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THE DESIGN OF THE CONTAINER AS WELL AS THE SWEETENED CONDENSED MILK POURER WITH A COMBINATION OF THE KANO APPROACH AND QUALITY FUNCTION DEPLOYMENT

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ABSTRACT

The era of creative industries in the present is growing a lot of food and beverage culinary SMEs rapidly. SMEs that are more of interest today are the manufacture of products that use sweetened condensed milk or hereinafter called SKM. 82 respondents answered after the SKM was opened from the packaging invited ants due to residue and spills. The purpose of the research is the design of storage equipment as well as SKM pourers by using the Kano Model and QFD approach. The results obtained that this tool could help SMEs in the storage and use of SKM in every product manufacturing process. Based on the evaluation of the Kano model, 6 attributes of the Must-be category were obtained, 3 Attractive categories and 2 One-dimension categories, and 1 indifferent category which means that the tool provides satisfaction to consumers.

Keywords: tools, kano model, quality function deployment (QFD), sweetened condensed milk.

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1. INTRODUCTION

In the current era of the creative industry based on data from the Central Statistics Agency and the Creative Economy Agency in 2020, the growth of the culinary industry is very rapid, small and medium micro enterprises (SMEs) in the culinary food and beverage sector that provide breakthrough- an innovation breakthrough in the presentation of its products, one of which is by adding Sweetened Condensed Milk or SKM into the processing so that it gives a delicious and different taste.

SKM is one of the dairy products that continues to grow, this is characterized by the number of brands sold and is an ingredient that is always used in the manufacture of sweet snacks and beverages [1]. SKM itself is the result of the recombination of non fat powdered milk with milk fat or vegetable fat that has been added to sugar and can last for a year if not opened. Sweetened Condensed Milk in addition to being consumed for drinking is often used as an additive to desserts, such as cakes or drinks.

In daily life, Sweetened Condensed Milk in addition to being consumed for drinking is often used as an additional ingredient in desserts, such as cakes or drinks that are often used in the household industry or SMEs. SKM is available in the form of sachet, pouch, and can packaging [2]. The use of SKM packaging sachets and cans often causes problems such as the residue that is still poured on the cans that cause many ants to come and unsafe storage for sachets because if not placed in a safe position will result in SKM spilled and cannot be used again. In addition, the use of SKM with any type of packaging currently does not have the appropriate dosage following the milli liter of use, so it requires pouring into a glass take before it is poured into food or beverages to be processed. This is very ineffective and can also lead to spilled SKM and others. Previous research on SKM is more specific to knowing the metal content [3] [4], failure in the canning process [5], analyzing the packaging design of SKM Pouch [6], the influence of packaging on consumer buying interest [7] and others whose essence is related to the content, interest and predict consumer interest in SKM.

It can be seen that there are no researchers who have researched the design of aids in storage as well as casting SKM that can facilitate the use of using it without causing any spills and ants that come. Supported by the results of the initial questionnaire dissemination conducted on housing sector 5 of Babelan as many as 84 samples who answered found 82 respondents complained of SKM security after opening and use, and 80 respondents answered wanting the storage and pouring aids SKM equipped with doses.

So that this research has the purpose of designing storage aids and pourers SKM in facilitating the process of use without resulting in spills and ants that come with the approach of the Kano model and Quality Function Deployment (QFD). Both of these methods are appropriate methods to improve the development design of a product.

2. MATERIALS AND METHODS

2.1 Quality Function Deployment

QFD is a method that can identify true consumer desires and is a practice of designing the process in response to consumer needs [8]. QFD can be used by companies and SMEs that offer products or services [9]. QFD is used to review the basic concepts of quality fungal application and success in new product development based on consumer identification [10]. In the application of QFD, users are needed to determine the desires of consumers [11]. In QFD there are four basics, namely

Product Planning, Part Deployment, Process Planning, and Production Operation Planning [12].

The purpose of the QFD is to prioritize design criteria that are the main focus of product design and development. House of Quality (HOQ) is the main planning tool used in QFD [13]. HOQ is the translation of consumer voices into design requirements that meet specific value targets and adapt them to the organization or company that will design the design [14]. House of Quality or house quality is a tool used to use the QFD structure. So that in this study also uses the QFD method to get good tool design results to the wishes of consumers. Figure-1 HOQ according to its attributes.

