p–ISSN: 2723 - 6609 e-ISSN: 2745-5254
Vol. 5, No. 7, July 2024 http://jist.publikasiindonesia.id/

Analysis of the Combination of Vendor and Consultant Executors Through Risk Management Moderation on Decision Making for the Development of the E-Procurement System at PT XYZ

Muhammad Sahlan[1*], Paidi W.S[2]
Universitas Tanri Abeng, Indonesia
Email: muh.sahlan@student.tau.co.id

*Correspondence

Keywords: executor combination, manova test, FMEA, AHP.

ABSTRACT

The selection of potential executor combinations is the initial stage in planning the development of an e-procurement system. The aim is to conduct studies and analyze each combination of executor vendors and consultants based on their impact and scale of importance on cost, time, quality, and flexibility. This study will lead to selecting a recommended combination with the least risk value and the most important based on the current conditions of PT XYZ. The method used in this research is a quantitative method with the MANOVA test to assess differences in the influence of each executor combination on costs, time, quality, and flexibility. Next, a risk analysis is carried out using the FMEA method to assess the Risk Priority Index and determine risk mitigation. After that, the best combination of executors is selected based on the risk value and the interest scale. The research results show that there are differences in the influence on cost and quality of all combinations of executors, but different combinations of executors do not have a different influence on time and specificity. The results of the risk analysis show that there are influences of risk management in the relationship between each type of executor on costs, time, quality, and flexibility, which can be seen from the decrease in the Risk Priority Index value for each risk event that has been identified due to risk mitigation. Finally, the results of selecting potential executor combinations using AHP show that combination 8 is the first potential with a value of 0.136, followed by combination 5 in second place with a value of 0.112, and third place is achieved by combination 7 with a value of 0.111. The fourth, fifth, and sixth places are each occupied by Combination 3 with a value of 0.101; combination 2 with a value of 0.098; and combination 1 with a value of 0.097.

Introduction

In the era of digital development like today, technology has had a great impact, where technology has entered and changed various aspects of life including the world of business and procurement (Stević et al., 2019). One of the developments in the supply chain system is the implementation of e-procurement or electronic procurement. E-procurement is a system that facilitates the process of procurement of goods and services electronically through the Internet and involves an online selection and purchase process, as well as efficient procurement administration (Hruška, Průša, & Babić, 2014).

E-procurement has a significant positive impact on organizations. With the implementation of e-procurement, the procurement process becomes more efficient, and transparent, and can reduce the cost and time required to complete each stage of procurement (Faisal, Paruntu, & Warka, 2017). In addition, e-procurement also facilitates wider access to providers of goods and services, can increase competition between suppliers, and improves quality in procurement (Az-Zahra, Fadhillah, Yuningsih, & Purwoko, 2024).

In the development of the e-procurement system, an in-depth study is needed on the stages of preparation for system development to prevent unwanted impacts in its implementation (Habibi & Untari, 2018). Because PT XYZ is a State-Owned Enterprise (BUMN) engaged in the health sector, it is very necessary to apply the principles of Risk Management to risks that may arise by SOE Regulation No. PER-2/MBU/3/2023 concerning guidelines for governance and significant corporate activities of state-owned enterprises. In addition, with the application of the Risk Management concept, it is hoped that the e-procurement system that will be built can be more efficient in terms of cost and development time, and flexible in future development plans, without reducing the quality of system development results (Mohamed, 2018).

The development of the e-procurement system is expected to reduce the level of corruption in the implementing organization. This is possible because, with the e-procurement system, all information can be monitored, controlled, and evaluated using the application (Jalal Faraj, 2016). This has the effect of transparency in working because the entire process has been integrated and can be monitored by many parties who can access it, including vendors, users, and procurement implementers (Rizki, 2018) (Kalıannan, O., Awang, D. D., & Raman, D. 2009). Errors that occur due to human error can be minimized by the existence of an e-procurement system.

