

Product Development of Futsal Shoes Using the QFD Method (Survey of Futsal Shoe Consumers in The Tangerang District Area)

Armando Tirta Dwilaga¹, Miftakhul Zaen²

^{1,2} Department of Industrial Engineering and Management, Postgraduate Program,
Universitas Gunadarma

Jl. Margonda Raya No. 100, Depok, West Java, 16424

Email: armando@staff.gunadarma.ac.id, miftakhulzaen25@gmail.com

ABSTRACT

Futsal shoe products are needed to support futsal because they help protect all parts of the foot when playing futsal from hitting the ball or opposing players. This study aims to identify technical characteristics according to customer needs and desires and design product design concepts for futsal shoes. This research uses the Quality Function Deployment (QFD) method. As a result, to identify technical characteristics and customer needs and design product design concepts using tools like Rhinoceros applications. The data collection technique is distributing questionnaires to 100 respondents, with the target respondents being male or female, members of the futsal community, employment status (students, students, and workers), domiciled in the Tangerang Regency area. The results of identifying technical characteristics are futsal shoes with PU synthetic upper material, phylon midsole material, rubber outsole material, Ethyl Vinyl Acetate (EVA) insole material, vamp width dimensions of 9.6 cm, and features without shoelaces. The result of identifying technical characteristics following customer needs and desires from using the house of quality matrix format, where the priority level is the width dimension of 9.6 cm with a weight importance value of 180.

Keywords: Identification of Customer Needs, Product Development, Futsal Shoes Products, QFD

Introduction

The growth of futsal in Indonesia has garnered much interest from predominantly male groups in junior high, high school, and university environments to those already working. This is also evident from the many futsal competitions between students, colleges, and professional teams [1]. An even smaller scope for futsal courts is also available, especially in the Tangerang district area, where based on sources from registered [2], there are 117 futsal courts and results from [3] obtained from several futsal courts that have entered into cooperation in it to make reservations, with a sample of 5 places in one day there must be an order to play futsal (not quiet) at least in 13 hours open at least 3 hours there is already a booking. Of course, participation in playing futsal alone, one field is filled with at least ten people to be able to play futsal[4][5].

Common problems Since international companies initially entered the Indonesian market with high-quality shoes, the shoe-making business faced some challenging obstacles. Local manufacturers' price arguments can affect consumer preferences [6]. In response to client demand, an Indonesian shoe business called Specs created a futsal shoe that is comfortable to wear and costs less than its competitors [7][8]. In today's marketing environment, customer orientation is one of the most critical aspects of success [9]. The need for product design begins with identifying market needs for certain products and ends with creating design drawings and documentation that serve as the basis for product manufacturing [10]. Specific problems do not know how to identify technical characteristics by customer needs. So that the solution to identify technical attributes of the customers' needs and desires, a structured approach called Quality Function Deployment (QFD) is used in product design and development to determine the requirements of the conditions [11].

Previous studies by [12] utilized various product design strategies, creating sports shoes compatible with football and futsal. The QFD approach was used because it guides product creation by considering consumer desires and aspirations. [13] the study showed that businesses must be able to determine what the market wants and needs for their products to price the shoes competitively with other products of the same quality. Therefore, use the QFD approach to improve the design so that it can learn what customers want and anthropometry can identify the correct size. Article [14] demonstrates how to survey customers and identify inventive product categories through questionnaires. It requires the proper methods and tools to create product innovations that increase its value. Quality function deployment (QFD) is a client-centered approach to product development introduced by quality houses as a tool to convert all customer needs and wants into product characteristics and generate quick 3D design drawings.

Based on previous studies and others, there is still relatively no research related to futsal shoe products, so the purpose of this research is to design futsal shoe products by identifying technical characteristics and product design concepts so that expectations can be in line with customer desire

Research Methods

The futsal shoe product development research was conducted in stages to ensure everything was on schedule. A flowchart illustrates the steps of this research development. Here is Figure 1.1 Diagram of Stages.