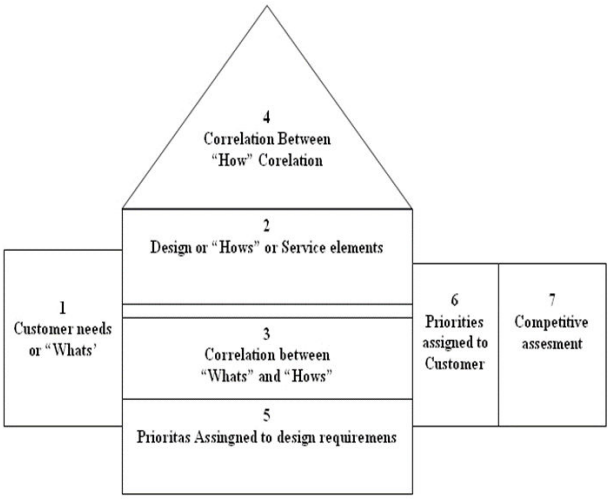

Figure-1. House of quality.

2.2 Model Kano

Kano was the first to develop a method for identifying user needs and expectations through preference classification techniques [15]. The Kano model is an invention of Noriai Kano which is used to categorize the attributes of a product or service based on how well the product or suit can satisfy consumer needs. Kano models to determine customer satisfaction [16].

The Kano model is a diagram that divides the specifications of the product provided to the customer into three types, namely:

a) Must be
b) Ability (Performance)
c) Delighter

Kano models are usually integrated with QFD in analyzing product satisfaction and quality.

2.3 Methodology

To achieve the design of storage devices and pourers SKM (Sweet Condensed Milk) requires several stages. Figure-2 describes the steps required in achieving the objectives of the researcher which consist of the:

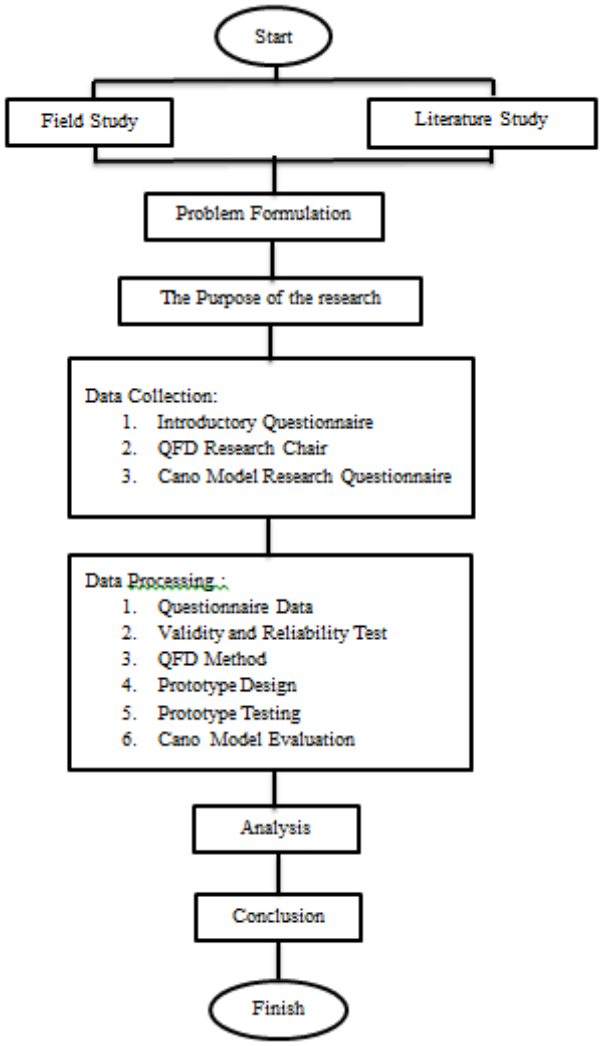

Figure-2. Research method flow.