PT XYZ is a Health SOE company that has implemented and used the e-procurement system for its procurement process since 2020. e-Procurement at PT XYZ is currently implemented at the Head Office of PT XYZ and is carried out for the entire procurement process that is authoritatively carried out by PT XYZ Head Office, such as the procurement of goods and services for units >300 million, auction procurement, and other procurement processes that occur internally of PT XYZ by applicable regulations.

Currently, the e-procurement system at PT XYZ consists of 4 modules, namely the vendor management module, e-catalogue module, e-purchasing module, and contract management module. However, these modules have not been implemented 100%. The

estimated implementation for each module is currently vendor management at 90%, e-catalogue at 20%, e-purchasing at 55%, and contract management at 0%. The potential addition of new modules such as planning modules, monitoring and evaluation modules is also a consideration to be added to PT XYZ's e-procurement system. The overall improvement that will be carried out will be assessed and studied for its optimality and feasibility of application to PT XYZ.

Biaya sangat menjadi fokus pada pengembangan kali ini dikarenakan kondisi Perusahaan PT XYZ yang sedang buruk. Selain itu, waktu penyelesaian pekerjaan juga menjadi fokus utama karena proses procurement di PT XYZ juga terus berjalan. Harapannya, projek dapat diselesaikan dalam waktu yang tidak terlalu lama agar sistem dengan segera dapat diimplementasikan dan dirasakan manfaatnya. Hal yang tentunya fundamental dalam hal pembuatan aplikasi sistem e-procurement adalah kualitas, dimana kualitas menjadi hal mutlak yang harus dipenuhi. Serta, belajar dari pengalaman sebelumnya maka peneliti menilai bahwa Fleksibilitas pengembangan juga menjadi faktor kunci setelah program dipublikasikan untuk dapat dilakukan refreshment dan improvisasi pada program aplikasi melalui tenaga IT Internal agar tidak bergantung This research focuses on developing e-procurement that has been implemented at PT XYZ to be better than before. The intended development of e-procurement is grouped into two parts, namely development by making improvements to the previous e-procurement application and development that starts from scratch such as making new e-procurement. According to the study, for the sake of time and process efficiency and uninterrupted implementation of the procurement process in the current procurement function, management is more focused on the development of existing systems. However, it turns out that there are limitations that make this impossible to implement. Some of the conditions that cause this to be impossible are because internally the programming language used is not familiar in the internal IT environment of PT XYZ, the mapping algorithm owned is not fully provided by the previous developer, data access is still controlled by the previous developer. This is a stumbling block for PT XYZ to develop an existing e-procurement application program. For this reason, an effective way for the procurement process in PT XYZ procurement to get its essence, it is necessary to develop an e-procurement system from scratch.

In terms of specifications, modules, and needs, PT XYZ has gotten an overview of the weaknesses of the previous application program and from several benchmarks to companies that have implemented e-procurement and are more agile and robust in their programs. Thus, PT XYZ has been able to prepare specifications for the creation of a new e-procurement system. To develop e-procurement from scratch, the thing that needs to be considered is the selection of executors. This is the main factor because PT XYZ does not want to get the same experience as the previous developer where the algorithm and basic materials of making e-procurement applications are not published to internal users to improvise after launching, the programming language used is not common at PT XYZ so it is necessary to find new employees who understand programming languages, The e-procurement system developed is not usable, user-friendly, informative, agile, and robust.

Departing from this, it is considered necessary to develop a system with much better quality than before and high flexibility to be developed internally when needed. But of course, no less important is the focus on development costs and system development time.

To the executive developers. Departing from the above, the researcher considers it necessary to conduct an analysis study to select the right executor combination based on risk management to reduce risks that will occur in the future and assess which executor combination is the most optimal.

The selection of the executor combination was inspired by several studies, one of which was a study (Fitriana & Santosa, 2020) that researched related to how to select developers/vendors/providers with certain criteria. In addition, several studies also assess that cost, time, and quality factors are also important factors to assess project completion. Departing from this, the researcher will research the selection of the Executor which is not only external but a combination of external and internal. This is considered necessary, because the success of external executors is inseparable from the role and contribution of internal actors in data preparation, including system support such as business processes and other data. The external parties that will be examined in this study are the difference between the involvement of vendors in the combination and the involvement of the implementing consultant in the combination. This inspires researchers because there will be potential differences in terms of costs to be incurred, system development time, quality of the system to be produced, and flexibility in system development later. For this reason, the researcher considers it necessary to analyze the selection of external executors based on their combination with internal users in PT XYZ.

