JSTI
Jurnal Sistem Teknik Industri

Evaluation of Online Learning Satisfaction During Pandemic Using the IPA-Kano Method

Ismianti Ismianti[1], Hasan Mastrisiswadi [2], and Astrid Wahyu Adventri Wibowo [3]

[1,2,3]*Department of Industrial Engineering, Universitas Pembangunan Nasional Veteran Yogyakarta, Jl. Babarsari 2 ,Yogyakarta, 55281, Indonesia*

Abstract. The COVID-19 pandemic has impacted all aspects of life, including learning activities. Therefore, the entire community must be ready to do online learning, which will have different processes and results from normal learning. The benefit of this approach is to determine the level of student satisfaction in online learning during a pandemic. This study uses attributes on Webqual 4.0 and processed using the integration of IPA and Kano. Based on the results of research conducted on 194 respondents, it was found that attributes users find it easy to learn the operation of the platform (US1) and the platform gives room for personalization (IT4) were in the Beginning jewelry category, users feel confident that files/ goods/ services will be sent properly (IT7) attributes were in the Defenseless Strategy point category, attribute users feel safe to carry out activities/ transactions (IT2) were in the Fatal category, attributes the platform provides accurate information (IF1), reliable information (IF2), users feel safe to carry out activities/ transactions (IT3) was in the Major weapon category, attributes the platform provides relevant information (IF4), easy to understand (IF5) are included in the precious treasure category, and other attributes are included in the removed category because they have the Kano Indifferent category.

Keyword: Kano, IPA, integrated, attribute

Abstrak. *Pandemi COVID-19 telah mempengaruhi berbagai aspek kehidupan, termasuk kegiatan belajar mengajar. Oleh karena itu, seluruh masyarakat harus siap untuk melakukan pembelajaran daring yang bisa jadi akan memiliki proses dan hasil yang berbeda dengan pembelajaran pada umumnya. Tujuan dari penelitian ini untuk mengetahui tingkat kepuasan mahasiswa dalam proses pembelajaran daring di masa pandemi. Penelitian ini menggunakan atribut pada Webqual 4.0 dan diolah menggunakan integrasi IPA dan Kano. Berdasarkan hasil penelitian yang dilakukan terhadap 194 responden, didapatkan bahwa atribut pengguna merasa mudah mempelajari pengoperasian platform (US1) dan platform memberikan ruang untuk personalisasi (IT4) berada pada kategori* Beginning Jewelry, *atribut pengguna merasa percaya diri bahwa file/barang/jasa akan terkirim dengan baik (IT7) berada pada kategori Defenseless Strategy point, atribut pengguna merasa aman untuk melakukan aktivitas/transaksi (IT2) berada pada kategori Fatal, atribut platform memberikan informasi yang akurat (IF1) , informasi terpercaya (IF2), pengguna merasa aman untuk melakukan aktivitas/transaksi (IT3) berada di kategori* major weapon, *atribut platform memberikan informasi yang relevan (IF4), mudah dipahami (IF5) termasuk dalam kategori* treasure category, *dan atribut lainnya termasuk dalam kategori yang dihapus karena memiliki kategori Kano Indifferent.*

Kata Kunci: Kano, IPA, integrasi, atribut

*Corresponding author at: [UPN Veteran Yogyakarta, Jl. Babarsari 2 , 55281, Yogyakarta, Indonesia]
    E-mail address: [ismianti@upnyk.ac.id]

1. Introduction

In December 2019, new pneumonia outbreak with fever, cough, dryness, fatigue, and occasional gastrointestinal symptoms occurred in Wuhan, Hubei, China [1]. The pathogen of this outbreak was later identified as a novel beta coronavirus, named 2019-nCoV [2]. Since then, the life of the world community has begun to change in order to prevent the spread of Covid-19, which is highly contagious and spreads. Almost all countries are tightening the movement of their population and imposing regulations not to move outside the home, so this change impacts various sectors, such as the economy, tourism, and socio-culture, including the education sector.