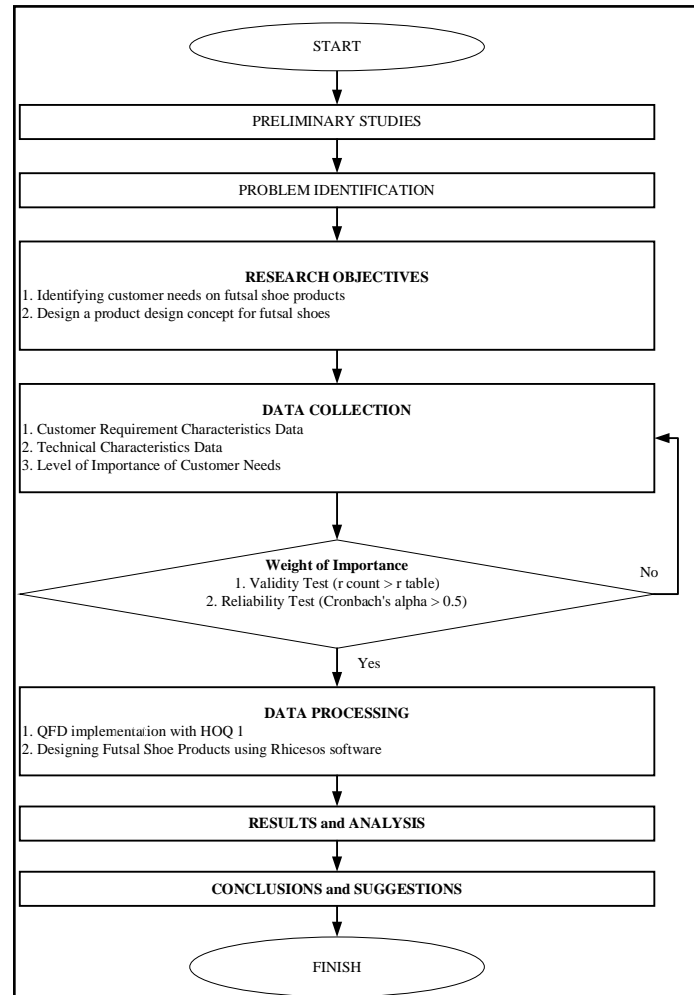


Figure 1. Stage Diagram

Figure 1 shows that there are stages of research, such as conducting preliminary studies to find various references and scientific sources, then identifying problems to introduce a process that will later be resolved. The research objectives are carried out because there are targets to be achieved from the problem, then data collection in the form of distributing questionnaires to 100 respondents with the target of male or female respondents, members of the futsal community, employment status (students, students, and workers), domiciled in the Tangerang Regency area so that validity tests and reliability tests validate it, then data processing and translated into QFD, then data analysis of concept reduction and improvement priorities, conclusions and suggestions.

Results and Discussion

Data Collection

The questionnaire is one of the instruments used to collect data [15]. Parameter estimation or data sufficiency test is carried out before data collection of open and closed questionnaires. According to the calculation of [16], the proportion estimation is known using a 2-way hypothesis (0.05), with the minimum

number of respondents needed to meet the data adequacy requirements for open and closed questionnaires determined as 96 respondents and more respondents will be preferred, then using 100 respondents[17]–[21].

Voice of the Customer

Based on the responses to the open customer requirements of Questionnaire 1, it can be said that 9 out of 20 questions were generally agreed upon by the respondents. Table 1. Available Questionnaire Answers include the summarized results of the questionnaire answers, which are presented below.

Table 1. Open Questionnaire Answers

NO	Statement	Number of Respondents (Most)/ 100 people
1.	The texture of the upper material is soft	69
2.	The texture of the midsole material is soft	64
3.	The texture of the outsole material is not slippery	99
4.	The texture of the counter material is hard	67
5.	The shape of the vamp part is wide	63
6.	The texture of the insole material is soft	94
7.	Futsal shoes feature no shoelaces	44

Based on Table 1, a description of each selected value can be explained. Due to the respondents' preference for open-ended questions, seven questions are listed. The most dominant is the texture of the outsole material part is not slippery, and it is still possible to use other conclusion results as a reference in the research.

Importance Weight Data

The next stage is the importance weight data, and the data is generated from the results of the overall conclusion of the answers to the closed questionnaire questions used to identify customer needs and find out more clearly how much the value of the importance weight of customer needs and desires based on completed questionnaire two questions. Table 2. Closed Questionnaire Answers.