One of the novelties of this study is the addition of variables regarding flexibility that arise as a result of bad experiences from previous system development. It is hoped that this flexibility variable can be a benchmark and additional parameter for PT XYZ's internal to develop a better system when needed, handle bugs quickly and quickly, make repairs and maintenance easily, and other things that are positive for system sustainability. In addition, when reviewed from research (Utami, Sitania, & Profita, 2022) in choosing the best option only based on the scale of interest and the results of risk analysis, another novelty that distinguishes it from other studies is the existence of an additional analysis regarding the assessment of differences from each external executor of vendors and consultants on their combination with internal costs, time, quality, and flexibility. This causes the existence of more than one independent variable and more than one dependent variable so the test must use a multivariate analysis.

All studies and analyses related to potential risks that will occur will be assessed using the implementation of risk management. This aims to lower the value of risks that may arise by trying to reduce, modify, and divide risks. However, in this study, the risk assessment taken is not the entire risk management cycle because it is limited to risk identification, risk assessment, and implementation of risk mitigation plans. This is the focus of the researcher because of the limited research time which does not allow for the assessment of the effectiveness of the results of the proposed selection of executor combinations for the development of the e-procurement system so that assessing its

effectiveness and reducing the risk value cannot be done for the time being. This is a potential for research development in the future.

Method

This study is quantitative because the researcher will analyze the differences between each combination of vendor executors and consultants with internal users on the dependent variables of cost, time, quality, and flexibility and calculate the risk level of the influence of each Executor Combination on cost, time, and quality as well as measure and determine the best Executor Combination to be selected in the development of PT XYZ's e-procurement system. The types of data used are divided into two, namely primary data and secondary data.

The data sources used in this study are divided into two, namely special and general data sources. The special data intended here is data obtained specifically from interviews with BoD-2 in the procurement and technical support team of the IT department. The data obtained can be used as material to start making specifications, and risk criteria and determining the criteria and user needs for the Executor Combination in the development of the e-procurement system at PT XYZ.

In addition, other sources of data are obtained in general. The data obtained in general is intended for data obtained from the procurement and IT division as prospective users of the e-procurement system and technical support as a whole starting from the implementer to BoD-3 at PT XYZ. Data will be collected through the distribution of questionnaires. The questionnaire will be created and adjusted to the needs of the researcher to be able to support the research results.

The sample population that will be taken by the researcher is from the procurement implementation population in the procurement division and also technical support from the IT division. This is intended to further explore and describe the needs of potential users, risks that may arise, and other considerations that are more specific to potential users. The sample population that will be formed is limited for the procurement team at the head office of PT XYZ because the system to be developed will be made a pilot project before being implemented in other users besides the head office. The procurement team at the Head Office will also be the target subject for the interview as a representative of all prospective users, especially for the Manager. As for the production team with the status of the implementer to manager, it will be the subject of a questionnaire that has been planned to support the research data.

The analytical tools or instruments used by the researcher in analyzing the results of this study are Microsoft Excel and the SPSS program. In detail, the test steps that will be carried out are:

1. The survey was conducted with a questionnaire that used the Likert method by scoring each answer choice
2. After the data has been received, the data is processed using Excel so that it can be adjusted to the raw data processed in the system
3. After that, a descriptive test or analysis of the data is carried out

4. Furthermore, because the data has more than one dependent variable, the analysis continues by conducting a MANOVA test

Results and Discussion

MANOVA Data Normality Test

This test was carried out to see whether the data used in the distributed research sample was normal or not. For this reason, the following data were obtained from the results of the study:

Table 2
MANOVA Data Normality Test

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Kode	Statistic	df	Sig.	Statistic	df	Sig.
Biaya	Kombinasi 1	.453	40	.000	.576	40	.000
	Kombinasi 2	.401	40	.000	.664	40	.000
	Kombinasi 3	.314	40	.000	.752	40	.000
	Kombinasi 5	.378	40	.000	.756	40	.000
	Kombinasi 7	.342	40	.000	.732	40	.000
	Kombinasi 8	.324	40	.000	.806	40	.000
Waktu	Kombinasi 1	.324	40	.000	.806	40	.000
	Kombinasi 2	.365	40	.000	.772	40	.000
	Kombinasi 3	.401	40	.000	.708	40	.000
	Kombinasi 5	.440	40	.000	.602	40	.000
	Kombinasi 7	.361	40	.000	.758	40	.000
	Kombinasi 8	.329	40	.000	.797	40	.000
Kualitas	Kombinasi 1	.425	40	.000	.626	40	.000
	Kombinasi 2	.410	40	.000	.647	40	.000
	Kombinasi 3	.275	40	.000	.801	40	.000
	Kombinasi 5	.388	40	.000	.680	40	.000
	Kombinasi 7	.357	40	.000	.714	40	.000
	Kombinasi 8	.344	40	.000	.800	40	.000
Flexibilitas	Kombinasi 1	.270	40	.000	.783	40	.000
	Kombinasi 2	.323	40	.000	.771	40	.000
	Kombinasi 3	.328	40	.000	.813	40	.000
	Kombinasi 5	.329	40	.000	.763	40	.000
	Kombinasi 7	.284	40	.000	.797	40	.000
	Kombinasi 8	.344	40	.000	.800	40	.000

Based on the results of the normality test, the significance value showed a value of <0.05. This can be seen from both tests, both the Kolmogorov-Smirnov test and the Shapiro-Wilk test. This shows that the data tested by the researcher has an abnormal distribution of data.

MANOVA Data Homogeneity Test

The homogeneity test on the MANOVA data can be seen in the table "Levene's Test of Equity of Error Variance".

Table 3
Homogeneity Analysis Table
Levene's Test of Equality of Error Variances[a]

		Levene Statistic	df1	df2	Sig.
Biaya	Based on Mean	1.458	5	234	.205
	Based on Median	1.548	5	234	.176
	Based on Median and with adjusted df	1.548	5	208.879	.176
	Based on trimmed mean	1.917	5	234	.092
Waktu	Based on Mean	.894	5	234	.486
	Based on Median	.539	5	234	.746
	Based on Median and with adjusted df	.539	5	228.292	.746
	Based on trimmed mean	1.237	5	234	.292
Kualitas	Based on Mean	.621	5	234	.684
	Based on Median	.180	5	234	.970
	Based on Median and with adjusted df	.180	5	227.462	.970
	Based on trimmed mean	.485	5	234	.787
Flexibilitas	Based on Mean	1.783	5	234	.117
	Based on Median	1.675	5	234	.142
	Based on Median and with adjusted df	1.675	5	225.504	.142
	Based on trimmed mean	1.815	5	234	.111

In the table above, we can conclude that the significance value is >0.05 which means that the data analyzed is homogeneous. For this reason, in looking at the results of the interpretation of the table "multiple comparison" can refer to the Bonferroni type.

Uji MANOVA (Multivariate Analysis of Variance)

Table 4
Tabel Analisa Multivariate Test
Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Noncent. Parameter	Observed Power[d]
Intercept	Pillai's Trace	.986	3933.557[b]	4.000	231.000	.000	15734.226	1.000
	Wilks' Lambda	.014	3933.557[b]	4.000	231.000	.000	15734.226	1.000
	Hotelling's Trace	68.114	3933.557[b]	4.000	231.000	.000	15734.226	1.000
	Roy's Largest Root	68.114	3933.557[b]	4.000	231.000	.000	15734.226	1.000
Kode	Pillai's Trace	.824	12.147	20.000	936.000	.000	242.935	1.000
	Wilks' Lambda	.298	16.915	20.000	767.090	.000	271.418	1.000
	Hotelling's Trace	1.957	22.462	20.000	918.000	.000	449.244	1.000
	Roy's Largest Root	1.733	81.086[c]	5.000	234.000	.000	405.429	1.000

According to (Adeleke, B., F. 2015), if the results of the normality test do not show a normal distribution, then the test using Pillai's trace, wilks lambda, hotteling's trace, and Roy's largest roots approach can be considered to see the influence of independent variables on the dependent variables. In the table above, we can conclude that the significance value of the four models of the effect between independent variables and

dependent variables is <0.05 which means that the analyzed data illustrates a significant influence of independent variables on dependent variables as a whole.