Figure-2 describes the stages of this study which began by conducting a field study of several Food and Beverage SMEs that on average use SKM in the process. From the results of this visit, it was found that the use of SKM is by the current packaging, especially the use in cans and sachets. After that, they conducted interviews and distributed questionnaires about the SKM user experience and what they wanted. Tools are what users want in facilitating them in the process of using them. The design of the aids was made based on the canoe model approach with QFD

3. RESULTS AND DISCUSSIONS

3.1 Results of Designing Tools for Storage and Casting SKM with QFD Method

The design of storage aids, as well as SKM pourers using the QFD method with the hope of meeting the desires of users to facilitate the process of storage and pouring, is adjusted to the millimeter measurements equipped on the tool. The design of this tool using the QFD method consists of several stages consisting of:

a. Matrix house of quality (HOQ)

This Matrix House of Quality is what consumers want and how to fulfill it. The HOQ consists of several stages:

b. Customer needs and expectations (customer requirement)

The first step is to find the attributes that consumers want for the sweetened Condensed Milk pouring tool. From the results of a questionnaire consisting of 84 respondents and SMEs in Pondok Ungu Housing Sector 5, it can be known the attributes that consumers want in the design of storage aids as well as casters SKM. Table-1 shows the attributes needed by consumers and declared valid from the results of the validity test:

Table-1. The attributes of the consumer need to be the design of the tool and valid in the validity test.

No	Attributes	Significance R Count	R Table	Description
1	Easy to use	0.385	0.1807	Valid
2	Adjustable	0.297	0.1807	Valid
3	Easy to store	0.185	0.1807	Valid
4	Large storage tube capacity	0.335	0.1807	Valid
5	There is a size on the tube	0.186	0.1807	Valid
6	The tube is removable	0.311	0.1807	Valid
7	Proper size	0.296	0.1807	Valid
8	Light material	0.339	0.1807	Valid
9	strong and durable material	0.224	0.1807	Valid
10	The pourer has a pouring system like a faucet	0.301	0.1807	Valid
11	Auto pourer	0.312	0.1807	Valid
12	Can be used to mix food and drink	0.385	0.1807	Valid

In Table-1 all the attributes desired by consumers and validity testing has been carried out. The results of testing the validity of the attributes used in the design of the container as well as the milk pourer are declared valid and can be used.

c. The relative importance and satisfaction of product attributes

The results of processing based on the value of importance show the contribution of the role of each attribute to customer satisfaction. From the survey data, it is found that the highest level of importance is that the tool can be used for a mixture of food and drink and the lowest is the material that is used lightly.

d. Technical parameters

Technical parameters are the result of the translation of consumer desires, from consumer desires translated into a technical language that can be measured to determine targets to be achieved and to determine which attributes will be developed. The results of interviews and brainstorming on the translation of consumer wants and needs can be obtained from the technical parameters listed in Table-2.

Table-2. Technical parameters.

No	Technical Response
1	Good quality material
2	Type of material used
3	The weight of the material used
4	Product shape design
5	Product size design
6	The price of the material used
7	Multifunction

Table-2 Provides information about the technical parameters that consumers want for the design of the tool made.

e. Interaction relationship between consumer desires and technical parameters

This stage is intended to determine the close relationship of each component of the technical parameters in meeting consumer desires. And is a description of the relationship between the matrix of consumer desires with technical parameters. The value of the relationship

between consumer desires and the technical parameters of the tool design. The assessment is on average at point 9 and point 3, which means it has a high and medium level of relationship.

From these stages, it can be described HOQ which is a combination of all the technical characteristics and attributes that consumers want for the container as well as the SKM pourer. Figure-3 describes the HOQ of all technical characteristics and attributes.

Note :	Note :
● : Strong Relationship (Point:9)	√ : Strong Relationship (Point:9)
○ : Medium Relationship (Point:3)	x : Medium Relationship(Point:3)
△ : Weak Relationship (Point:1)	o : Weak Relationship (Point:1)