Table 2. Closed Questionnaire Answer

No.	Customer Requirement Statement	Answer					Level of Importance		Value
		1	2	3	4	5	Total	Informant	
1	Futsal shoe products have a cushioned upper	1	0	12	36	51	436	100	4
2	Futsal shoe products have a soft midsole	0	2	8	47	43	431	100	4
3	Futsal shoe products have a non-slip outsole	0	0	1	55	44	443	100	4
4	Futsal shoe products have a hard counter	3	4	13	33	47	417	100	4
5	Futsal shoe products have a wide vamp	0	3	18	43	36	412	100	4
6	Futsal shoe products have a cushioned insole	0	3	10	43	44	428	100	4
7	Futsal shoe products feature no shoelaces	2	0	11	38	49	432	100	4

Based on the results in Table 2, a description of each value is selected for 1 (strongly disagree) or very unimportant, 2 (trivial), 3 (disagree), 4 (essential), and 5 (very important). The conclusion with the most significant value weight is on the upper pad with a total value of 436. Next, find the weight of importance from the table of closed questionnaire conclusions for each of the seven statements, such as soft upper, soft midsole,

non-slip outsole, hard counter, wide vamp, soft insole, and features without shoelaces. Here is an example of calculating the critical weight value of customer needs for futsal shoe products having a soft upper.

Validity and Reliability Test

The metric that indicates that a measuring instrument measures what it is intended to do are known as validity [22][23][24][25]. A test is said to have high reliability if it produces data with consistent (fixed) results even though it is given at different times to the same respondent. Data processing for this validity test uses SPSS 27 software.

Table 3. Validity Test

	<i>Upper</i>	<i>Midsole</i>	<i>Outsole</i>	<i>Counter</i>	<i>Vamp</i>	<i>Insole</i>	Strapless Feature	<i>Total Score</i>
<i>Total Score</i>	Person Correlation	0,596**	0,540**	0,436**	0,428**	0,595**	0,641**	1
	Sig (2-tailed)	<,001	<,001	<,001	<,001	<,001	<,001	<,001
	N	100	100	100	100	100	100	100

Based on Table 3, for significant degrees of freedom, 0.05 is 0.1966, and 0.01 is 0.2565. For example, the total Pearson correlation value/score of the upper padded is 0.596** (the two stars/quotation marks above indicate that the significant value used is 0.01 and 2-tailed as a two-way test level), that r count is 0.596 > r table 0.256 which means valid with the amount of data (N) is 100. The following is the Reliability Statistics Output which can be seen in Table 4.

Table 4. Reliability Test

Reliability statistics	
Cronbach's Alpha	N of Items
0,545	7

Based on Table 4 for the reliability test, the Cronbach's Alpha value is 0.545, which is included in the medium reliability category (0.5-0.7), meaning that the questionnaire consisting of seven questions can be said to be reliable, and it is likely that one or more items are reliable [14].

Identify Customer Needs and Technical Characteristics

One of the phases of the product development process is the concept development phase, which includes identifying customer needs, in identifying customer demand is a process that creates information between consumer wants and conditions. The following is Table 5—customer Needs.

Table 5. Customer Needs

No.	Quality Dimension	Needs
1.	Reliability	Futsal shoe products have a non-slip outsole
2.	Features	Futsal shoe products feature no shoelaces
3.	Conformance	Futsal shoe products have a wide vamp
4.	Durability	Futsal shoe products have a hard counter
		Futsal shoe products have a cushioned midsole
5.	Performance	Futsal shoe products have a cushioned upper
		Futsal shoe products have a cushioned insole

Based on Table 5, they are divided into three groups that are interrelated with each other: primary needs, which are needs that must be met; secondary needs, which are completed when immediate needs are met; and tertiary requirements, which are encountered when primary and secondary conditions are met. The following Table 6. List of Metric.

