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Development of Assessment Criteria and Weight in the Evaluation Stage in Selecting Goods Suppliers in EPC *Industrial Plant* Project

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Abstract:- At present the project material procurement system is still a major obstacle in infrastructure project work which is currently being carried out by the government through state-owned construction companies. 2013-2019 annual report data from PT. Wijaya Karya (Persero) Tbk, as a business actor in the construction industry, shows that goods and services procurement contracts are an average of 71% of company sales. This data shows that one of the things that has an important role in supporting this is the procurement process, both the process of providing goods and service providers. In construction projects, especially the type of EPC project, the procurement of goods has a large weight on the overall procurement process.

Currently at PT. Wijaya Karya (Persero) Tbk, weighting the selection of suppliers of goods still uses the same criteria as the selection of service suppliers and also weighting is carried out in the same dimension and does not adjust to the category of goods to be used, therefore it is necessary to develop a model of supplier selection criteria and weighting based on the classification or category that has been carried out in previous research by this research, especially in the EPC project at PT. Wijaya Karya (Persero) Tbk.

This study provides proposed criteria, sub-criteria and assessment indicators as well as the weight of each of these indicators that previously existed in the existing assessment system model for the selection of suppliers of goods and services. The development of the existing model will be obtained from several previous research models regarding the process of selecting and selecting suppliers of goods, which will be carried out in two stages. The first stage is developing a conceptual model by producing dimensions and elements (sub criteria), then the second stage by developing weights for each criterion, sub-criteria and indicators for each category of goods, namely (Strategic, Leverage, Bottleneck, and Non-Critical). In determining the weight, the calculation is carried out using the Analytic Hierarchy Process (AHP) process.

Keywords:- *Biodiesel EPC Project, Supplier of Goods, Strategic, Leverage, Bottleneck, and Non Critical, AHP.*

I. INTRODUCTION

The successful implementation of project management is measured by the achievement of project objectives, among others, projects completed on time, within budget, by technical specifications, effective and efficient use of project resources, and received by customers. Today many contracting companies have developed and utilized technology as part of efficiency to face increasing business competition.

PT Wijaya Karya (Persero) Tbk is a company engaged in the construction industry. Procurement of goods and services that occur at PT. Wijaya Karya (Persero) Tbk, inseparabl namely "To be one of the best companies in the field of Engineering Procurement and Construction (EPC) and Integrated Investment in Southeast Asia".e from the efforts to achieve the company's Vision and Mission,

The phenomenon of problems that occur there are some delays to the procurement and delivery of materials/goods in the Biodiesel EPC Project, the lack of time and service performance and flexibility of some suppliers of goods, and the absence of classification of goods during the procurement process so that the same conditions for the assessment parameters of the supplier selection of suppliers is a multi-criteria decision-making issue (Pujawan, 2005). As an alternative solution to minimize project delays and to accelerate procurement and delivery of materials, creating transparency, efficiency is required to identify criteria weights based on the classification or category of goods to be purchased, to facilitate stakeholders in making decisions to solve problems, and obstacles that occur.

PT Wijaya Karya (WIKA) is a company engaged in civil construction and EPC. In this case EPC and civil construction work, WIKA does not work alone but is supported by suppliers or specialist subcontractors who can meet the requirements of the project owner. There are

weaknesses in the selection of suppliers conducted by WIKA, namely decision-makers judge only based on the price offered and the quality of goods owned subjectively even though there are already procedures that govern it. The resulting decision is subjective so that other conditions do not consider evenly, other than that the weighting of existing criteria has not been based on each category of goods.

The previous research has revealed what criteria are influential in supplier selection but have not identified criteria weights based on classification or category of goods to be purchased. Therefore, it is necessary to develop the model criteria for supplier selection and weighting based on the classification or category that has been done in previous research by this research, especially conducted in the EPC Project at PT.Wijaya Karya (Persero) Tbk (PT WIKA).

One of the methods that can be used to weigh the selection of suppliers is to use the Analytical Hierarchy Process (AHP) method.AHP is a form of decision-making method that is used to cover the shortcomings of the previous model. The striking difference between AHP and other decision-making models lies in the type of input. Generally other decision-making models use quantitative input derived from secondary data. So it can only process data that is quantitative. While the AHP model uses human perception that understands correctly about the proposed problem as its main input. Population and samples of this research are parties involved in the implementation of E-SCM in PT. Wijaya Karya (Persero) Tbk, at the EPC Project for the Construction of 1500 TPD Biodiesel Plant including Pre-Treatment in Batulicin-South Kalimantan.