Ministry of Education and Culture of the Republic of Indonesia, through Circular No. 36962/MPK.A/HK/2020, urges students to apply online learning from home for students in order to put a stop to the transmission of Covid-19 [3]. Based on the circular, many universities in Indonesia have conducted online learning for 3 semesters until early 2021. All assignments, and lecture materials from lecturers to evaluate learning are completed online. Situations like this should not reduce maintenance and quality of teaching and learning activities. Instead, it is challenging for academics to take advantage of technology from various distance learning platforms.

Online learning certainly requires the readiness of the entire academic community, be it lecturers, students, and education staff, to synergize with each other. However, obstacles have been found in its implementation because not all academics are ready to operate the new system as if they were forced to adapt quickly. Therefore, this study aims to evaluate students' satisfaction during the COVID-19 pandemic in online learning.

Many types of research on online learning have been carried out, such as [4]–[7] using various methods to measure satisfaction. However, nothing in the study used the IPA-Kano method. The IPA-Kano method itself is a method that can analyze the relationship between satisfaction and performance of each attribute in online learning to get the right strategy to deal with it. This method has been widely used in various studies to measure satisfaction and set strategies to improve it [8]–[16]. The novelty of this research is to use of the IPA-Kano method in measuring online learning contentment, which has never been done before.

The results of this research are expected to be a reference for improving the quality of online learning for lecturers. They can provide good service for students as stakeholders and determine of student satisfaction with online learning services that have been implemented.

2. Methods

This research begins with determining attributes using Webqual 4.0. then proceed with the design of the questionnaire. The next step is to test the validity and reliability of the questionnaire and continue to improve the questionnaire. After the questionnaire was finished, the questionnaire was distributed to student respondents online via Google form. After the data is obtained, data processing and analysis are carried out using the IPA-Kano method.

2.1.   Research object and Data collection

The object of this research is the level of student contentment in carrying out virtual learning during the spread of Covid-19. Primary data was collected using a questionnaire to 208 respondents, and 198 valid questionnaires were obtained after the screening. The respondent in this study are vocational, undergraduate, and postgraduate students from various regions in Indonesia. The age of the respondents was between 18 and 23 years old, with the mean and standard deviation being 19,52 ± 1,02 years old. From the data collection, there were 64.4% fees and 35.6% male respondents. The respondents' locations spread from Java, are Sumatra Sulawesi and Nusa Tenggara, with the majority of respondents coming from Yogyakarta. The questionnaire uses the widely used Webqual 4.0 attribute [17]–[19]. The primary data taken include satisfaction level data, importance level data, and Kano questionnaire data for each attribute.

2.2.   Data processing and analysis

This study uses the Kano and IPA model integration methods, which have been widely used in assessing the quality of systems and products [8], [10]–[15], [20]–[22]. The Kano model provides an overview of consumer perceptions of an attribute and divides it into four categories: must-be, one-dimensional, attractive, and indifferent [23]–[26]. Meanwhile, the IPA model classifies each attribute into four categories: concentrate here, keep up the good work, low priority, and mostly overkill [27].

3.   Results and Discussion

3.1.   Importance-Performance Analysis

At this stage, a calculation is made of students' interest and desire for online learning during the pandemic. The calculation results of the level of importance and desire for each attribute can be seen in Table 1. In Table 1, it can be seen that the performance value for all attributes is below the importance value. This means that all attributes need to be improved in performance.

After knowing the average value of the performance level and the level of importance, the next step is to calculate the suitability value. The average of these suitability scores, which are decision scores, will determine whether corrective action is needed to be taken. If the suitability value is below the decision scores, it is necessary to take corrective action. On the other hand, if the decision scores are below the suitability value, corrective action is unnecessary.

