Designing E-Commerce Website as Efforts to Improve the Quality of Interface Design on Online Store using Quality Function Deployment Analysis

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Abstract:- The development of information technology especially in Internet, Internet is a global network that combines computer networks from the whole world, which allows communication and interaction between each other in the whole world. So, a rapid internet technology development will support the implementation of e-commerce system in selling product. The purpose of this study is to design an e-commerce website for Atikah' s Closet Online Shop that accommodates various needs of the customer.

The method that is being used by the writer is to do a structured analysis using a cluster of phases, called systems development life cycle (SDLC). Among various model of SDLC, waterfall model is chosen. Waterfall system development method is a cluster of activities that is done in system development, starting from problem identification, customer needs analysis, implementation designing, integration, system test, application and conservation. This model offers a software making method in a more realistic way. In addition, Quality Function Deployment (QFD) analysis is done to recognize the customer's need for the design and website requirements required so that the website design can match the customer's needs

The result of Atikah's Closet website program that is planned is already in accordance with the needs of the customer, based on the test result of the system, shows that the design characteristic which is needed for the fulfillment of the customer needs has been fulfilled. And the evaluation of the new system could increase the performance of Atikah's Closet Online Shop and hopefully could also increase the shop's sales.

Keywords:- *Website, Quality Function Deployment, E-commerce designing, SDLC, Waterfall Model*.

I. INTRODUCTION

Because the expanding use of Internet especially in Indonesia. Based on the research of We Are Social and Hootsuite 2017, the internet user in Indonesia had grown 51 percents in the span of a year time. This number is the biggest in the world, even far more than global average growth that only had 10 percents. In the second and third place were Philippine and Mexico where both had the growth numbers of 27 percents. This was directly proportional to the online shopping's purchasing power in Indonesia. Data from Social Research & Monitoring soclab.co showed that in 2016, the amount of online shopper reached 8.7 million people with transaction values around 4.89 billion USD.

Yet, even when online shopping has become a new trend that grows and also become a popular shopping method, customers still not fully satisfied with the design and operation of shopping sites nowadays (Kuo, 2006) . According to the analysis conducted by the Eastern Integrated Consumer Profile (2006) the quality of website design was an immensely important factor which influenced customer's online shopping behavior. To increase market share in a tight competition, every service aspect that was being offered in a website had to be increased. Thoughtfulness had to be given to the customer's needs to increase customer's satisfaction. The goal was to make customer willing to come back to do more purchasing also to prevent the possibility to get eliminated in the competition.

So that to increase customer satisfactory and give better shopping experience in evolutionary era as of nowadays, it is important to understand and fulfill customer's needs, which made website design a fundamental aspect. As a result, designing website for online shopping becomes a crucial matter. For years, several techniques had been used to design website yet there was still no certain technique proved quite effective. Regardless of the numbers of articles and books about how to build an effective website, there were only really few numbers of researches that had truly researched the effect of various website feature designs. As a result, designing website for Ecommerce website had become highly demanding area for researchers. Just recently the use of Quality Function Deployment (QFD) in designing Ecommerce sites has been reported and rated quite effective to design website based on customer's desire.

QFD was a method that could be used in designing process and product's development (Ulrich, 2001) to set the specifications of customer's needs. The advantages of QFD method were the ability to reduce time and cost in the process of product's development. With QFD method, the product is not necessarily made to know customer's needs, but only by selecting what becomes customer needs and what kind of concept that can be applied to that product to be able to fulfill customer needs.

In this research will be shown how QFD can be used as a guide to designing decision for website suitable to customer desire, by using Atikah's Closet online shop as a case example.

Atikah's Closet is an online shop that sells women fashion items (bags, purses, accessories, cosmetics, etc.) in social media (Instagram) with pre-order system or ready stock. Yet, there were many problems surfaced because the selling method was still conducted manually, that was why as the solution the writer was interested to make Ecommerce website that suited customer's needs.

II. RESEARCH METHODOLOGY

The method that is being used by the writer is to do a structured analysis using a cluster of phases, called systems development life cycle (SDLC) (Shelly,2011) . Among various model of SDLC, waterfall model is chosen. Waterfall system development method is a cluster of activities that is done in system development, starting from problem identification, customer needs analysis, implementation designing, integration, system test, application and conservation.