Table 5
Resume of risk value mapping results

Combination Type	Variable Dependencies				Total
	Cost	Time	Quality	Flexibility	
Combination 1	13,8	8,1	9,333333333	15	46,23333333
Combination 2	11,8	8,2	9,5	16,66666667	46,16666667
Combination 3	8,2	8,4	10,66666667	20	47,26666667
Combination 5	8,2	8,3	9,333333333	9,666666667	35,5
Combination 7	7,8	8,6	9,5	11,33333333	37,23333333
Combination 8	4,2	8,9	10,16666667	13,66666667	36,93333333
Highest	*Combination 1*	*Combination 8*	*Combination 3*	*Combination 3*	*Combination 3*
Lowest	*Combination 8*	*Combination 1*	*Combination 1 & 5*	*Combination 5*	*Combination 5*

From the table above, it can be concluded that the results of the risk assessment of the existing executor combination are obtained:

1. The highest risk to Cost is obtained from Combination 1 of (13.8), while the lowest risk is obtained from Combination 8 of (4.2)
2. The highest risk to Project Completion Time was obtained from Combination 8 of (8.9), while the lowest risk was obtained from Combination 1 of (8.1)
3. The highest risk to the Quality of Project Results was obtained from Combination 3 (10.67), while the lowest risk was obtained from Combination 1 & 5 (9.33)
4. The highest risk to the Potential Flexibility of Program Development was obtained from Combination 3 of (20), while the lowest risk was obtained from Combination 5 of (9.67).
5. The highest risk of Total Program Development was obtained from Combination 3 of (47.27), while the lowest risk was obtained from Combination 5 of (35.5).

After calculating the risk value of the dependent variable, the researcher also tried to dig up information and present information about how and what risk mitigation can be done to be able to decrease, divert, or divide the risk. The following is a table showing the projected results of the risk reduction if mitigation actions are implemented.

Priority determination using AHP is carried out to narrow down the best choice between all combinations available when viewed from the perspective of cost, quality, time, and flexibility. The calculation is generated from the assessment of the importance of all dependent variables.

Table 6
Comparative Analysis Table

Comparative Analysis				
	Cost	Time	Quality	Flexibility
Cost	1	4	0,33333333	6
Time	0,25	1	0,14285714	2
Quality	3	7	1	9
Flexibility	0,16666667	0,5	0,11111111	1
Sum	4,41666667	12,5	1,58730159	18

The data in the table above was obtained from structured interview data with experts, in this case, BoD-2. The results of the interviews were then plotted into a comparison table. To be further processed, the data then needs to be normalized to obtain the Priority Vector and Eigen Value. Normalization is carried out by dividing the individual comparison value by the total/total comparison value per each dependent variable. Priority Vector is the average result of the total number of normalized values of each variable. Meanwhile, the value is the value of the product between the Priority Vector and the sum of each dependent variable before normalization.

Uji Changed

The data test using MANOVA was chosen because the data used was data that had more than one independent variable and more than one dependent variable. This is by what was expressed (Iqbal et al., 2021), that for such conditions, the MANOVA test can be used to see the influence of dependent variables on independent variables. From the results of the conclusion of this study on the time and flexibility component, whoever the combination of executors is chosen will not have a significant difference in terms of time and flexibility.