Table 6. List of Metric

<i>Metric No.</i>	<i>Need No.</i>	<i>Metric</i>	<i>The Unit</i>
1	1,2,3,5,6,7	PU Synthetic Upper Material (Synthetic Leather)	Unit

Table 6. List of Metric (Continued)

Metric No.	Need No.	Metric	The Unit
2	1,5,6,7	Midsole phylon material	Unit
3	1,3,5,6,7	Rubber Outsole Material	Unit
4	1,3,5,6,7	Insole material Ethyl Vinyl Acetate (EVA)	Unit
5	4	Counter Material polypropylene (pp)	Unit
6	1,3,5,6,7	Size Dimensions Vamp Width	Cm
7	2,6	Strapless Feature	Unit

Based on Table 6 provides information about the existing metrics or technical characteristics and relationships based on the numbering of customer needs. The first metric, namely Upper PU Synthetic material (synthetic leather) with a unit number, has a relationship with 1,2,3,4,6,7 which means it has a relationship with futsal shoe products that have a non-slip outsole, futsal shoe products have a shoeless feature, futsal shoe products have a wide vamp, futsal shoe products have a soft midsole, futsal shoe products have a smooth upper, futsal shoe products have a soft insole. The following is Table 7, a comparison of Technical Product Characteristics.

Table 7. Comparison of Technical Product Characteristics

Technical Characteristics	Rival Products	Development Product
Upper	Microfiber Synthetic	Synthetic (Skin Synthetic)
Insole	Ethyl Vinyl Acetate (EVA)	Ethyl Vinyl Acetate (EVA)
Outsole	Rubber	Rubber
Vamp	8 cm (Slim)	9,6 cm (Width)
Counter	-	Polypropylene (pp)
Features	-	Strapless
Functions	Used to protect the foot when playing futsal.	It is used to protect the feet when playing futsal.
Pros	Slimmer vamp shape suitable for slender feet.	An innovative laceless feature makes it easier and faster to use shoes.
Disadvantages	No counters and additional features	Less suitable for feet with slender dimensions

Based on Table 1.6, it can be explained that the reference product information uses a brand from Specs because, based on the results of a closed questionnaire survey with the type of LS ultra has a difference with the product to be made, the product has additional innovative features without straps, the vamp is made wide according to customer wishes. The following is an anthropometric calculation using 50 percent [16].

$$\begin{aligned} \text{Product Width} &= \text{Leg Width} + \text{Allowance} \\ &= 9,14 + (9,14 \times 0,05) = 9,597 \approx 9,6 \text{ cm} \end{aligned}$$

Benchmarking

Benchmarking is done in a chart to compare the importance of customer demand and adequate technical specifications between the company's product development and competitors' shoe products. The following is Table 8. Benchmarking Customer Needs.

Table 8. Benchmarking Customer Needs

No.	Technical Requirements	Reference Product					Innovation Products					
		1	2	3	4	5	1	2	3	4	5	
1	Reliability					■						■
2	Features		■									
3	Conformance				■							■

Table 8. Benchmarking Customer Needs (Continued)

No.	Technical Requirements	Reference Product					Innovation Products				
		1	2	3	4	5	1	2	3	4	5
4	Dimensions			■							■
5					■						■
6	Performance				■						■
7	Features				■						■
Total					25						31

Based on Table 7, the average point award is determined by the conclusion of the customer needs. The total points of customer needs describe comparing an innovative product with a competitor. The total points awarded for the competitor's product is 25, and for the innovative product is 31. The following is Table 9. Benchmarking Technical characteristics.

Table 9. Benchmarking Technical characteristics.

No.	Technical Characteristics	Reference Product					Innovation Products				
		1	2	3	4	5	1	2	3	4	5
1	Materials				■						■
					■					■	
						■					■
				■		■				■	
					■						■
2	Dimensions				■					■	
3	Features	■								■	
Total					25					32	

Based on Table 8, regarding technical characteristics, the futsal upper product gets only four points. The innovation product gets four moderately fine points, and the insole receives 4. The innovative product gets four rather fine points, and the outsole gets five excellent points. The innovation product gets five fine points, and the insole gets only four. The innovation product gets four fine points, and the counter gets three moderately fine points. The innovative product gets four fine points, and the front of the shoe widens gets four excellent points. The innovative product gets five very prominent points, the laceless feature gets one very unsuperior point, and the innovative product gets five excellent points. The total points of customer needs explain the results of comparing the innovative product with competitors. The total points given for the competitor's product is 25, and the innovative product is 32.