Characteristics Of Costumer Need \ Tehnical Parameter Characteristics		Tool Function	Flexibility	Tool Storage	Capacity	Product Shape Design	Product Size Design	Material Quality	Type Of Material Use	Weight Of Material Use	Material Price	Multifunction	Benchmarking		Planning				
													Other Product	Automatic Milk Paurer	Level Of Importance	Improvement Ratio	Sales Point	Raw Weight	Normalized Raw Weight
Easy to Use		9	9			3	3		1	1			3.68	3.76	3.96	1.00	1.5	5.9	8.65
Adjustable		9	9			9	3		1				2.96	3.68	3.22	1.19	1.5	6.8	0.44
Easy to Store				9	3		1						3.69	3.55	3.30	1.13	1.2	5.1	7.47
Large to be Capacity					9		9						2.94	3.40	3.30	1.06	1	3.7	5.47
There is a size an the to be					9	3	9	3	1				2.89	3.55	3.07	1.22	1.2	5.5	8.02
Can be removed			9	3		3	3			1			2.78	3.50	2.89	1.32	1.5	7.6	11.15
Tool size not to big				3		9	9		1	3			2.86	3.52	3.16	1.12	1	3.9	5.76
Light material						3	3	9	9	9	1		3.25	3.41	3.50	0.99	1	3.4	4.98
Strong and durable material						9	9	9		1	3		3.15	3.26	3.80	0.97	1.2	4.3	6.31
Having a pouring		9			3	3	1		9				2.24	3.55	2.79	1.42	1.5	8.5	12.43
Auto pourer		9	9		3	9					1		2.76	3.63	3.12	1.27	1.5	7.5	11.05
Can be used to mix found and drinks		9	3		1							9	3.33	3.88	4.00	1.00	1.5	6.0	8.79
Amount		457.8	253.3	117.8	222.9	433.2	352.6	118.0	186.6	88.2	35.0	79.1							
Percentage		19.53	10.8	5.02	9.51	18.48	15.04	5.03	7.96	3.76	1.49	3.37							
Order of priority		1	4	8	5	2	3	7	6	9	11	10							

Figure-3. HOQ combines technical characteristics and attributes in the design of the SKM container and pourer.

f. Results of the design of the container as well as pouring SKM

Table-3 and Figure-4 are specifications of the design of the container as well as the SKM pourer based on the QFD method.

Table-3. Specifications for the design of the SKM container and pourer designed according to the wishes of consumers.

Tool design attributes	Specification
Material	Dispenser frame: Acrylic Milk tube: Acrylic
Weight	Above 2 Kg
Dimension	Length = 28 cm Height = 22 cm Width = 193 cm
Energy Sources	Using Mini d = DC Motor Pump 12 Volt

Table-3 provides information about the specifications of the tool design to be made from the material side to the automated system used. These specifications are the reference used in the design of the container as well as the pouring of SKM in this research.