Meanwhile, in the cost and quality components, several combinations have differences. In the cost component, the difference is shown in combination 1; 2; 3 to 5; 7; 8, where the combination is 1; 2; 3 have no significant differences from each other. In addition, the combination of 5 & and 7 was also stated to have a significant difference from the combination of 1; 2; 3; and 8, where the combination of 5 & and 7 has no difference from each other. For the combination of 8, it is stated that there is a difference in all combinations of executors. Based on the above, regarding the difference between each combination of executors on their influence on the cost-dependent variable, there is a significant difference. When referring to the survey results, it can be concluded that a

combination of 1; 2; and 3 has a high expense cost, while a combination of 5; and 7 has a reasonable expense cost, and a combination of 8 has a crunchy cost. It is for this reason that the grouping of each difference can occur. It should be noted that the cost of vendors in the execution of e-procurement production reaches 2-3 M-an per project with the specifications attached in Appendix 6. As for the consultant fee, it is around 200-300 million. This information is obtained through recognition from experts who have made RFIs (Request for Information) to consulting vendors. Because combinations 5; and 7 have more than one consultant, then the costs that will be incurred for the combination are considered reasonable. Meanwhile, group 8 is classified as cheaper because it only consists of one implementing consultant, where the estimated price per implementing consultant is lower.

In the quality component, there are also differences per combination of executors on their influence on the quality-dependent variable. In the results of the study, the difference between the combination of 3; and 8 against a combination of 1; 2; 3; and 5. Meanwhile, combinations 3 and 8 do not have significant differences and neither do the combination groups 1; 2; 3; and 5 that have no significant differences. This means that in terms of quality, a combination of 1; 2; 3 and 5 have no difference. The difference only occurs between 1; 2; 3; and 5 to 3; and 8. When referring to the description of variables. It can be seen that in combination 3 and 8 there is not only 1 external party. There are no supervisory consultants or planners in the combination. So in terms of planning and supervision, there is no backup from the outside. Meanwhile, from the variable description data and survey results, internal users and IT generally do not have enough experience in the e-procurement system development process. So careful planning and strict supervision are needed to maintain the quality of the results of the e-procurement system development project.

Risso's study using FMEA

In the risk assessment using FMEA (Failure Mode and Effect Analysis), 144 Risk Even or potential risk events were obtained for 4 dependent variables, namely cost, time, quality, and flexibility. Each of these dependent variables has a risk register of 30 risk events for cost, 36 risk events for quality, 18 risk events for flexibility, and 60 risk events for time. In addition, from the data, if grouped into independent variables (executor combinations), each combination was recorded to have 24 risk events. Each risk event has its risk cause and severity. The following is also the scoring regarding likelihood and consequence as components that form the RPI (Risk Priority Index). In summary, the results of the FMEA can be seen in "Table 5 Resume of risk value mapping results". From the table, we can see a comparison of the risk value of each combination per total, and per dependent variable component, looking at the lowest and highest risk values per each dependent component and in total.

In "Table 4.14 resume of the results of the risk value mapping", it can be seen that the highest risk value to cost is obtained by combination 1 and the lowest value is obtained by combination 8. This shows that the combination of 8 will incur less cost expenditure and the combination of 1 will incur a huge cost expenditure. The unique result is shown

by the combination of 3 and 5, where both combinations have the same value. So it can be concluded that the risk of the number of costs incurred by the user in choosing combination 5 and the costs that will be incurred by the user if choosing combination 3 is the same even though the combination of 3 consists of (vendor; IT user; user procurement) while the combination of 5 consists of (implementing consultant; planning consultant; supervisory consultant, IT user, and user procurement.). In other words, the risk of high costs for expenses to vendors is equal to the high costs that will be incurred for a total of 3 consultants at once.

To answer the hypothesis about whether or not risk management affects the relationship between the combination of executors and dependent variables, it is necessary to mitigate the risk to the risks that may arise. From the study, a mitigation plan has also been made that can be done for the risk event that may arise as attached to attachment 5. From the results of the calculation of the Risk Priority Index before mitigation, a total of 35 Extreme High, 21 High, 26 Medium, 55 Low, and 7 Very Low-risk statuses. After the mitigation plan is made, the projected Risk Priority Index value is 0 for Extreme High, 1 for High, 9 for Medium, 72 for Low, and 62 for Very Low. When viewed from the decrease in the RPI value, 138 risk events have experienced a decrease in the RPI value and 6 risk events have fixed or unchanged values. Departing from this, it can be concluded that risk management on the influence of the combination of executors on dependent variables (cost, time, quality, and flexibility) can reduce the value of risk. For this reason, the H5 hypothesis; H6; H7; and H8 are acceptable.