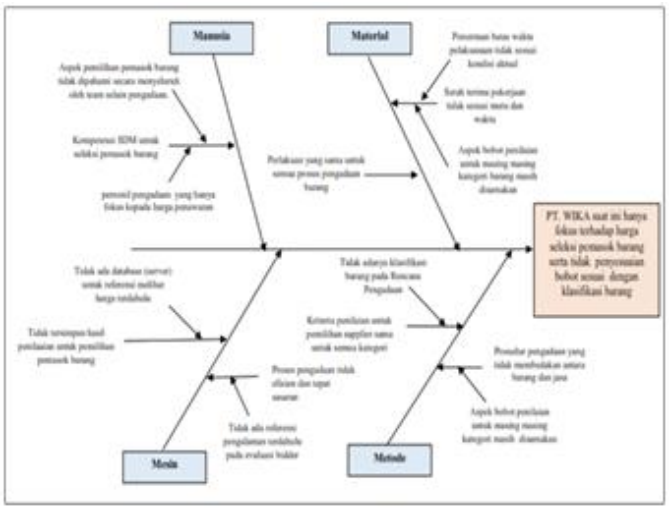

Fig 1:- fishbone diagram

II. RESEARCH METHODE

Research Approach

At this stage, the conceptual and the operational models are developed. The conceptual model consists of the factors that influence the selection of suppliers, they are criteria and sub-criteria and the operational model consists of indicators and assessment parameters that influence the selection and assessment of subcontractors.

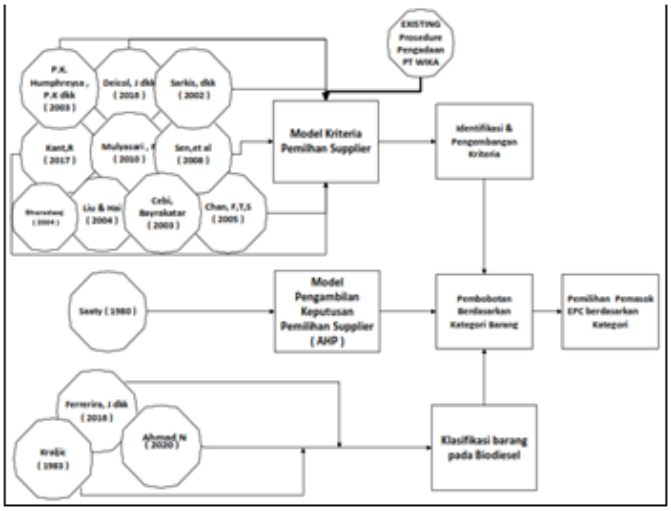

Fig 2:- Model Formulation Schematic

Method of Collecting Data

In this study, the way to collect the data is to use a limited survey method for participants involved in projects related to EPC Biodiesel at PT Wijaya Karya and PT Wijaya Karya Rekayasa Konstruksi. The results of this data collection are followed up in data processing. The maximization of the objectivity of this research design is carried out by using numbers, statistical processing, structure, and controlled experiments.

Compilation of Questionnaire

From the results of the development of the operational model, the suggested indicators are obtained. Before entering into indicator screening, it is necessary to prepare an assessment instrument with the following steps

1. Determinate of the rating scale,
2. Design the assessment instrument sheet,
3. Test the validity and reliability of the assessment instrument.

Designing Scale

To screen the indicators, an assessment scale was created which aims to enable respondents to select indicators according to the respondent's experience ranging from the “strongly disagree” scale to the “strongly agree” scale used in the evaluation and selection of subcontractors. This scale is included in the Likert scale, where the type is included in the ordinal scale. This scale is used because it is quite easy to assess opinions, attitudes, or behaviors. (Anderberg, 1977; Franceschini dan Rupil, 1999; dalam Liquiddanu. E, 2015).