Based on Table 1, it can be seen that the attributes that need improvement are US5, IF1, IF3, IF4, IF5, IF6, IF7, IT2, IT3, and IT7. At the same time, other attributes do not require immediate corrective action. After knowing the hold or action decision, the next step is to draw it into a scatter diagram and divide it into four groups. The results of the division can be seen in Fig. 1.

Table 1 Important-Performance Analysis (IPA) calculation

No	Attribute		Avg Imp.	Avg Perf.	Suitability	Decision scores	Hold or Action
1	Users find it easy to learn the operation of the platform	(US1)	3.5048	3.1731	90.53%	88.30%	H
2	The interaction between the platform and the user is clear and easy to understand	(US2)	3.5000	3.1202	89.15%	88.30%	H
3	Users find it easy to navigate within the platform	(US3)	3.3750	3.0962	91.74%	88.30%	H
4	Users find the platform easy to use	(US4)	3.5048	3.1923	91.08%	88.30%	H
5	The platform has an attractive appearance	(US5)	3.3462	2.8798	86.06%	88.30%	A
6	Design according to the type of platform	(US6)	3.2885	2.9904	90.94%	88.30%	H
7	Platform contains competence	(US7)	3.3798	3.0481	90.18%	88.30%	H
8	The platform creates a positive experience for users	(US8)	3.5481	3.1875	89.84%	88.30%	H
9	The platform provides accurate information	(IF1)	3.7019	3.2115	86.75%	88.30%	A
10	The platform provides reliable information	(IF2)	3.6971	3.2788	88.69%	88.30%	H
11	The platform provides timely information information	(IF3)	3.6394	3.0337	83.36%	88.30%	A
12	The platform provides relevant information	(IF4)	3.6490	3.2067	87.88%	88.30%	A
13	The platform provides easy-to-understand information.	(IF5)	3.6971	3.2115	86.87%	88.30%	A
14	The platform provides detailed information at the right level	(IF6)	3.6202	3.0385	83.93%	88.30%	A
15	The platform presents information in the right format	(IF7)	3.6106	3.1490	87.22%	88.30%	A
16	The platform has a good reputation	(IT1)	3.4038	3.1058	91.24%	88.30%	H
17	Users feel safe carrying out activities/transactions	(IT2)	3.6058	3.1779	88.13%	88.30%	A
18	Users feel safe about their personal information	(IT3)	3.6971	3.1923	86.35%	88.30%	A
19	The platform gives room for personalization	(IT4)	3.5192	3.1635	89.89%	88.30%	H
20	The platform provides space for community	(IT5)	3.3510	3.0337	90.53%	88.30%	H
21	The platform makes it easy to communicate with the organization	(IT6)	3.4231	3.0625	89.47%	88.30%	H
22	Users feel confident that files/goods/services will be sent properly	(IT7)	3.6442	3.0192	82.85%	88.30%	A
	Average		3.5321	3.1169	88.30%	88.30%	

Quadrant 1: Concentrate here; included in this quadrant are IF3, IF6, and IT7. If it is included in this quadrant, these attributes need to be considered, and their performance improved.

Quadrant 2: Keep up the good work; those included in quadrant 2 include US8, IF1, IF2, IF4, IF5, IF7, IT2, and IT3. Included in this category, these attributes are still quite good, but their performance can still be improved.

Quadrant 3: Low priority, included in quadrant 3, is US3, US5, US6, US7, IT1, IT5, and IT6. Those who fall into this category have little priority.