Importance level analysis using AHP

This study aims to choose the best executor combination between a combination of vendors and consultants together with users in terms of cost, implementation time, quality of work results, and flexibility of system development in the future. For this reason, the researcher conducted a study using the AHP test to obtain the results based on the scale of importance (Fitriana & Santosa, 2020). Based on this, the following is the AHP test scheme carried out in this study:

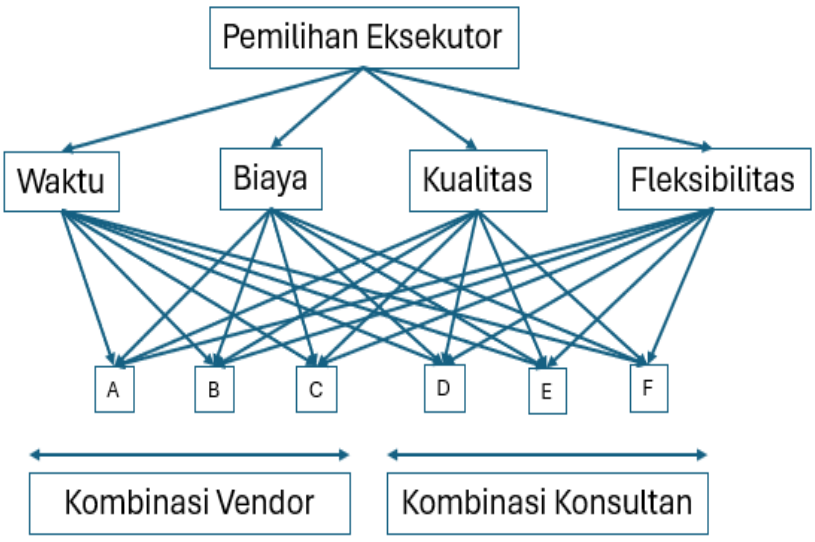

Figure 1. AHP test framework diagram

From the research data, a ratio consistency value of 0.04 was obtained, which means that the data is consistent and can be used in determining the priority scale. The priority vector value in "Table 4.17 Eigen Value Acquisition Table", is the focal point of this test. The priority vector value indicates the highest to lowest priority level. The highest score means that it has a higher priority or level of importance than others. From the results of the study, it was obtained that quality had a higher importance value of 0.592, followed by costs with an importance value of 0.272, followed by a time of 0.084 and Flexibility of 0.051. The results will then be used for the ranking analysis process where the priority vector value will be multiplied by the value of the risk analysis results.

After the transformation, the best results were obtained from the combination of 8 followed by the combination of 5 and after that in the third position, there was a combination of 7. From these results, it can be seen that the distance of the cost gap between combination 5 and combination 8 makes combination 8 the first choice of the AHP analysis results. This can be seen from the results of the risk analysis which states that the lowest total risk value is obtained from a combination of 5, in terms of quality, the combination of 5 is also the combination with the smallest risk value. This is also supported by the composition of the value of the level of importance where quality is the most important component. However, based on the ranking, it changes when it has been multiplied as a whole. The change was caused by a significant difference of 50% of the cost value between combination 1 and combination 8 which caused combination 8 to rank 1st in AHP.

If users from PT XYZ are still concerned about quality, then the choice of combination 5 can also still be chosen as long as the risk can be properly mitigated. Mitigation recommendations may be considered for action. However, if the biggest concern is in costs because the company's financial condition is currently not good, then the right choice can be obtained from combination 1 according to the results of the AHP analysis.