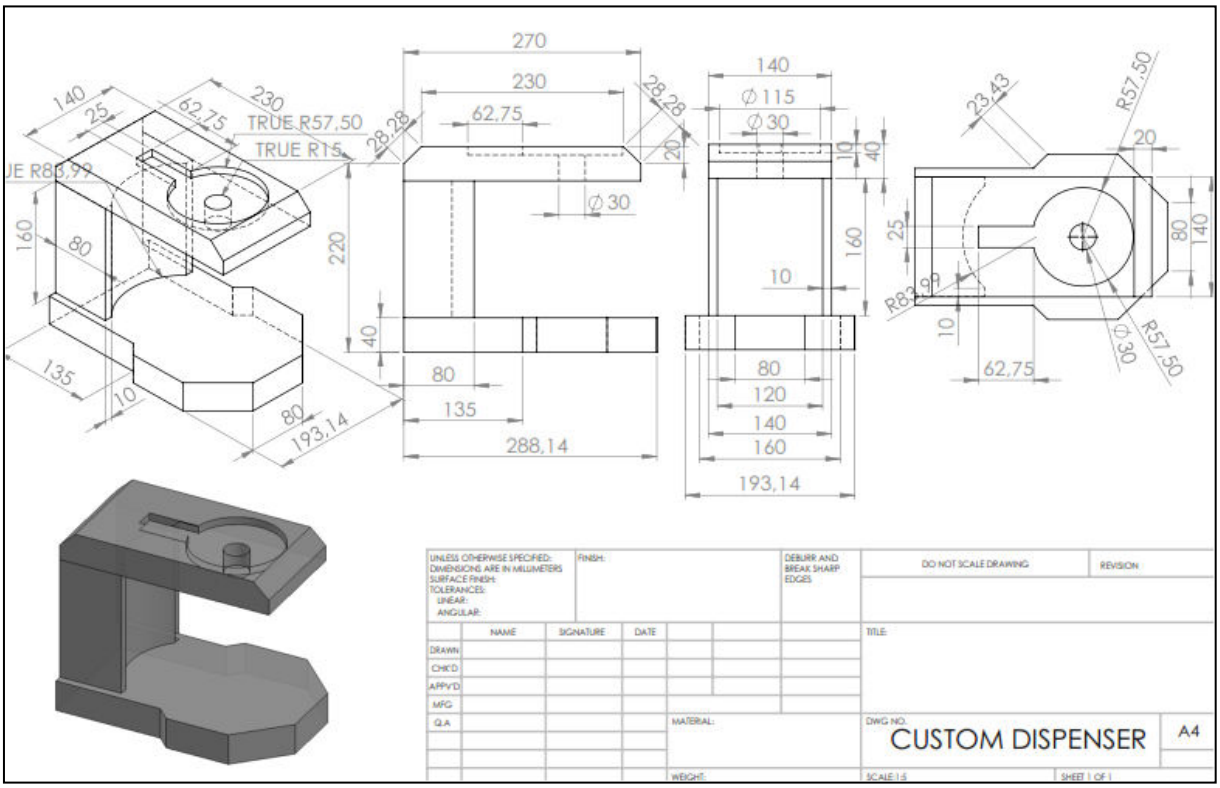

Figure-4. The design of the SKM container and pouring tools.

Figure-4 describes in detail the design of the tool that will be made according to the wishes of the consumer. The image consists of 2D and 3D which makes it easy for the public to read and understand. The result of the design of the tool that has been made can be seen in Figure-5. Figure-6 is a form of product storage tool as well as the SKM pourer that has been made.

Figure-5. SKM container and pourer.

3.2 Discussions

3.2.1 Product design of sweetened condensed milk pouring tool

Product design Sweetened condensed milk pouring tool is designed and designed from the results of the previous data processing and pays attention to prioritized technical attributes and respondents. The results of data processing using the QFD method are ranked 1 to 12 for the level of importance of attributes and technical responses. Product specifications are obtained from the satisfaction level of the product attribute questionnaire. The value of importance shows the contribution of the role of each attribute to customer satisfaction. It was found that the highest level of importance is that the tool can be used for a mixture of food and drink and the lowest is the material that is used lightly. So this product is designed according to the specifications desired by consumers as follows:

1. Material:
- Dispenser frame: Acrylic
- Milk tube: Acrylic
2. Weight:
- Above 2 kg
3. Dimension:
- Length = 28 cm
- Height = 22 cm
- Width = 193 cm
4. Automatic Machine:
- Using Mini d = DC Motor Pump 12 Volt

3.2.2 Kano model evaluation results

After obtaining the number/value of the Kano category of each attribute for all respondents, the Kano category is determined by using Baluth's Formula as the formula above to produce:

Quadrant I

There are 3 attributes belonging to the Attractive category, while the impact on this category will have an impact on increasing customer satisfaction.

Quadrant II

There are 6 attributes belonging to the Must-be category, while the impact on this category will not have an impact on increasing customer satisfaction, but if there is none it will make customers disappointed.

Quadrant III

There are 2 attributes belonging to the One-Dimension category, while the impact on this category will have an impact on increasing customer satisfaction.

Quadrant IV

There is 1 attribute belonging to the Indifferent category, while the impact on this category will have an impact on customer ratings of good and bad a product.

4. CONCLUSIONS

The use of SKM by SMEs and individuals in the form of sachet, pouch, and can packaging has an impact on spills and make ants come according to 82 respondents from the results of the questionnaire. Respondents want a multifunctional and easy-to-use container as well as an SKM pourer. Based on the QFD method, the design of the container device as well as the casting of SKM with specifications by the consumer's wishes are obtained from the relationship of 12 attributes with 7 technical parameters used. The results obtained from the application of the tool by using the canoe model are that there are 6 attributes of the Must-be category, 3 Attractive categories and 2 One-dimension categories, and 1 indifferent category which means that the tool provides satisfaction to consumers. So that the container and pourer SKM is suitable for use because it provides convenience for users. This tool has a measurement and an automatic system in the casting.

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REFERENCES

[1] Anam W. 2016. Analisis Pengaruh Desain Kemasan Pouch Susu Kental Manis Frisian Flag Terhadap Keputusan Pembelian Dan Loyalitas Konsumen (Doctoral dissertation, Universitas Brawijaya).

[2] Rosyidi K. 2016. Faktor-Faktor Yang Mempengaruhi Pengendalian Kualitas Produksi Susu Kental Manis PT. IDK Pasuruan. Sketsa Bisnis. 3(2): 52-60.

[3] Harurani L. 2011. Analisa Kandungan Logam Berat Pb Dan Fe Dengan Metode Spektrofotometri Serapan Atom Terhadap Susu Kental Manis Di Pekanbaru (Doctoral dissertation, Universitas Islam Negeri Sultan Syarif Kasim Riau).