Quadrant 4: mostly overkill, included in quadrant 4 is US1, US2, US4, and IT4. Those that fall into this category don't really need to be noticed.
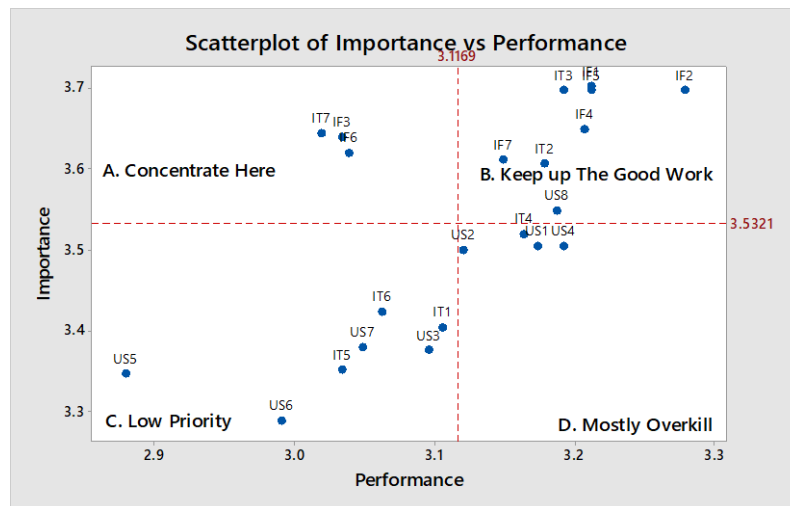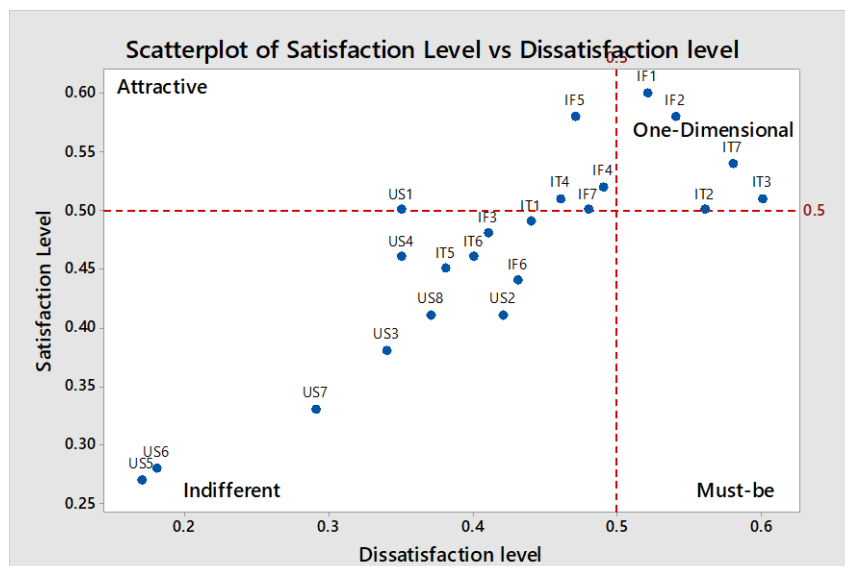
Figure 1 IPA Diagram

Figure 2 Kano Diagram

Based on the analysis results using the IPA method, the results show that the attributes that have the concentration here and action categories are IF3, IF6, and IT7. Meanwhile, those included in keeping up the good work and action categories are IF1, IF4, IF7, IT2, and IT3. These five categories can still be improved further.

3.2. Kano model

After analyzing using the IPA method, the next step is to analyze using the Kano method. The first step that must be done is to calculate the value of satisfaction and dissatisfaction. The calculation of the value of satisfaction and dissatisfaction can be seen in Table 2. After knowing the value of satisfaction and dissatisfaction for each attribute, the next step is to describe it in a scatter diagram. The results of this scatter diagram can be seen in Fig. 2. The results of the group division based on the Kano model are as follows.