Determination of Sample Questionnaires

Data processing is carried out at PT WIKA as a company that has a lot of experience in project activities which is a limitation in this study. Moreover, the author has also worked for more than 10 years in this company. Taking specific target respondents who are considered capable and representing the information provided (Sekarman, 2003), judgment sampling technique is used to obtain expert opinion data regarding the assessment criteria in the EPC Biodiesel

project with weighting according to the classification of goods. The target respondents are experienced personnel at PT.WIKA who are involved in the EPC Biodiesel project representing the level of experience and position of the personnel. The personnel referred to are important officials at PT. WIKA, which consists of:

a. Project Director (PD)
b. Project Manager
c. Bureau Manager
d. Project procurement team.
e. Other teams related to the proposed criteria, such as financial function, contract administration, commercial, and safety.
f. Spread the sheet to the target respondents,

The collection of questionnaire data from respondents is then carried out by filtering the indicators using the cut off method, the consideration using this method is because it is adjusted to the type of data to be used Likert-scales (ordinal data), where this type of data cannot be added or divided, but only a mode can be searched for each category.

Data Processing Methods

This data processing uses validity and reliability tests in which there is a cut-off method before testing the validity and reliability. Then the weighting of each criterion for each item classification is carried out to obtain the weight of the criteria and sub-criteria for each item classification (Strategic, Leverage, Bottleneck & NonCritical).

Validity and Reliability Test

Before entering this stage, the process of collecting data from the distribution of questionnaires has been designed in the section above. To get a good assessment instrument, the results of this research questionnaire need to be tested for validity which aims to ensure that the instrument being developed can be assessed. The next step is to conduct a reliability test which aims to measure the stability and consistency of an indicator (Sekaran, 2003). The process of calculating the test has been described in the previous chapter (literature study) and is assisted by the IBM-SPSS version 22 application software.

Analytic Hierarchy Process

After screening, the criteria and sub-criteria that are needed in the assessment system for supplier selection at EPC Biodiesel are obtained. The weighting method here is carried out using the AHP method. The steps taken to determine the assessment instrument and conduct a limited survey to get almost the same weight in Chapter 2, this survey is the same as the survey for determining criteria but the difference is in terms of respondents who are more detailed in making decisions, these are as follows:

1. Target respondents are Management personnel in the EPC Biodiesel Project, with the following details:
a. Project Director
b. Field manager
c. Leader / head of section / main executor
2. The calculation of the weight of the questionnaire data collection results using the AHP method, both weights for each criterion and sub-criteria for each item classification (Strategic, Leverage, Bottleneck & NonCritical) in the Biodiesel EPC Project. AHP data processing uses the AHPcalc Ver 2016 web software.

III. RESEARCH RESULT

Performance Analysis of the Proposed Model

There are eight main criteria for selecting suppliers of goods in the Biodiesel EPC project for each category are the same and have been approved by experts through surveys and validation and reliability tests that have been carried out. The results of the survey are valid and reliable

Table 1. Person Correlation for each criterion

No.	*KRITERIA*	*PEARSON CORRELATION*
1	Total Biaya Pengadaan	.727**
2	Tingkat Inovasi	.762**
3	*Sustainability*	.933**
4	Performansi Pengiriman	.717**
5	Performansi Pelayanan	.611**
6	Kualitas Produk	.604**
7	Hubungan Kerja Sama	.455**
8	Fleksibilitas	.467**

Tables 2. Reliability Test for each criterion

CODE	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
A	77.58	108.702	.663	.715
B	78.00	111.333	.715	.719
C	77.95	96.942	.909	.674
D	77.68	109.339	.652	.717
E	77.58	120.813	.573	.745
F	77.16	114.918	.533	.733
G	77.79	126.398	.193	.762
H	77.58	128.035	.088	.766

The main criteria are:

• Total Procurement Costs

The total procurement cost does not only combine the price (net price) but also calculates the financial position and payment terms of the supplier of goods during the tender process. This is necessary based on the author's experience and the results of discussions with several experts who state that some suppliers of goods provide a fairly cheap price, but in practice, they have difficulty costs and finally the supplier of goods will propose a change in the Payment Term that has been agreed to be contacted. Through combining the prices and commercial conditions, it is expected that the results of

the evaluation will be better than using the existing model criteria where price and finance are separate criteria.

• Innovation Level

The level of innovation is a new criterion added by the author. This is required in the procurement of goods using a high level of innovation with value engineering where the suppliers can provide suggestions to contractors to get additional without changing the contract with the owner of the job. Suppliers of goods identify how they implement the innovation in their products and how they support the product development in the future. It can be seen in the Sub-criteria of Innovation, Support in Product Development, and Product Performance. In the Biodiesel EPC project, innovation in a product is being an important part because this high technology-based project ensures that there is a need for sustainable development to gain efficiency.