Conclusion

Based on the results of the research on the Analysis of the Combination of Vendor and Consultant Executors Through Risk Management Moderation on Decision Making for the Development of the e-Procurement System at PT XYZ, the following results were obtained:

1. There was a difference in the influence of the Executor Combination on the cost and quality dependent variables, but no difference was found in the time and flexibility variables.
2. There is an effect of Risk Management on the relationship between each combination of executors on the dependent variables of e-procurement system development (cost, time, and flexibility). This is shown from the results of the FMEA analysis with the RPI (Risk Priority Index) parameter between before risk mitigation and after risk

mitigation. From these results, it was shown that there was a decrease in the RPI value for 144 risk events, namely 138 risk events whose values decreased, and 6 risk events whose RPI values remained constant. This proves that the H5 hypothesis; H6; H7; H8; H13; H14; H15; H16 accepted.

3. The best executor combination advice ranking was obtained based on the level of importance and risk level arising using AHP analysis. The ranking from the first to the last is a combination of 8 with a total value of 0.136, followed by a combination of 5 with a value of 0.112 in second place, followed by a combination of 7 with a value of 0.111 in third place, a combination of 3 with a value of 0.101 in fourth place, a combination of 2 with a value of 0.098 in the fifth place, and finally a combination of 1 with a value of 0.097 in the sixth position.

Bibliography

Az-zahra, Diva Sukma, Fadhillah, Yurni, Yuningsih, Aisah, & Purwoko, Sigit Djalu. (2024). Analisis Sistem E-Procurement Pengadaan Barang Dan Jasa. *Jurnal Kajian Dan Penelitian Umum*, *2*(1), 53–60.

Faisal, Muhammad, Paruntu, Febri Yakob, & Warka, I. Wayan. (2017). Implementasi E-Procurement Dalam Rangka Peningkatan Kualitas Pengadaan Barang dan Jasa di Disfaslanal. *Jurnal Strategi Pertahanan Laut*.

Fitriana, Nur Cholidah, & Santosa, Budi. (2020). Analisis Faktor-Faktor Pemilihan Suplier Material pada Jasa Usaha Konstruksi dengan Metode Fuzzy AHP. *Fondasi: Jurnal Teknik Sipil*, *9*(1).

Habibi, Muhammad Mujtaba, & Untari, Sri. (2018). Efektivitas Pelaksanaan E-Procurement Dalam Pengadaan Barang Dan Jasa. *Jurnal Ilmiah Pendidikan Pancasila Dan Kewarganegaraan*, *3*(2), 159–168.

Hruška, Roman, Průša, Petr, & Babić, Darko. (2014). The use of the AHP method for the selection of suppliers. *Transport*, *29*(2), 195–203.

Iqbal, Muhammad, Salsabila, Inas, Syahbani, Dwi Astiti, Douw, Januaria, Marzuki, Marzuki, & Rusyana, Asep. (2021). Analisis MANOVA Satu Arah untuk Melihat Perbedaan Status Gizi Balita Berdasarkan Wilayah Pembangunan Utama di Indonesia Tahun 2017. *Journal of Data Analysis*, *3*(1), 50–61.

Jalal Faraj, Salem Almadani. (2016). *E-Procurement Implementation for Projects (Analysis, Challenges, and Solutions)*. UTAR.

Mohamed, Adan A. (2018). *E-Procurement Implementation And Performance Of County Governments In Kenya*. University of Nairobi.

Rizki, Alisia Ardita. (2018). The challenges of e-procurement implementation in infrastructure projects. *JPAS (Journal of Public Administration Studies)*, *3*(1), 17–25.

Stević, Željko, Vasiljević, Marko, Puška, Adis, Tanackov, Ilija, Junevičius, Raimundas, & Vesković, Slavko. (2019). Evaluation of suppliers under uncertainty: a multiphase approach based on fuzzy AHP and fuzzy EDAS. *Transport*, *34*(1), 52–66.

Utami, Karina Suci, Sitania, Farida Djumiati, & Profita, Anggriani. (2022). Penerapan FMEA Dan AHP Dalam Perumusan Strategi Mitigasi Risiko Proses Penyaluran Jaringan Gas. *Journal Of Industrial and Manufacture Engineering*, *6*(1), 23–35.