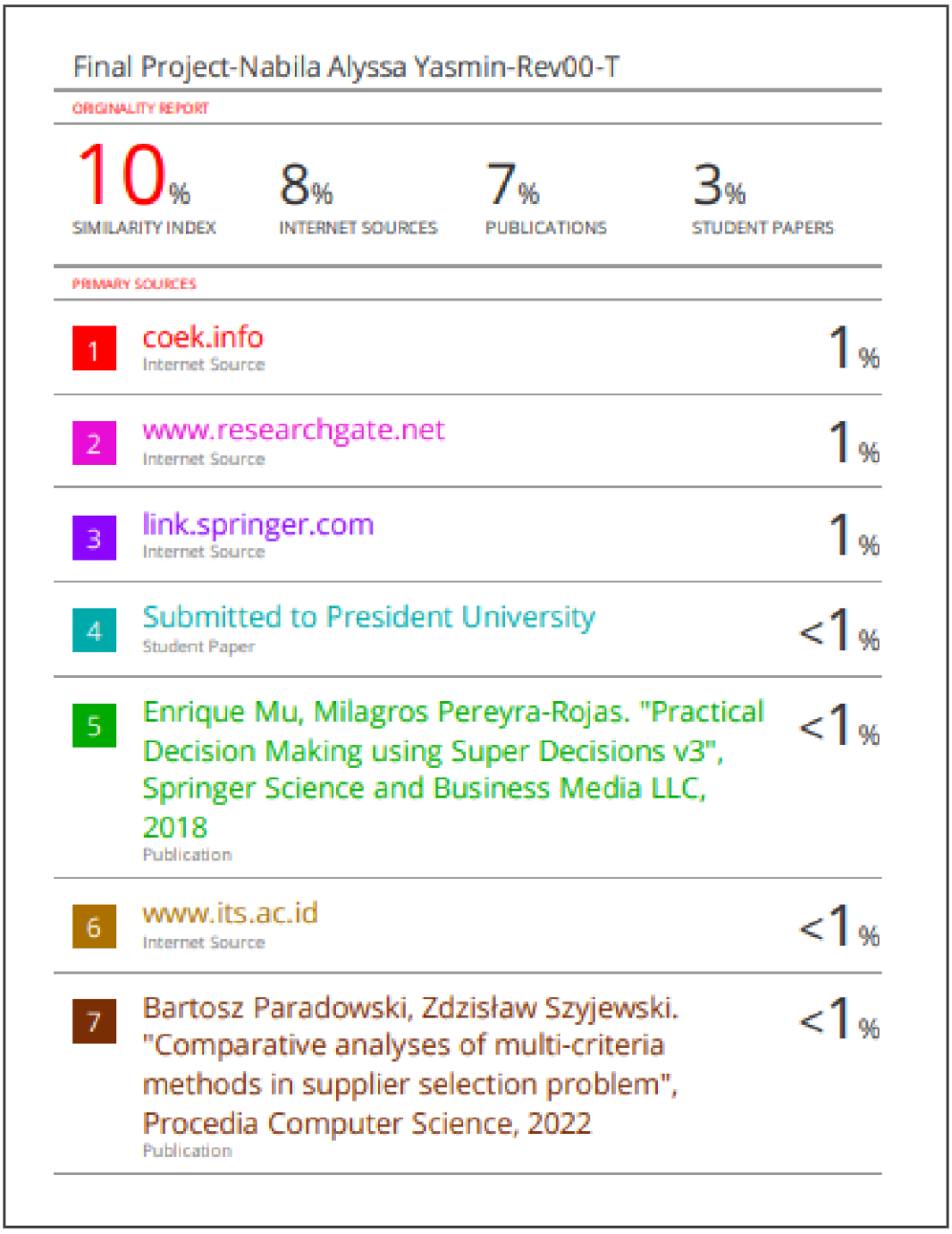

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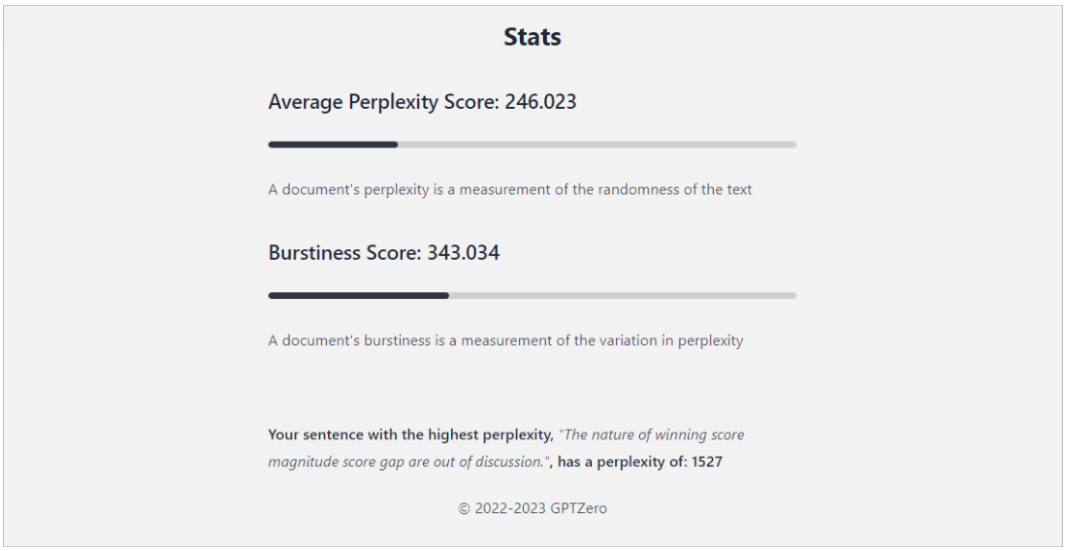

ABSTRACT

In daily practice, normally purchasing department deal with so many suppliers. These suppliers have so many variations in performance and specification profiles. This fact leads Purchasing Department to complex situations since it involves multi-criteria decision-making in selecting the best suppliers. This issue is critical to Supply Chain Management. To help the purchasing department in selecting the best supplier, this research applies two methods i.e. Analytical Hierarchical Process (AHP) and Ordinal Priority Approach (OPA). Executing these complete processes steps can clarify the issues on how to develop the criteria based on the perceptions of the decision makers for the supplier selection, on how to select the supplier based on Multi-Criteria Decision-Making (MCDM) using AHP and OPA methods. Two projects were evaluated on the process selection of the best supplier, each project has 3 candidates. The results show that both AHP and OPA methods provide the same rank of suppliers, even though it has different values.

Keywords*: MCDM, AHP, OPA, Supply Chain Management, Supplier Selection, Purchasing.*

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In the name of Allah SWT the most merciful and the most graceful, and may all pleases be upon Prophet Muhammad. Finally, the researcher, now very pleased after completing this final project. Let the researcher shares the joyful feeling with the readers. The researcher also would like to express my deepest gratitude to:

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF TERMINOLOGIES

Contractor : A person or business that accepts a contract to provide supplies or labor to complete a job

Supplier : The entity in the form of an individual or organization that provides goods or services to other entities or also known the customer.

Tender : The invitation to submit a bid a price, contract work, or supply goods for a project