• Sustainability

In the existing criteria, it is called K3L or Health, Work Safety and Environment and Criteria that proposed are more detailed and separate in the sub-criteria between the environment through Environment Performance and work safety through Safety. With green construction that is echoed by PT WIKA in every construction project undertaken, so these criteria can be taken into consideration in selecting suppliers of goods. So not only around the project of the environment but for the suppliers of goods that involved in the project also participate in environmental sustainability and safety in their environment. In Table 4.16, it can be seen that sustainability has the strongest correlation to be considered as an assessment parameter for decisions to choose suppliers of goods.

• Delivery Performance

The existing criteria (time) only prioritize time and does not take into account the conditions of delivery needed so as not to be late. The experience of On-Time Delivery in previous projects has become a concern in selecting suppliers, including how they do the packing and methods of delivery so it can be on time. Besides that, the location of the supplier's factory or office (geographical location) is one of the sub-criteria that are taken into account to estimate the accuracy of the lead time submitted by the supplier.

The total time of delivery and implementation schedule to reach the total time must be displayed and agreed upon for clarification and negotiation with the supplier of goods. By considering the things above, so the delivery performance can be maintained based on the project schedule or it can be faster. Currently, industrial plant projects have a delivery time of mostly less than 18 months from the effective date until the factory can be operated, it makes the time of product delivery very important and conditions must be specified.

• Service Performance

In the existing model, there are no criteria that describe how the service performance can be provided by the supplier of goods. This is very important because this high-tech project has a big risk during installation and commissioning, so how the supplier of goods communicate (communication), the conditions of service, after-sales service procedures and the location of after-sales services, and the response (responsive) from the supplier of goods when problems occur in the project will be an indicator material required in selecting suppliers of goods. As we know that, currently the Indonesian government's infrastructure development program is mostly focused on remote areas so it requires the service performance from suppliers of goods to support it. So, if there is a problem in the project, it does not take a long time for a solution that can be provided by the supplier of the goods.

• Product Quality

The existing criteria (quality) only assess the quality indicators on past performance, qualification value, and experience. Based on the results of discussions with the experts during the survey distribution, so it can be concluded that with such indicators, the existing criteria are incomplete to decide to choose a supplier of goods in the EPC Biodiesel project, the quality of the product is not judged by these indicators but also it needs to be developed into Quality, Reputation (performance in the industry), Technical capability, percentage defectiveness, customer satisfaction level. The quality of sub-criteria indicates how the supplier of goods is concerned about the quality procedures, the conformity to specifications, the ease of operation and maintenance, and where the goods will be supplied by the supplier of goods.

• Cooperation Relationship

Focus on the company's assessment of the supplier's ability to forge good cooperation. These assessments are based on the closeness and trust between the companies and establish cooperation. In this case, the Ethical Standard is usually different if we collaborate with suppliers of goods from abroad and the Attitude of the supplier in the bidding process can be a consideration in the assessment because based on the author's experience, the bidding conditions can describe how the suppliers work together during project implementation. How the suppliers are loyal to the company by looking at the supplier's experience with the previous company also becomes a consideration in assessing the selection of suppliers of goods. Although it has a fairly small correlation when it is seen in Table 4.21.

• Level of Flexibility

This criterion does not exist in the existing model, it requires a level of supplier flexibility in assessing the selection of suppliers of goods on the EPC Biodiesel project, because in the execution process after a contract with the supplier, it has design changes or quantity after detailed engineering is carried out with a consultant owned by the Owner of Work. With the inflexibility of the supplier of goods, this will lead to a potential dispute with the supplier of goods and it will interfere with the delivery time of the goods. Therefore, the author includes the criteria by considering the indicators of facilities and capacity of production, Operational control in the internal suppliers of goods, and the flexibility of the types of companies and organizations of suppliers of goods. This criterion is approved by the experts through a survey that is conducted and validation tests and reliability tests.