Matrix House of Quality

The most popular type of QFD representation is the house of quality (HOQ) matrix. There are essentially two critical components to this matrix. The customer table is the horizontal portion of the matrix that holds information about consumers. The technical table is the vertical portion of the matrix with technical data in response to user input. Because it includes various factors related to customer perceptions and expectations, the House of Quality (HOQ) is the first stage that can be used to generate target clusters that will be prioritized [17]. The following is Figure 2. HOQ of futsal shoe products.

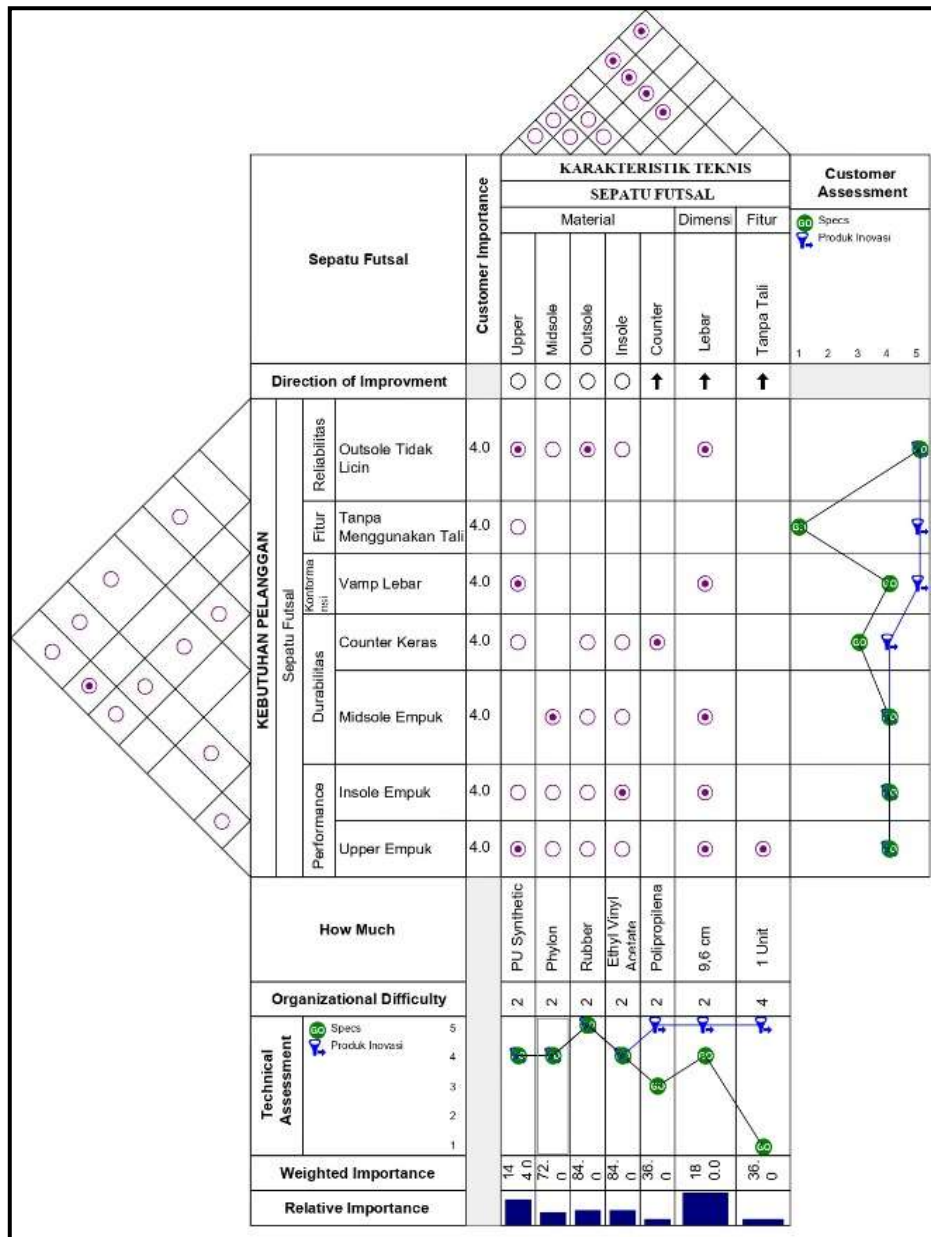


Figure 2. HOQ of futsal shoe products

Based on Figure 2. the analyzes were carried out to obtain information on the house of quality matrix. The decline in the selected concept is seen from the weight importance section. The relative importance section, the relative importance which is the top priority when viewed from the data results for the priority level, is the width dimension of futsal shoes, which is 9.6 cm with a weight importance value of 180 and a relative importance value of 28.30%, the second priority level is the material (upper), namely PU Synthetic with a weight importance value of 144 and a relative importance value of 22.64%, the third priority level is the material group (outsole (Rubber) and insole (EVA) with a weight importance value of 84 and a relative importance value of 13.21%, the fourth priority level is the material (midsole), namely phylon with a weight importance value of 72 and a relative importance value of 11.32%. The fifth priority level is the feature (without laces) and counter (polypropylene), with a weight importance value of 36 and a relative importance value of 5.66%.

Product Design Concept of Futsal Shoes

2D design of futsal shoe goods is used in creating futsal shoe product designs using Rhinoceros software. It is essential to translate this into a 2D design based on how the concept is developed and the