This model offers a software making method in a more realistic way. By the means of waterfall model, in this research will be done in 5 analysis steps, 1) Planning, 2) Analysis, 3) Designing, 4) Implementation, and 5)Testing in e-commerce system designing. In addition, Quality Function Deployment (QFD) analysis is done to recognize the customer's need for the design and website requirements required so that the website design can match the customer's needs

III. ANALYSIS OF RESULT

This research The writer using a cluster of phases, called systems development life cycle (SDLC) and will be done in 5 analysis steps, 1) Planning, 2) Analysis, 3) Designing, 4) Implementation, and 5)Testing in e-commerce system designing.

A. Planning

At the planning stage, problem identification and analysis of system weaknesses are observed in the planning stage of Preliminary investigation. To conduct Preliminary investigation the author uses pieces analysis. The Analysis Weakness of the Old System (Instagram) of Atikah's Closet can be seen in Table 1

PERFORMANCE	Transactions often getting delayed because still depended on the interaction between buyer and seller. If seller as well as buyer does not response buyer's questions, the urge to shop could be delayed or even cancelled.
INFORMATION	1. Promotion system of Atikah's Closet still considered small where the promotion system could only reach followers or hashtag included in Instagram.
	2. Information about products was so inadequate in the old system (Instagram)
ECONOMY	Income still conducted manually by checking mutation of bank account, because there was no database that could save buying-selling transaction history
CONTROL	1. There was still no database that could save buying-selling transaction data.
	2. Human Error often happened (Seller forgot to send product, product was sent to the wrong customer, etc.)
	3.Unsold products often forgotten to be re-uploaded
EFICIENCY	Ineffective and inefficient selling system because all process was done manually (from ordering to sending products)
SERVICE	1. Order could not be accessed for 24 hours (less flexible)
	2. The accuracy of information delivery which was done manually to each customer made that information not quite accurate and consistent.

Table 1. Analysis Weakness of the Old System (Instagram)

B. Analysis

In this step, the analysis of customer's needs by using Quality Function Deployment and data modelling

- *Identification Customer Requirements*

In the identification of all customer's wishes and needs, Electronic Service Quality (E-SERVQUAL) was used, Parasuraman, Zeithaml and Malhotra (2000) which as the 1ST level category of requirement. The identification of customer requirements can be seen at Table 2

Requirement 1st Level	Requirement 2nd Level
Reliability	Website has navigation menu and great layout
Security or privacy	Security assurances of website and customer's privacy
Access	Website address can be found and memorized easily
	Accessible through handphone
Flexibility	There is option for delivery service
Ease of navigation	Descriptions of product's price and product's conditions which are thorough, clear, and relevant
	User friendly
Efficiency	Transaction processes which are fast, effective and efficient
Assurance or Trust	Authentication guarantee of products on sale
	Customer can give review or complaint about the products they have purchased.
Responsiveness	Seller responses which are fast and responsive.
Price knowledge	Customer can see the price of each item clearly
Site aesthetics	Catchy website view
Customization or personalization	There are information of contact person and help page in the website
	There are information about new products or the most popular ones
	There are interesting promos
	Customer can have consignment service in Atikah's Closet website

Table 2. The Identification of Customer Requirements

- *Importance of customer quality needs.*

To evaluate the importance of each quality need for the customer, we surveyed Atikah's Closet Customer. Questionnaires were given to 109 respondents to customers who had been shopping at Atikahs closet before, participation was encouraged by giving away free points. The subjects were consumers with previous online shopping experience. The 5-point Likert scale was used in the questionnaire.. The top five quality needs, to which customers attach the most importance are: Seller responses which are fast and responsive (4.58), Descriptions of product's price and product's conditions which are thorough, clear, and relevant (4.55), Transaction processes which are fast, effective and efficient (4.49), Customer can give review or complaint about the products they have purchased. (4.46), and user friendly (4.45). The results show that customers care most about Seller responsiveness

- *Identification of Customer Requirements*

Aims to develop a set of characteristics design in fulfilling customer's needs, in other words it is about how to fulfill customer needs with certain ways. Based on the brainstorming done by researcher with an expert in website designing field, there were design characteristic results just as followed. The identification of characteristic design of customer requirements can be seen at Table 3