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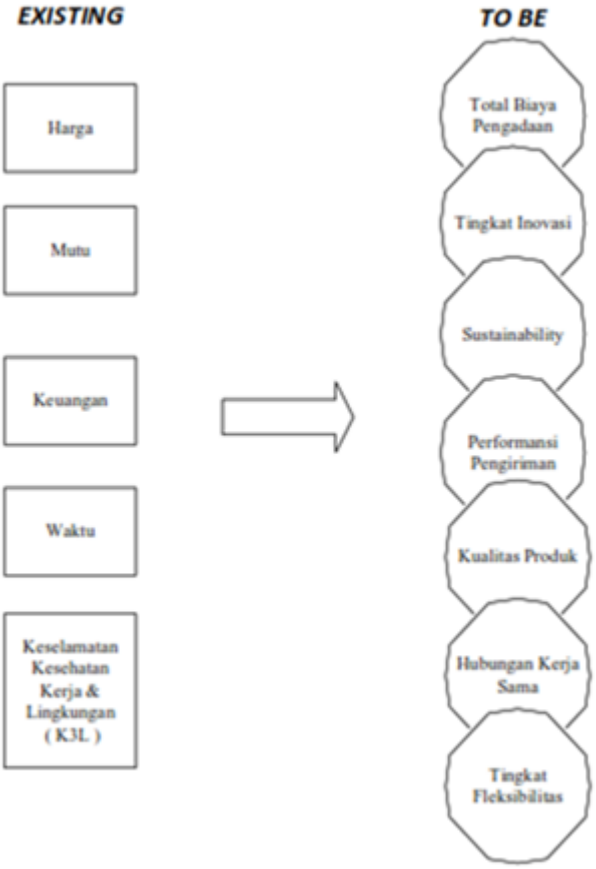

Fig 3:- Existing Criteria vs To-be Criteria

The advantage of the new criteria is that they are not fixated on the price and assess other aspects that are not in the existing criteria, it is expected that it can be obtained the earlier information regarding the condition of the supplier of goods to be appointed so that they are more measurable and there are no problems when the implementation of work. With this new criterion, the weighting based on categories of goods can be more detailed and efficient.

The weakness of the new criteria is the existence of an assessment indicator that depends on the ability of human resources to make decisions about selecting suppliers of goods. Experience and understanding of the person are required in this process, that the documentation during the acquisition process must be provided completely to avoid misinterpretation during the assessment process.

Weighting Analysis for Each Classification of Goods

Weighting is done by using the Analytic Hierarchy Process method that is helped by Web software to do the AHP calculations belonging to K.D Goepel Version 04.05.2016 (http://bpmsg.com). The questionnaire is used to design the weighting between criteria and between Sub criteria and between Indicators. Based on the weighting of the criteria, sub-criteria, and indicators obtained from respondents at PT WIKA, after rounding off the EPC Biodiesel project with calculations by using AHPcalc Ver 2016, the weighting results (after rounding) were obtained for each category.

Table 3. The Weigh of Total Cost of Procurement and Level of Innovation

	DESKRIPSI	STRATEGIS	LEVERAGE	BOTTLENECK	NON CRITICAL
		BOBOT	BOBOT	BOBOT	BOBOT
A.	**KRITERIA : TOTAL BIAYA PENGADAAN**	**0.23**	**0.17**	**0.23**	**0.21**
1	*Net Price*	0.47	0.28	0.32	0.46
a.	Harga Penawaran Utama	0.39	0.33	0.35	0.41
b.	Harga Suku Cadang	0.10	0.14	0.13	0.13
c.	Harga Transportasi ke site	0.27	0.22	0.22	0.23
d.	Harga supervisi (manpower) instalasi & komisioning	0.24	0.31	0.30	0.23
2	*Financial position*	0.33	0.35	0.32	0.21
a.	Komposisi kepemilikan saham	0.10	0.11	0.10	0.11
b.	Curent Ratio (CR)	0.19	0.18	0.19	0.20
c.	Debt to Equity Ratio (DER)	0.16	0.17	0.16	0.16
d.	Net Cash Flow (NCF)	0.33	0.32	0.35	0.30
e.	Surat dukungan bank	0.22	0.22	0.21	0.23
3	*Payment Term*	0.20	0.37	0.36	0.33
a.	Syarat Pembayaran	0.44	0.27	0.41	0.37
b.	Jenis Fasilitas Pembayaran	0.30	0.30	0.27	0.26
c.	Masa Tempo Pembayaran	0.26	0.43	0.32	0.37
B.	**KRITERIA: TINGKAT INOVASI**	**0.06**	**0.08**	**0.05**	**0.07**
1	*Innovation*	0.11	0.17	0.25	0.18
a.	Prosedure standar inovasi perusahaan	0.36	0.40	0.29	0.41
b.	Terdaftar sebagai anggota assosiasi di bidangnya	0.24	0.25	0.32	0.31
c.	Jumlah patent teknologi yang dimiliki.	0.40	0.35	0.39	0.28
2	*Support in Product Development*	0.27	0.27	0.23	0.24
a.	Ketersediaan Divisi Engineering	0.39	0.38	0.38	0.40
b.	Ketersediaan divisi Penelitian dan Pengembangan	0.24	0.28	0.27	0.30
c.	Standar Product Development	0.37	0.34	0.35	0.30
3	*Product Performance*	0.62	0.56	0.52	0.58
a.	Tahun teknologi produksi yang digunakan	0.36	0.27	0.33	0.36
b.	Rentang waktu inovasi untuk produk yang dihasilkan	0.28	0.33	0.28	0.29
c.	Jumlah adaptasi inovasi terbaru pada produknya	0.36	0.40	0.39	0.35