importance of technical features matching consumer desires and demands. The following is Figure 3. Drafting of Futsal Shoes.

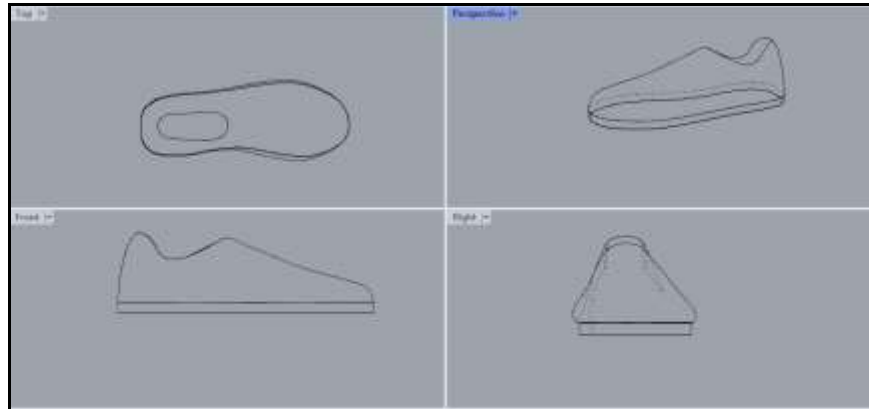


Figure 3. Futsal Shoe Drafting.

Based on Figure 3, the information in it has four parts of the box. The top box shows a 2-dimensional picture of futsal shoe products from the Top of the shoe product, and the front box shows a 2-dimensional picture of shoe products from the side of the shoe product. The correct box shows a 2-dimensional image of shoe products from the back of futsal shoe products, and the perspective box shows a 2-dimensional picture of shoe products based on perspective.

Conclusion

The conclusion of the results of identifying technical characteristics by customer wants and needs in futsal shoe products is that the results of customer needs are the texture of the soft upper material, the texture of the soft midsole material, the texture of the non-slip outsole material, the texture of the hard counter material, the shape of the wide vamp section, the texture of the insole material, and futsal shoes have features without shoelaces. The results of identifying technical characteristics using the house of quality matrix format, where the priority level of the width dimension is 9.6 cm with a weight importance value of 180, the second priority level of material (upper) are PU Synthetic with a weight importance value of 144, the third priority level of material groups (outsole (Rubber) and insole (EVA) with a weight importance value of 84, the fourth priority level of material (midsole) is phylon with a weight importance value of 72, and the fifth priority level of features (without laces) and counters (polypropylene) with a weight importance value of 36. The results of designing product design concepts using Rhinoceros software are in 2D drafting form.

Further research suggests representation in the form of design for 3D to see the same product picture as the original, and it is hoped that further research will be able to carry out the processes of calculating the cost of goods of a pair of futsal shoes.