Table 2 Satisfaction and dissatisfaction level

Attribute	Satisfaction level	Dissatisfaction level
US1	0.50	-0.35
US2	0.41	-0.42
US3	0.38	-0.34
US4	0.46	-0.35
US5	0.27	-0.17
US6	0.28	-0.18
US7	0.33	-0.29
US8	0.41	-0.37
IF1	0.60	-0.52
IF2	0.58	-0.54
IF3	0.48	-0.41
IF4	0.52	-0.49
IF5	0.58	-0.47
IF6	0.44	-0.43
IF7	0.50	-0.48
IT1	0.49	-0.44
IT2	0.50	-0.56
IT3	0.51	-0.60
IT4	0.51	-0.46
IT5	0.45	-0.38
IT6	0.46	-0.40
IT7	0.54	-0.58

Attributes that include attractive category are US1, IF4, IF5, IT4, attributes that include one dimensional category are IF1, IF2, IT3, IT7, attributes that include must-be category is IT2, and attributes that include indifferent category are US2, US3, US4, US5, US6, US7, US8, IF3, IF6, IF7, IT1, IT5, IT6.

The classification based on the Kano chart can be seen in Table 3.

Table 3 Attribute categories based on Kano

Attribute	Kano
US1	A
US2	I
US3	I
US4	I
US5	I
US6	I
US7	I
US8	I
IF1	O
IF2	O
IF3	I
IF4	A
IF5	A
IF6	I
IF7	I
IT1	I
IT2	M
IT3	O
IT4	A
IT5	I
IT6	I
IT7	O

3.3. Integrating IPA-Kano

After knowing the results of the IPA and Kano analysis, the next step is to analyze the results in the IPA-Kano integration table [13] (Table 4 and Table 5).

Table 4 IPA-Kano Integration [13]

Series	IPA	Categories
Hygiene (must-be)	II	Survival
	I	Fatal
	III	Chronic disease
	IV	Fitness
War (One-dimensional)	II	Major weapon
	I	Defenseless Strategy point
	III	Defenseless zone
	IV	Supportive weapon
Treasure (Attractive)	II	precious treasure
	I	dusty diamond
	III	rough stone
	IV	beginning jewelry

Table 5 Attribute categories based on IPA-Kano

No	Attribute	Kano	IPA	Integration
1	US1	A	4	Beginning Jewelry
2	US2	I	4	Remove
3	US3	I	3	Remove
4	US4	I	4	Remove
5	US5	I	3	Remove
6	US6	I	3	Remove
7	US7	I	3	Remove
8	US8	I	2	Remove
9	IF1	O	2	Major Weapon
10	IF2	O	2	Major Weapon
11	IF3	I	1	Remove
12	IF4	A	2	Precious treasure
13	IF5	A	2	Precious treasure
14	IF6	I	1	Remove
15	IF7	I	2	Remove
16	IT1	I	3	Remove
17	IT2	M	2	Fatal
18	IT3	O	2	Major weapon
19	IT4	A	4	Beginning Jewelry
20	IT5	I	3	Remove
21	IT6	I	3	Remove
22	IT7	O	1	Defenseless Strategy Point

Based on these data, the strategies for each attribute are obtained in Table 6.

Table 6 Category and strategies

Category	Strategy
Beginning jewelry	Included in this category are US1 and IT4. This category means that if the attributes in this category can be increased in attractiveness values, the greater the opportunity to increase user satisfaction. However, strategies can also focus on attributes in other categories.
Defenseless Strategy point	Included in this category are US1 and IT4. This category means that if the attributes in this category can be increased in attractiveness values, the greater the opportunity to increase user satisfaction. However, strategies can also be used to focus on attributes in other categories.
Fatal	Included in this category is IT2. This category gives the greatest dissatisfaction to online learning users. So this attribute should be given the greatest priority.
Major weapon	Included in this category are IF1, IF2, and IT3. This category is usually used to win the competition. By increasing this category, the opportunity to increase user satisfaction with online learning will increase.
Precious treasure	Included in this category are IF4, and IF5. This category has good value for users. In addition to maintaining performance in this category, promotions are also needed to make it more attractive.
Remove	Other attributes are included in the removed category because they have a Kano category of indifferent.