Table 4. The Weight of Sustainability, Delivery Performance, and Service Performance

	DESKRIPSI	STRATEGIS	LEVERAGE	BOTTLENECK	NON CRITICAL
		BOBOT	BOBOT	BOBOT	BOBOT
C.	**KRITERIA: SUSTAINABILITY**	**0.07**	**0.07**	**0.06**	**0.07**
1	*Environmental performance*	0.40	0.33	0.39	0.35
a.	Prosedur Pengelolaan Lingkungan	0.39	0.39	0.34	0.34
b.	Dokumen sertifikat ISO 14000	0.31	0.25	0.27	0.33
c.	Penghargaan terkait kelestarian lingkungan (5 tahun terakhir)	0.30	0.36	0.39	0.33
2	*Safety*	0.60	0.67	0.61	0.65
a.	Prosedur SHE	0.34	0.37	0.39	0.35
b.	Dokumen sertifikasi SHE	0.34	0.30	0.31	0.31
c.	Penhargaan terkait SHE pada Proyek sebelumnya (5 tahun terakhir)	0.32	0.33	0.30	0.34
D.	**KRITERIA: PERFORMANSI PENGIRIMAN**	**0.11**	**0.14**	**0.16**	**0.15**
1	*On time delivery*	0.65	0.52	0.52	0.52
a.	Ketepatan pengiriman pada proyek sebelumnya (3 tahun terakhir)	0.43	0.40	0.42	0.36
b.	Prosedur packing & marking	0.25	0.30	0.26	0.28
c.	Metode pengiriman yang dimiliki	0.32	0.30	0.32	0.36
2	*Geographical Location*	0.13	0.18	0.18	0.15
a.	Letak geografis pemasok	0.29	0.32	0.31	0.34
b.	Lokasi pabrik / gudang pemasok	0.34	0.35	0.32	0.34
c.	Kepemilikan cabang di indonesia (untuk pemasok LN)	0.37	0.35	0.37	0.32
3	*Lead time*	0.22	0.30	0.30	0.33
a.	Total waktu pengiriman sesuai lokasi pengiriman (delivery term)	0.68	0.63	0.68	0.60
b.	Detail jadwal pelaksaan pekerjaan	0.32	0.37	0.32	0.40
E.	**KRITERIA: PERFORMANSI PELAYANAN**	**0.11**	**0.12**	**0.12**	**0.11**
1	*Communication*	0.21	0.24	0.24	0.22
a.	Kepemiliki sistem komunikasi di internal pemasok	0.28	0.32	0.31	0.38
b.	Prosedur komunikasi	0.26	0.27	0.30	0.26
c.	Kepemiliki sistem komunikasi yang terkoneksi dengan konsumen	0.46	0.41	0.39	0.36
2	*Service*	0.30	0.28	0.30	0.33
a.	Prosedur pelayanan purna jual (klaim garansi)	0.21	0.22	0.22	0.32
b.	Kepemilikan layanan purna jual di negara konsumen	0.34	0.34	0.36	0.28
c.	Kepemilikan layanan purna jual di dekat lokasi proyek	0.45	0.44	0.42	0.40
3	*Responsiveness*	0.49	0.48	0.46	0.45
a.	Kecepatan respon pemasok saat tender terhadap perubahan	0.46	0.47	0.43	0.36
b.	Prosedure perubahan pemesanan yang mudah	0.32	0.26	0.30	0.29
c.	Jumlah team dari pemasok yang bertanggung jawab saat tender	0.22	0.27	0.27	0.35