References

- [1] P. Priyono and F. Yuamita, "Pengembangan Dan Perancangan Alat Pemotong Daun Tembakau Menggunakan Metode Quality Function Deployment (QFD)," *J. Teknol. dan Manaj. Ind. Terap.*, vol. 1, no. III, pp. 137–144, 2022.
- [2] R. Alfatiyah, "Analisis Kualitas Jasa Periklanan Dengan Kombinasi Metode Servqual Dan Quality Function Deployment (Qfd) Untuk Meningkatkan Kepuasan Pelanggan," *JITMI (Jurnal Ilm. Tek. dan Manaj. Ind.*, vol. 1, no. 1, pp. 1–7, 2018.
- [3] A. Dwilaga and M. Zaen, "Perancangan Produk Rak Sepatu Dengan Fungsi Penyimpanan Kaus kaki dan Tempat Duduk Menggunakan QFD," *J. Adijaya Multidisplin*, vol. 1, no. 01, pp. 121–132, 2023.
- [4] S. Sugiono, N. Noerdjanah, and A. Wahyu, "Uji validitas dan reliabilitas alat ukur SG posture evaluation," *J. Keterapian Fis.*, vol. 5, no. 1, pp. 55–61, 2020.
- [5] M. A. Mutazam and A. Anwar, "Perancangan Produk Sepatu Pantofel dengan Pendekatan Quality Function Deployment dan Antropometri di Home Industri X Shoes," in *Bandung Conference Series: Industrial Engineering Science*, 2021, vol. 1, no. 1, pp. 9–16.
- [6] D. P. Andriani, M. Choiri, and D. Priharseno, "Aplikasi quality function deployment untuk redesign kontainer penyimpanan pada industri kemasan kaleng," *J. Tek. Ind.*, vol. 18, no. 2, pp. 176–190, 2017.
- [7] R. Ependi and M. Subkhan, ... *Gaya Hidup, Kualitas Produk, Harga, Dan Citra Merek Terhadap*