Requirement 2nd Level (R)		**Characteristics Design (CD)**	
R1	Website has navigation menu and great layout	**CD 1**	Website system which is accurate, systematic, and coordinated
R2	Security assurances of website and customer's privacy	**CD 2**	There is Sign Up system for customer who wants to shop online in the website
R3	Website address can be found and memorized easily	**CD 3**	SEO friendly so that easily found in Google
		CD 4	There is Clear Logo in website page
R4	Accessible through handphone	**CD 5**	Support Mobile access
R5	There is option for delivery service	**CD 6**	Support various delivery services (JNE, TIKI, COD (Cash On Delivery), etc.)
R6	Descriptions of product's price and product's conditions which are thorough, clear, and relevant	**CD 7**	Full description for each product which easily understood (product details, price, condition, return policy, etc.)
R7	User friendly (easy to use website)	**CD 8**	Website has navigation menu and great layout

Requirement 2nd Level (R)		Characteristics Design (CD)	
R8	Transaction processes which are fast, effective and efficient	**CD 9**	Using payment gateway system
R9	Authentication guarantee of products on sale	**CD 10**	There is return system based on the rules applied
R10	Customer can give review or complaint about the products they have purchased.	**CD 11**	There is testimony widget for customer review
R11	Seller responses which are fast and responsive.	**CD 12**	There are Hotline Service and Live Chat
R12	Customer can see the price of each item clearly	**CD 13**	The system can do shopping computation automatically and accurately
R13	Catchy website view	**CD 14**	Using high quality graphic and font that is easy to read
R14	There are information of contact person and help in the website	**CD 15**	There is seller's contact information in the website (Handphone, Line, Whatsapp, etc.)
R15	There are information about new products or the most popular ones	**CD 16**	There is a page about new product or the most popular products in website's front page
R16	There are interesting promos	**CD 17**	There is unique code for certain promos
R17	Customer can have consignment service in Atikah's Closet website	**CD 18**	There is a special category in website for customer who want to do consignment

Table 3. Identification of Characteristic Design Of Customer Requirement

- *Relationship Between Customer Quality Needs and Quality Elements.*

Expert interviews were conducted with Internet store webpage designing. The relationships between customer quality needs and quality elements are identified with a matrix diagram. 9 points are given for "strongly related" relationships, 3 for "neutrally related" relationships, 1 for "weakly related" relationships and the category is left empty if no relationship exists. The relationship averages are calculated for the data obtained. Values less than 1 are not displayed.

	CD 1	CD 2	CD 3	CD 4	CD 5	CD 6	CD 7	CD 8	CD 9	CD 10	CD 11	CD 12	CD 13	CD 14	CD 15	CD 16	CD 17	CD 18
R1	9					9	3	1									1	
R2		9							3	1	3							
R3			9	9	3			3							3			
R4					9			9						3	1			
R5	9					9		3					3					
R6	9						9	9						1		3		
R7	9	3	1		3	3	9	9	3				1	3		1		
R8	3		1		1	1	9	9	9			1	3	3	3	3		
R9										9	3							
R10										9	9							
R11									1			9			9			
R12	1						3	3					9					
R13							1	9						9		1		
R14								1							9			
R15								1								9		
R16																	9	
R17																		9

Table 4. Relationship Between "Customer Quality Needs" and "Quality Elements"

The relationship between customer quality needs and quality elements can be seen in Table 4. The relationship between

an item from quality needs and a quality element is higher when the corresponding value shown in Table 3 is closer to 9. For example, "Website has navigation menu and great layout" has the strongest relationship with "Website system which is accurate, systematic, and coordinated", with a corresponding value of 9. "Security assurances of website and customer's privacy" has the strongest relationship with "There is Sign Up system for customer who wants to shop online in the website", with a corresponding value of 9.

Absolute and relative importance levels are calculated by using the connections between customer demands and technical requirements and then written as shown in table 4. The formula used in the calculation of absolute importance and relative importance shown

$$abs\ importance = \sum(\boldsymbol{Customer\ Importance\ x\ Relationship\ Matrix}) \quad (1)$$

$$relative\ importance = \frac{absolute\ importance}{\sum absolute\ importance} x100\% \quad (2)$$