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Table 5. The Weight of Product Quality, Cooperation Relationship, and Level of Flexibility

	DESKRIPSI	STRATEGIS	LEVERAGE	BOTTLENECK	NON CRITICAL
		BOBOT	BOBOT	BOBOT	BOBOT
F.	KRITERIA: KUALITAS PRODUK	0.27	0.24	0.20	0.21
1	*Quality*	0.41	0.42	0.45	0.38
a.	Kepemilikan Standar Quality Procedure	0.26	0.27	0.25	0.27
b.	Tingkat kesesuaian dengan spesifikasi yang dipersyaratkan	0.31	0.25	0.27	0.33
c.	Tingkat kemudahan Maintanance dan Operation	0.27	0.29	0.28	0.23
d.	Asal Negara dari Pemasok / Pabrikan	0.17	0.19	0.20	0.17
2	*Reputation /Performance in industry*	0.13	0.07	0.09	0.11
a.	Pengalaman proyek sejenis yang dikerjakan dalam 5 tahun terakhir	0.30	0.28	0.32	0.30
b.	Reputasi perusahaan di komunitasnya	0.23	0.17	0.17	0.20
c.	Nilai kontrak proyek sejenis yangdikerjakan dalam 5 tahun terakhir	0.20	0.22	0.22	0.22
d.	Pengalaman pemasok di proyek pembangkit listrik	0.27	0.33	0.29	0.28
3	*Technical capability*	0.23	0.22	0.20	0.16
a.	Jumlah tenaga ahli yang dimiliki	0.52	0.56	0.53	0.43
b.	Kesesuaian teknis dengan persyaratan konsumen	0.48	0.44	0.47	0.57
4	*Percentage defectiveness*	0.12	0.12	0.12	0.15
a.	Tingkat defect produk selama 3 tahun terakhir	0.61	0.62	0.65	0.61
b.	Tingkat reject produk selama 3 tahun terkahir	0.39	0.38	0.35	0.39
5	*Customer satisfaction level*	0.11	0.17	0.14	0.20
a.	Tingkt CSI di perusahaan pemerintah	0.27	0.30	0.31	0.27
b.	Tingkt CSI di perusahaan swasta	0.29	0.30	0.25	0.34
c.	Tingkat VPI (Vendor Performance Index) di WIKA pada proyek sebelumnya	0.44	0.40	0.44	0.39
G.	KRITERIA: HUBUNGAN KERJA SAMA	0.07	0.08	0.09	0.09
1	*Ethical Standards*	0.23	0.35	0.40	0.32
a.	Prosedure ethical standard	0.47	0.46	0.42	0.28
b.	Tingkat kesamaan budaya dalam bekerja sama	0.30	0.28	0.32	0.38
c.	Tingakt kesamaan bahasa dalam berkomunikasi	0.23	0.26	0.26	0.34
2	*Attitude*	0.45	0.30	0.25	0.31
a.	Tingkat sopan santun supplier selama bidding / tender	0.26	0.25	0.33	0.34
b.	Tingkat gaya komunikasi supplier selama bidding / tender	0.33	0.33	0.34	0.31
c.	Karakter pemasok pada proyek sebelumnya di WIKA	0.41	0.42	0.33	0.36
3	*Loyalty and Confidential*	0.32	0.35	0.35	0.37
a.	Pengalaman dengan WIKA sebelumnya (3 tahun terakhir)	0.39	0.42	0.43	0.39
b.	Dokumen paket integritas	0.34	0.33	0.29	0.31
c.	Ketersediaan Non Disclosure Agreement	0.27	0.25	0.28	0.30
H.	KRITERIA: FLEKSIBILITAS	0.08	0.10	0.09	0.09
1	*Fasilitas & kapasitas produksi*	0.45	0.38	0.32	0.40
a.	Jumlah produksi produk perbulan	0.53	0.57	0.57	0.52
b.	Tingkat sisa kemampuan produksi saat ini	0.47	0.43	0.43	0.48
2	*Operation Control*	0.32	0.32	0.34	0.26
a.	Procedure Sistem Operasi Perusahaan	0.33	0.35	0.28	0.28
b.	Tingkat implementasi SOP yang berdasarkan Standar International	0.34	0.29	0.33	0.34
c.	Tingkat kemampuan kontrol produksi	0.33	0.36	0.39	0.38
3	*Flexibility*	0.23	0.30	0.34	0.34
a.	Jenis perusahaan supplier	0.33	0.46	0.36	0.33
b.	Organisasi perusahaan supplier	0.26	0.22	0.21	0.26
c.	Tingkat kemudahaan jika terjadi perubahan	0.41	0.32	0.43	0.41