- Keputusan Pembelian Produk Sepatu Futsal Specs (Studi Kasus Pada Produk Sepatu Futsal Specs)*. eprint.stieww.ac.id, 2019. [Online]. Available: <http://eprint.stieww.ac.id/id/eprint/966>
- [8] R. Mahmudi and F. M. Sitohang, "Pengaruh Kualitas Produk, Harga, Dan Promosi Terhadap Keputusan Pembelian Sepatu Futsal Dan Bola Merek Specs Di Toko Keranjang Bola Sidoarjo," *J. Ilmu dan ...*, 2021, [Online]. Available: <http://jurnalmahasiswa.stiesia.ac.id/index.php/jirm/article/view/4085>
- [9] M. A. Maulana, *PENGARUH INOVASI PRODUK DAN KUALITAS PRODUK TERHADAP KEPUTUSAN PEMBELIAN SEPATU FUTSAL MEREK SPECS DI KOTA TEGAL*. repository.upstegal.ac.id, 2020. [Online]. Available: <http://repository.upstegal.ac.id/871/>
- [10] S. Subandrio and N. Setiawan, "Pengaruh Citra Merek Dan Kualitas Produk terhadap Minat Beli Sepatu Futsal Specs," *J. Econ. Edu*, 2022, [Online]. Available: <http://jurnal.umb.ac.id/index.php/ecoedu/article/view/3529>
- [11] A. Habibulloh, *Pengaruh Kualitas Produk, Harga dan Citra Merek terhadap Keputusan Pembelian Sepatu Futsal (Studi pada Pengguna Produk Sepatu Specs di Kebumen)*. eprints.universitaspurabangsa.ac.id, 2021. [Online]. Available: <http://eprints.universitaspurabangsa.ac.id/id/eprint/659/>
- [12] I. Pranata, *Pengaruh Harga dan Kualitas Produk Terhadap Keputusan Pembelian Sepatu Futsal Nike di Toko Venus Singaraja*. repo.undiksha.ac.id, 2021. [Online]. Available: <https://repo.undiksha.ac.id/id/eprint/5985>
- [13] Y. D. Anggoro, ... , *Desain Produk dan Kualitas Produk Terhadap Keputusan Pembelian Sepatu Futsal Merek Specs (Survei Terhadap Konsumen Sepatu Futsal Specs di Kecamatan ...* repository.unipasby.ac.id, 2021. [Online]. Available: <https://repository.unipasby.ac.id/id/eprint/775/>
- [14] A. M. Nur, S. Bahri, and N. Nirwan, "KUALITAS PRODUK TERHADAP KEPUASAN KONSUMEN MENGGUNAKAN SEPATU FUTSAL MEREK SPECS DI PALU," *J. Ilmu Manaj. Univ. ...*, 2020, [Online]. Available: <http://www.jimutuntad.com/index.php/jimut/article/view/200>
- [15] S. R. Roberto, *PENGARUH PERSEPSI HARGA, KUALITAS PRODUK, DAN CITRA MEREK TERHADAP KEPUTUSAN PEMBELIAN SEPATU FUTSAL MEREK SPECS (Studi Kasus* repository.stei.ac.id, 2021. [Online]. Available: <http://repository.stei.ac.id/5453/>
- [16] N. Nazaruddin, "Implementation of Quality Improvements to Minimize Critical to Quality Variations in Polyurethane Liquid Injection Processes," *J. Appl. Eng. Technol. Sci.*, vol. 3, no. 2, pp. 139–148, 2022.
- [17] P. Wicaksono, *ANALISIS PENGARUH ATLET ENDORSER, KUALITAS PRODUK DAN HARGA TERHADAP KEPUTUSAN MEMBELI SEPATU FUTSAL SPECS (Studi Kasus Pada* repository.stei.ac.id, 2021. [Online]. Available: <http://repository.stei.ac.id/id/eprint/5787>
- [18] M. A. A. Azhari, C. S. Wahyuning, and L. Irianti, "Rancangan Produk Sepatu Olahraga Multifungsi Menggunakan Metode Quality Function Deployment (Qfd)," *Reka Integr.*, vol. 3, no. 4, 2015.
- [19] A. F. Aras, D. Rahmatika, and E. Putra, "Perancangan meja laptop portable yang ergonomis untuk penyandang cerebral palsy dengan pendekatan antropometri," *J. Inov.*, vol. 2, no. 1, pp. 16–19, 2019.
- [20] S. A. Saputra and F. Evelyn, "Pengaruh Harga, Citra Merek, dan Celebrity Endorser Terhadap Keputusan Pembelian Produk Sepatu Futsal Specs: Studi Kasus pada Pengguna Sepatu Futsal Merek Specs di Kebumen," *J. Ilm. Mhs. Manajemen, Bisnis dan Akunt.*, vol. 4, no. 5, pp. 585–596, 2022.
- [21] I. H. Yandri, "Hubungan Kepuasan Konsumen terhadap Brand Loyalty pada Atlet Futsal Kota Padang Pengguna Sepatu Futsal Merk Specs." Universitas Negeri Padang, 2019.
- [22] N. Nazaruddin and W. Septiani, "Risk Mitigation Production Process on Wood Working Line Using Fuzzy Logic Approach," *SITEKIN J. Sains, Teknol. dan Ind.*, vol. 19, no. 1, pp. 100–108, 2021.
- [23] M. L. Hamzah, A. A. Purwati, S. Sutoyo, A. Marsal, S. Sarbani, and N. Nazaruddin, "Implementation of the internet of things on smart posters using near field communication technology in the tourism sector," *Comput. Sci. Inf. Technol.*, vol. 3, no. 3, 2022.
- [24] Nazaruddin, M. L. Hamzah, M. Rizki, M. I. H. Umam, and Sarbaini, "Integration of Fuzzy Logic Algorithms with Failure Mode and Effect Analysis for Decision Support Systems in Product Quality Improvement of Piano Cabinets," in *2022 International Conference on Electrical and Information Technology (IEIT)*, 2022, pp. 13–19. doi: 10.1109/IEIT56384.2022.9967920.
- [25] M. L. Hamzah, L. A. Hultari, A. A. Purwati, and N. Nazaruddin, "Analysis of E-Library Based on Level of User Satisfaction Using EUCS and IPA Methods," *J. Appl. Eng. Technol. Sci.*, vol. 4, no. 1 SE-Articles, pp. 599–610, Dec. 2022, doi: 10.37385/jaets.v4i1.1426.