[4] Dewisartika V., Afkar Z. and Yerimadesi, Y. 2012. Analisis Kadar Logam Timbal (Pb) dan Tembaga (Cu) pada Susu Kental Manis Kemasan Kaleng dengan Metoda Spektrofotometri Serapan Atom. Periodic. 1(2): 59-62.

[5] Pratiwi A. 2020. Analisa Kandunga Logam Berat (Pb) Pada Susu Kental Manis Kemasan Sachet dengan Menggunakan Metode Spektrofotometri Serapan Atom (SSA) (Doctoral dissertation, Universitas Muhammadiyah Surabaya).

[6] Talitha M. 2012. Analisis desain kemasan dilihat dari Perceived Quality (studi pada: kemasan Pouch Susu Kental Manis Frisian Flag Gold di Jakarta.

[7] Purnamasari I. M. 2016. Pengaruh Kemasan Terbaru Susu Kental Manis Frisian Flag Dan Daya Tarik Iklan Terhadap Minat Beli Konsumen Pada Masyarakat Semarang (Doctoral dissertation, Fakultas Ilmu Komunikasi UNISSULA).

[8] Aji E. R. and Yuliawati E. 2016. Pengembangan produk lampu meja belajar dengan metode kano dan Quality function deployment (QFD). Journal of Research and Technology. 2(2): 78-86.

[9] Suseno S. and Huvat T. T. T. 2019. Perancangan Alat Panggangan Otomatis Menggunakan Metode QFD (Quality Function Deployment). Jurnal Teknologi. 12(2): 123-129.

[10] Mehrjerdi Y. Z. 2010. Quality function deployment and its extensions. International Journal of Quality & Reliability Management.

[11] Dyrengga S. 2011. Perancangan Alat Bantu Pengencang Senar Raket Menggunakan Metode Quality Function Deployment (QFD) (Doctoral dissertation, Universitas Muhammadiyah Surakarta).

[12] Jaelani E. 2012. Perencanaan Dan Pengembangan Produk Dengan Quality Function Deployment (QFD). Jurnal Sains and Manajemen Akuntansi. 4(1).

[13] Parasdiasari W., Wiyono W. and Lalu H. 2021. Rancangan Konsep Usulan Timer Peringatan Untuk Meminimasi Defect Jahitan Rusak Pada Proses Sewing Di Pt Xyz Dengan Menggunakan Metode Quality Function Deployment. eProceedings of Engineering. 8(2).

[14] Mahesh Patil J. 2010. Quality function deployment (QFD) for product design.

[15] Garibay C., Gutiérrez H. and Figueroa A. 2010. Evaluation of a digital library using quality function deployment (QFD) and the Kano model. The Journal of Academic Librarianship. 36(2): 125-132.

[16] Rahmayuni I., Humaira H. and Defni D. 2016. Pemanfaatan Metode Kano Untuk Menilai Tingkat Kepuasan Pengguna Terhadap Fungsionalitas Sistem Informasi Kepegawaian (Studi Kasus: AKNP Pelalawan). INOVTEK Polbeng-Seri Informatika. 1(2): 133-139.

[17] Jaelani E. 2012. Perencanaan Dan Pengembangan Produk Dengan Quality Function Deployment (QFD). Jurnal Sains & Manajemen Akuntansi. 4(1).

[18] Parasdiasari W., Wiyono W. and Lalu H. 2021. Rancangan Konsep Usulan Timer Peringatan Untuk Meminimasi Defect Jahitan Rusak Pada Proses Sewing Di Pt Xyz Dengan Menggunakan Metode Quality Function Deployment. eProceedings of Engineering. 8(2).

[19] Mahesh Patil J. 2010. Quality function deployment (QFD) for product design.

[20] Garibay C., Gutiérrez H. and Figueroa A. 2010. Evaluation of a digital library by means of quality function deployment (QFD) and the Kano model. The Journal of Academic Librarianship. 36(2): 125-132.

[21] Rahmayuni I., Humaira H. and Defni D. 2016. Pemanfaatan Metode Kano Untuk Menilai Tingkat Kepuasan Pengguna Terhadap Fungsionalitas Sistem Informasi Kepegawaian (Studi Kasus: AKNP Pelalawan). INOVTEK Polbeng-Seri Informatika. 1(2): 133-139.