Managerial Implications

The criteria, sub-criteria, and indicators that are generated in the development of this proposed model will be applied to the assessment system procedure for the selection of suppliers of goods at PT. WIKA. This development is made by combining the existing model with the models from several previous studies.

From this development, there are managerial implications to PT. WIKA if the proposed model is implemented, they are:

1. The Impacts of Procedure

The procedural changes are required in the implementation of this new proposed model. At PT WIKA for the development of procedure at procedure number: WIKA-DAN-PM03.01, revision: 05, date: February 1, 2017, regarding the acquisition of a contract for the procurement of project goods and services where the procedure must be separated between the procedures of goods procurement and service procurement. To accommodate the category of goods, so at the time of planning the procurement of goods has been started the categorization which relates to the items to be purchased so will facilitate the weighting based on the category of goods.

2. The Impact of Human Resources (HR)

Because the weighting is carried out based on the category of goods, so it is necessary to have human resources who understand the goods that will be purchased, so the assessment is done and it is recommended to the decision-maker to be appropriate following the procurement plan. The human resources must be able to collect the item data and item supplier data in detail, both ongoing bidding and the old data that is used as a basis for assessment, and the data can be displayed easily to decision-makers for selecting suppliers of goods. In addition, they are also able to provide suggestions to other parts of the item categorization process.

3. The Impact of Organization

The implementation of the proposed model with the weight according to the category of goods causes the procurement organization to be required to make changes and add the job desks for each procurement personnel. A procurement organization can have specialized personnel for each category of the strategic, leveraged, non-critical, and bottleneck.

4. The Impact of technology on Information

The proposed model requires the data from the previous procurement process as a basis for evaluating supplier selection, an integrated procurement information system and a web-based assessment system are needed to make it easier for decision-makers to make assessments.

Moreover, currently, the proposed model has a different weight for each category of goods, so using an integrated information system is better and the process is faster.

IV. CONCLUSION

The criteria that are used in selecting suppliers of goods in each category strategic, bottleneck, leverage, and non-critical are the same, it is Total Cost of Procurement, Level of Innovation, Sustainability, Delivery Performance, Service Performance, Product Quality, Cooperation Relationships and Level of Flexibility.

The sub-criteria arranged are as follows:

Total Procurement Costs : Net Price, Financial Position, dan Payment Term,
Innovation Level : Innovation, support in product development dan product performance,
Sustainability : Environmental Performance dan Safety,
Delivery Performance : On Time Delivery, Geographical Location dan Lead Time
Service Performance : Communication, Service dan Responsiveness,
Product Quality : Quality, Reputation /Performance in industry, Technical capability, Percentage defectiveness, Customer satisfaction level,
Cooperative Relationship : Ethical Standards, Attitude dan Loyalty and Confidential,

Level of Flexibility : Facilities & Capacity Production, Operation Control, and Flexibility.

The results of the weighting show that the Criteria of Product Quality in most of the categories are the highest compared to the Criteria of Total Procurement Cost. In the category of Strategic Total Procurement Costs (23%) and Criteria Product Quality (27%), while in the category of Total Procurement Costs of Leverage (17%) and Criteria of Product Quality (24%). Based on the survey results, respondents were categorized as Bottleneck Total Procurement Costs (23%) and Criteria of Product Quality (20%) while in the Non-Critical category Total Procurement Costs (21%) and Criteria of Product Quality (21%).

The weighting for Service Performance has almost the same weight for each category with a range (11% -12%) while for the Delivery Performance Criteria it weights each category with a range (14% -16%) only in the strategic category it weights 11%.

For other weights of criteria almost have the same weight for each category, the weight range (5% -7%) for the innovation and sustainability level and the weight range (7% - 9%) for the Criteria of Cooperation Relationship and the Criteria of Flexibility Level.

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