4. Conclusions

Based on the study, the results showed that attributes US1 and IT4 were in the Beginning jewelry category. The US1 attribute is "Users find it easy to learn the operation of the platform", and IT

4 is "The platform gives room for personalization", the strategy for these attributes is to polish its attractiveness so that the student can achieve satisfaction drastically.

IT7 attributes "Users feel confident that files/goods/services will be sent properly "were in the Defenseless Strategy point category, which means that this attribute is a weak point of the system. Many students complain about which will increase when the examination is held. Some students can't upload their paper because of traffic or error in the platform. If this attribute can be fixed properly, then the satisfaction trough online learning will decrease drastically. IT2 attributes "Users feel safe to carry out activities/transactions", were in the Fatal category, some student feels unsafe for use online learning. This attribute needs the greatest priority to be fixed. Much reason for this feeling to emerge, and to identify this thoroughly requires deeper understanding and research. Maybe this can be used as a new research theme, how to know a person's level of awareness of online learning security.

Attributes IF1, IF2, IT3 were in the Major weapon category, "The platform provides accurate information", "The platform provides reliable information, and "Users feel safe about their information needed to win the competition. Some lecturers use other means to provide information, which should be done in online learning. The information topic needs to improve to gain satisfaction from the student. Attributes IF4, and IF5 are included in the precious treasure category, "The platform provides relevant information" and "The platform provides easy-to-understand information" they already have good values, so we need to improve the promotions for these attributes. The other attributes are included in the removed category because they have the Kano Indifferent category. It will get the same result whether we do or not make improvements.

Acknowledgments

REFERENCES

[1] C. Huang *et al.*, "Articles Clinical features of patients infected with 2019 novel coronavirus in Wuhan , China," pp. 497–506, 2020.

[2] Y. Wu, C. Chen, and Y. Chan, "The outbreak of COVID-19 : An overview," pp. 217–220, 2019.

[3] Menteri Pendidikan dan Kebudayaan, *Pembelajaran secara Daring dan Bekerja dari Rumah untuk Mencegah Penyebaran Covid-19*. 2020.

[4] R. M. F. Oducado and H. Estoque, "Online Learning in Nursing Education During the COVID-19 Pandemic: Stress, Satisfaction, and Academic Performance," *J. Nurs. Pract.*, vol. 4, no. 2, 2021.

[5] N. M. Almusharraf and S. H. Khahro, "Students' Satisfaction with Online Learning Experiences during the COVID-19 Pandemic," *Int. J. Emerg. Technol. Learn.*, vol. 15, no. 21, 2020.

[6]   D. Gandasari and D. Dwidienawati, "Evaluation of Online Learning with Digital Communication media during the COVID 19 Pandemic," *J. Soc. Sci.*, vol. 48, no. 3, 2020.

[7]   M. Maqableh and M. Alia, "Evaluation online learning of undergraduate students under lockdown amidst COVID-19 Pandemic: The online learning experience and students' satisfaction," *Child. Youth Serv. Rev.*, vol. 128, 2021.

[8]   T. Indrayanti, Jamhari, J. H. Mulyo, and Masyhuri, "The analysis of community based agrotourism customer satisfaction in Yogyakarta," *J. Environ. Manag. Tour.*, 2019.

[9]   A. Gunawan, N. Wahyuni, and A. S. Utami, "Analisis Tingkat Kepuasan Pelanggan Terhadap Pasien Rawat Jalan Di Krakatau Medika Hospital," *J. Integr. Syst.*, vol. 3, no. 1, 2020.

[10] S. A. Fudhila Nengsih, R. Lestari, and R. Husna, "Integrasi Metode Importance Performance Analysis dan Model Kano dalam Peningkatan Kualitas Pelayanan(Studi Kasus: Perpustakaan Universitas Andalas)," *J. Mat. UNAND*, 2016.

[11] A. A. Pratiwi and W. Silfianti, "Integrating IPA with Kano model for analyzing service quality elements of mobile ride-hailing app," *Int. J. Comput. …*, 2018.