Characteristics Design	Absolute Importance	Relative Importance
Website system which is accurate, systematic, and coordinated	341.3	15.90%
There is Sign Up system for customer who wants to shop online in the website	246.7	11.50%
SEO friendly so that easily found in Google	208.6	9.70%
There is Clear Logo in website page	150.6	7%
Support Mobile access	135.1	6.30%
Support various delivery services (JNE, TIKI, COD (Cash On Delivery), etc.)	112.5	5.30%
Full description for each product which easily understood (product details, price, condition, return policy, etc.)	112.3	5.20%
Website has navigation menu and great layout	104.6	4.90%
Using payment gateway system	98.1	4.60%
There is return system based on the rules applied	93.1	4.30%
There is testimony widget for customer review	90.9	4.20%
There are Hotline Service and Live Chat	89.9	4.20%
The system can do shopping computation automatically and accurately	69.9	3.30%
Using high quality graphic and font that is easy to read	68	3.20%
There is seller's contact information in the website (Handphone, Line, Whatsapp, etc.)	63.5	3%
There is a page about new product or the most popular products in website's front page	59.4	2.80%
There is unique code for certain promos	55.6	2.60%
There is a special category in website for customer who want to do consignment	41.6	1.90%

Table 5. Priority of Characteristic Design

Table 5 shows the priority order of each attribute of design characteristics based on the absolute value of importance and the relative importance of the largest to the smallest. For the most important characteristic design is "Website system which is accurate, systematic, and coordinated" and for the least important is "There is a special category in website for customer who want to do consignment"

- *Data Modelling*

At this stage, a graphic model will be developed to show how the system transforms data into useful information. The end result of data modeling and process is a logical model that meets the needs of users. The tool used in data modeling is Data Flow Diagram (DFD)

Data Flow Diagram (DFD) is used to describe the logic of system requirements, ie what processes are required by the system steps in making DFD. DFD Level 0 and Level 2 can be seen at figure 1 and figure 2