After-Sales Services : A process or effort made by a business to ensure customers are satisfied, either with the services or products offered

r Test : Reliability Test for determining a proposed criteria which is under examination whether valid to become a liable criteria.

$r_{calculated}$: The value of r, obtained by calculation to series of data.

r_{table} : The value of r, provided at public scientific references

i : Running number Index of matrix element at row i

j : Running number Index of matrix element at column j

$[r_{ij}]$: Reciprocal Matrix which elements are divided by unity value at diagonal, and all elements are inverse of the mirrored position elements to the unity diagonal. $\begin{bmatrix} 1 & r_{12} & r_{13} \\ r_{21} & 1 & r_{23} \\ r_{31} & r_{32} & 1 \end{bmatrix}, \begin{bmatrix} 1 & r_{12} & r_{13} \\ 1/r_{12} & 1 & r_{23} \\ 1/r_{13} & 1/r_{23} & 1 \end{bmatrix}$

$[a_{ij}]$: Reciprocal Matrix which elements are result of pairwise

$[a_{ij}]_m$: Matrix which elements of column are divided by the sum of elements at the respective columns. It is called as Normalized Matrix. $\begin{bmatrix} r_{11}/\sum r_{i1} & r_{12}/\sum r_{i2} & r_{13}/\sum r_{i3} \\ r_{21}/\sum r_{i1} & r_{22}/\sum r_{i2} & r_{23}/\sum r_{i3} \\ r_{31}/\sum r_{i1} & r_{32}/\sum r_{i2} & r_{33}/\sum r_{i3} \end{bmatrix}$

$[W_{i1}]$	: Column Matrix which elements are the preference weight of aspects
Det	: Eigen Vector, vector matrix which elements are the result of multiplication between elements of $[a_{ij}]$ and matrix of Weight $[M_{i1}]$
n	: Numbers of sample or data, Number of Criteria
λ_{max}	: Principal Eigen Value, average value of Eigen Vector elements
CI	: Consistency Index, ratio between $(\lambda_{max} - n)$ to (n-1)
RI	: Randomness Index, Great Abundance data Consistency Index for n numbers Criteria. The Value are provided by Saaty (1987) in a table. The table now available in public.
CR	: Consistency Ratio. The ratio between CI and RI. It describes the consistency of preference weighting (decision). The value must rely in $0 < CR < 0.1$ as Saaty (1987)