[12] S. Li and Q. Xiao, "Classification and Improvement Strategy for Design Features of Mobile Tourist Guide Application: A Kano-IPA Approach," *Mob. Inf. Syst.*, 2020.

[13] Y. F. Kuo, J. Y. Chen, and W. J. Deng, "IPA-Kano model: A new tool for categorising and diagnosing service quality attributes," *Total Qual. Manag. Bus. Excell.*, 2012.

[14] C. C. Tseng, "An IPA-Kano model for classifying and diagnosing airport service attributes," *Res. Transp. Bus. Manag.*, 2020.

[15] S. K. Dewi, A. R. C. Putri, and B. A. D. Winarko, "Peningkatan Kualitas Jasa Fasilitas Kesehatan dengan Integrasi Metode IPA dan KANO," *J. Sist. dan Manaj. Ind.*, 2018.

[16] S. K. Dewi, "Analisis Kualitas Pelayanan Dengan Menggunakan Integrasi Importance Performance Analysis (IPA) dan Model Kano," *Semin. dan Konf. Nas. IDEC*, vol. 12, no. 1, 2018.

[17] S. Sujono and H. B. Santoso, "Analisis Kualitas E-Learning dalam Pemanfaatan Web Conference sebagai Media Belajar Mahasiswa," *SAINTEKBU*, 2017.

[18] D. Dafid and D. P. Kesuma, "Identifikasi Atribut Kepuasan Mahasiswa Terhadap Layanan Sistem Pembelajaran Online Menggunakan Metode WebQual dan Kano," *JuSiTik J. Sist. dan Teknol. Inf. Komun.*, 2020.

[19] D. Dafid, "Penggunaan Metode IPA dan WebQual untuk Mengukur Kualitas Sistem Informasi Akademik," *J. Ilm. Inform. Glob.*, 2018.

[20] D. A. Amelia and W. S. Jatiningrum, "Evaluasi Kualitas Layanan Kedai Kopi Melalui Model IPA-Kano," *J. PASTI*, 2020.

[21] A. Indrasari, "Integrasi Metode IPA dan Model Kano dalam Pengembangan Kualitas Pelayanan Perpustakaan," *J. Ilm. Tek. Ind.*, 2017.

[22] F. Rindani and S. Puspitodjati, "Integration of Webqual Method to Importance Performance Analysis and Kano Model to Analyze System Quality of E-Government: Case Study LAPOR!," *J. Sist. Inf.*, 2020.

[23] W. S. Jatiningrum and H. Mastrisiswadi, "Studi Preferensi Konsumen Terhadap Produk Sepatu Gunung," *J. Ilm. Tek. Ind.*, vol. 16, no. 2, p. 164, Dec. 2017.

[24] K. W. Solihin, Amalia, and H. Mastrisiswadi, "Customer Needs Analysis as Product Design Base of Refilled Bottled Water for Adults using Kano Models," *Int. J. Innov. Res. Adv. Eng.*, vol. 4, no. 04, pp. 16–21, 2017.

[25] H. Mastrisiswadi and H. Herianto, "Analisis Kebutuhan Robot Rehabilitasi Pasien Pasca Stroke dengan Menggunakan Metode Kano," *J. Ilm. Tek. Ind. Vol 15, Iss 2, Pp 151-156 VO - 15*, 2017.

[26] H. Mastrisiswadi, D. N. Izzhati, and R. Setyaningrum, "Analisis Preferensi Konsumen Terhadap Kemasan Ikan Asap dengan Menggunakan Metode," in *RAPI XVII*, 2018, pp. 82–88.

[27] H. Mastrisiswadi, D. N. Izzhati, and T. Talitha, "The use of importance-performance analysis for Indonesian smoked fish production strategy," in *IOP Conference Series: Materials Science and Engineering*, 2018, vol. 403, no. 1, p. 12053.