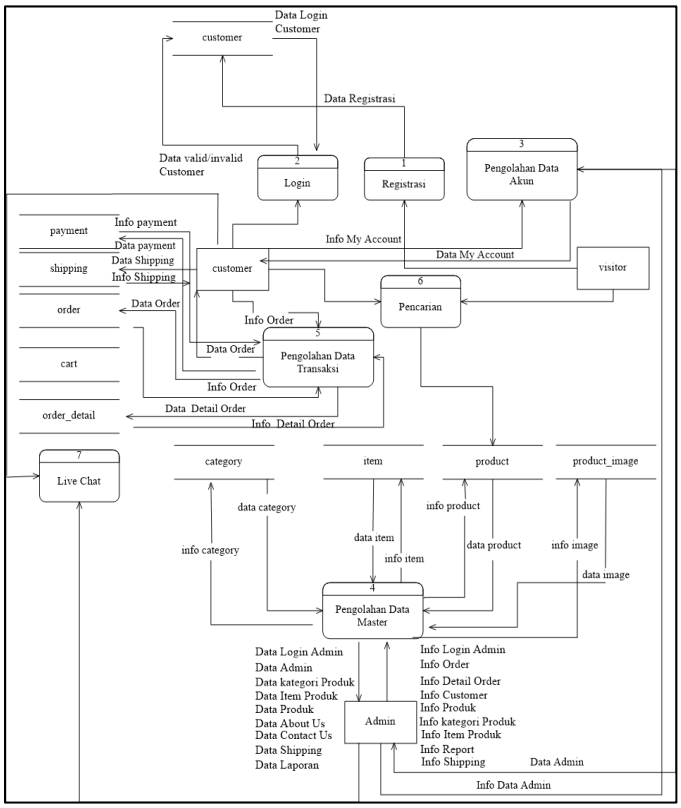

Fig 1:- DFD Level 0 Ecommerce Atikah's Closet

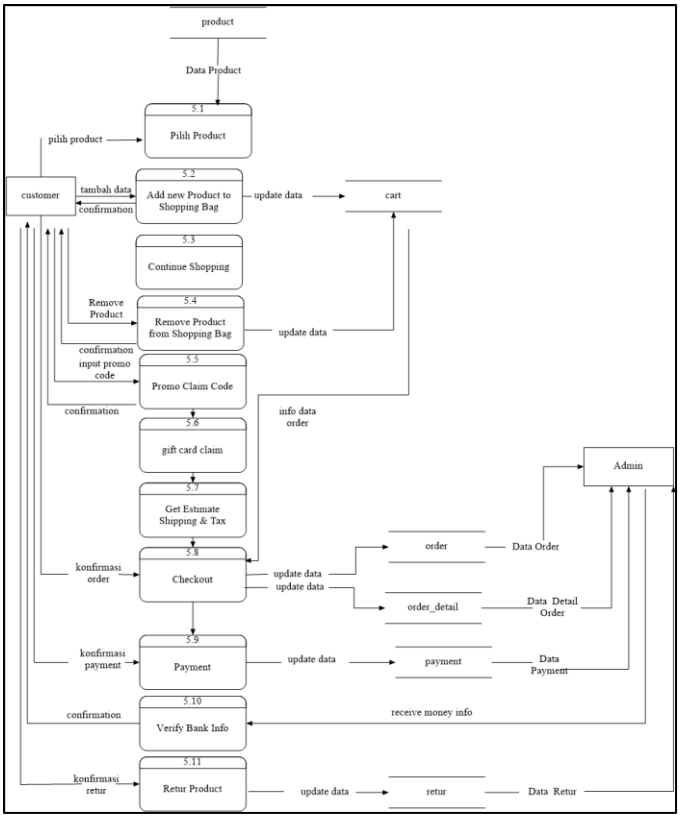

Fig 2:- DFD Level 1 Ecommerce Atikah's Closet

C. System Design

For general database design's step, the thing that needed to be done by analyst was indentifying files that were needed in the information system beforehand. In this case, preface step used Logical model analysis, which contained of ERD (Entity Relation Diagram) and Logical Record Structure (LRS) .

- *ERD (Entity Relation Diagram)*

Entity Relationship Diagram (ER-D) is a networking model that uses data arrangement saved in the system abstractly. ER-D figure of ecommerce Atikah's Closet was shown in figure 3

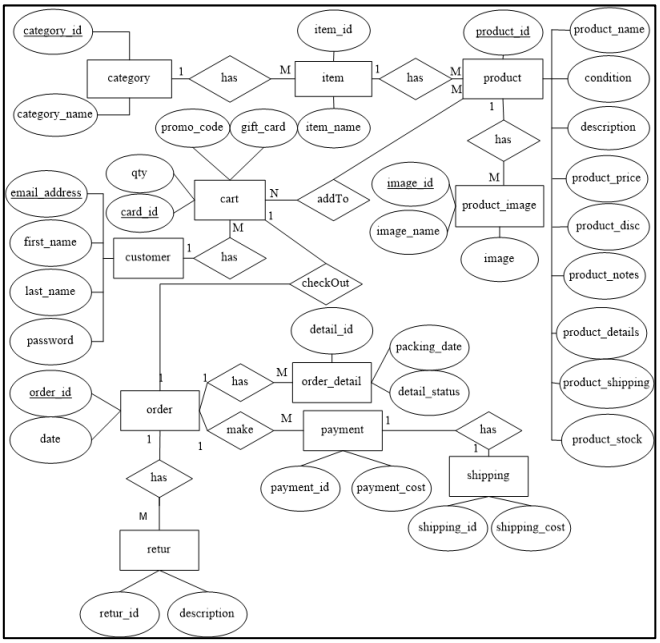

Fig 3:- Entity Relation Diagram(ERD) Website Ecommerce Atikah's Closet

- *Logical Record Structure Scheme/ LRS*

Logical Record Structure explains the relation between tables (Kadir, 2009). LRS of website ecommerce Atikah's Closet was shown at figure 4.

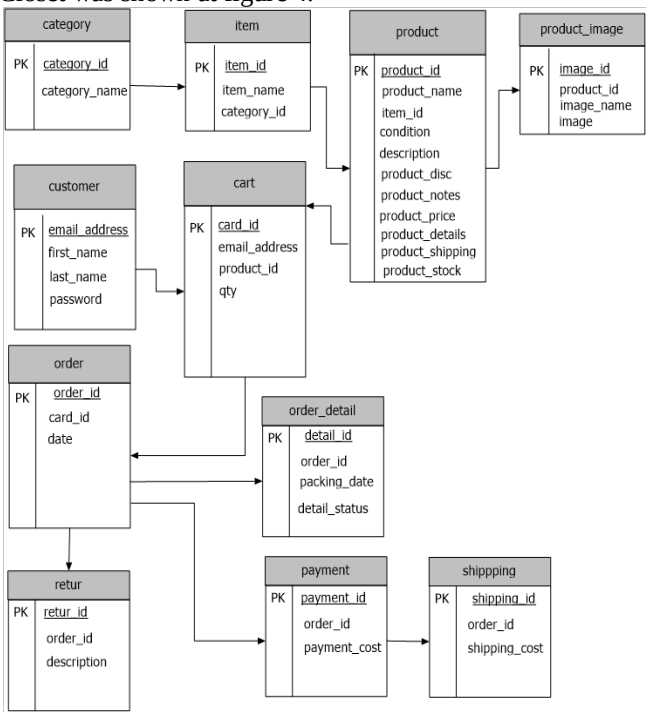

Fig 4:- LRS of website ecommerce Atikah's Closet

C. Implementation System

In this step, there would be implementation physical model that had been gotten from designing step and also analysis of customer's needs which had been analyzed by using QFD beforehand to be real application. Implementations of user interface were the steps of mapping, designing, and modifying website which was addressed toward user. These implementations were based on analysis and design that had been made on the previous step.

D. Testing

The last step after system had become prototype was testing. This testing step was important to see whether a prototype that had been made had already fulfilled the intended expectations or not. Testing steps were reviewed from three sides, which were verification test, validation test and prototype test which each had certain goal that connected to one another.

- *Verification Test*

Verification is a checking process or testing which were done by system mapping before the system would be used by user to the software whether it had met the intended specifications which had been appointed in the mapping process. And from the verification test some results were obtained as followed:

1. System did not encounter mistake or error/debug and all processes had gone along with the flows that were set beforehand.
2. There are no coding mistakes in the system because the construction system of Atikah's Closet website did not need changes or in the coding process did not require reconstruction (automatically) and system run just as the process in static test.

- *Validation Test*

Validation test was done to know whether Atikah's Closet website had been made as the user desired which had been analyzed by using Quality Function Deployment analysis. And from the prototype design, the prototype had met the customer requirements to ecommerce website.

- *Prototype Test*

The prototype test was performed by comparing the old system with the new system with PIECES analysis. Comparison between old system (instagram) and new system (ecommerce) can be seen at table 5.

From table 6 we can see new system (ecommerce) plays an important role in reducing the weakness of the old system. Because purpose of new system to improve the performance of the old system and eliminate unnecessary performance.

	Old System (Instagram)	**New System (E-commerce)**
PERFORMANCE	Transactions often getting delayed because still depended on the interaction between buyer and seller. If seller as well as buyer does not response buyer's questions, the urge to shop could be delayed or even cancelled.	Product election process, product specification, ordering data management have fast time processing because everything is done automatically based on system.
INFORMATION	1. Promotion system of Atikah's Closet still considered small where the promotion system could only reach followers or hashtag included in Instagram.	The new system connected to social media, such as Instagram and Facebook. So that brand from online shop will be able to get discovered faster by customers. Where old system is valued to able to optimize promotion program to the new system.
	2. Information about products was so inadequate in the old system (Instagram)	Thorough products' specifications, from details of each product, condition, price, etc. Customer can easily know product's condition
ECONOMY	Income still conducted manually by checking mutation of bank account, because there was no database that could save buying-selling transaction history	There is history of conducted transaction so that administrator can be easily control buying-selling transaction and selling cash flow
CONTROL	1. There was still no database that could save buying-selling transaction data.	1.There is database that saves product's data, customer, and order.
	2. Human Error often happened (Seller forgot to send product, product was sent to the wrong customer, etc.)	2.Minimizing the occurrence of Human Error because part of the processes were done by system.
	3.Unsold products often forgotten to be re-uploaded	3. Can easily add, revise, and delete products if stocks are not available.
EFICIENCY	Ineffective and inefficient selling system because all process was done manually (from ordering to sending products)	Data report can be understood by either administrator or customer because all process is recorded by system.
SERVICE	1. Order could not be accessed for 24 hours (less flexible)	1. System of information is accessible for 24 hours because system is available online.

	Old System (Instagram)	New System (E-commerce)
	2. The accuracy of information delivery which was done manually to each customer made that information not quite accurate and consistent.	2. The delivering of order information can be done rapidly because ordering status relayed by system.

Table 6. Results of Prototype Test with PIECES Analysis

IV. CONCLUSION

- In the analysis of Atikah's Closet online shop's website making that used Quality Function Deployment (QFD), there were 17 website requirement points and 18 design characteristic points as results, which were needed in the construction of Atikah's Closet ecommerce website so that it could meet the intended requirements of its customers.
- Mapping result of Atikah's Closet website that had been mapped had met customer needs, based on system's testing result it was showed that design characteristics needed in fulfilling customer's needs had been met. And the new system was to be expected to increase the effectiveness and efficiency of Atikah's Closet online shop's performance and also increase customer satisfactory of the Atikah's Closet online shop

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