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## The model of flood control using servqual method and importance performance analysis in Surakarta City – Indonesia

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**Abstract.** This research is to create a model of flood control in the city of Surakarta using Servqual method and Importance Performance Analysis. Service quality is generally defined as the overall assessment of a service by the customer or the extent to which a service meets customer's needs or expectations. The purpose of this study is to find the first model of flood control that is appropriate to the condition of the community. Surakarta This means looking for a model that can provide satisfactory service for the people of Surakarta who are in the location of the flood. The second is to find the right model to improve service performance of Surakarta City Government in serving the people in flood location. The method used to determine the satisfaction of the public on the quality of service is to see the difference in the quality of service expected by the community with the reality. This method is Servqual Method While to assess the performance of city government officials is by comparing the actual performance with the quality of services provided, this method is Importance Performance Analysis. This means looking for a model that can provide satisfactory service for the people of Surakarta who are in the location of the flood. The second is to find the right model to improve service performance of Surakarta City Government in serving the people in flood location. The method used to determine the satisfaction of the public on the quality of service is to see the difference in the quality of service expected by the community with the reality. This method is Servqual Method While to assess the performance of city government officials is by comparing the actual performance with the quality of services provided, this method is Importance Performance Analysis. Samples were people living in flooded areas in the city of Surakarta. Result this research is Satisfaction = Responsiveness+ Realibility + Assurance + Empathy+ Tangible (Servqual Model) and Importance Performance Analysis is From Cartesian diagram can be made Flood Control Formula as follow: Flood Control = High performance

**Keywords:** Flood Control, Servqual, Importance Performance Analysis

### 1. Introduction

Solo city is often buffeted by local flooding. Although local flooding has characteristics of small magnitude, duration of fast and narrow inundation area, but its presence considered quite troubling because the majority of local flooding is in the city center. This flood is very disturbing urban economic activity particularly for transportation. Local flooding caused by the pouring rain in Solo City that cause the flow of surface is greater than the capacity of micro-channel system that tertiary canals and city quarters. In other words, this flood caused by rains that occurred in the city of Solo himself. Given this problem, ideally the responsibility of local flood management is done entirely by



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the citizens of the city under the management of the municipal government. The area that often floods in the city of Solo is Karangasem precisely at the intersection of Slamet Riyadi road with Sawo road, around Purwosari Station, in front of Sriwedari Park to the north to Timuran, in Jayengan precisely around Singosaren Plaza, Gajahan, Gladag and Kadipiro which is around the road Mr. Sartono to the north. The largest local flood ever recorded was the 1978 flood, which covers all the flooded areas as mentioned above plus other locations as follows: Jayengan around Honggowongso road, Ivory, along Kaptan Mulyadi road in the east of Keraton, around Jenes Joyosuran River, Juanda street in Jagalan, RE Martadinata street in Gandekan, Ahmad Yani street in Gilingan and other areas such as Manahan, Sumber, Nusukan and Banyuanyar.. Natural disasters are phenomena or events that cannot be avoided, from year to year occurrence can increase rapidly. Natural disasters might occur because of natural processes or as a result of human activities that often destroy nature. The Indonesian archipelago is a country prone to natural disasters, one prone to flood disasters. Flooding is an event when water flooded the areas that normally are not filled with water at intervals. Floods are disasters that most often occur in Indonesia that resulted in deaths. In Indonesia, especially Java, the cause of the flooding is still dominated by the presence of high rainfall, resulting in rivers overflow and inundate the surrounding area. As was the case in the Begawan Solo, heavy rainfall and Bengawan Solo can't accommodate water from rainwater, then an overflow and cause flooding. Solo's overflow inundating the area - the area traversed by the river bank of Bengawan Solo mainly residential. Flooding can harm humans when inundating human settlement and damaging the people's livelihood [4]. These losses can be anticipated with the readiness of flood control facilities as well as the readiness of the people in the flood locations to cope with this flood condition. For it is necessary knowledge and application of all factors related to the quality of public services that will be able to assist in control of this flood. The need for flood control facilities can only be felt by residents or people whose homes are flooded by Bengawan Solo outburst or due to flooding of mails. Therefore needed flood control model by looking at the needs of flood control services in flood locations. The gap between the needs of the flood in the already fulfilled and unmet areas of flooding is needed to prepare the service quality of the Surakarta city government personnel who are responsive to the potential for flooding and adequate infrastructure development, so that flood events from heavy rains can be avoided. The readiness of the community needs to be addressed through the fulfillment of the community's need for knowledge on flood control by looking at the factors needed to control the floods. The use of the Servqual method is considered appropriate to analyze the level of quality of the readiness of a service by the community or the extent to which a service meets customer's needs or expectations [1]. Service quality that can be used to measure the level of customer satisfaction that physical evidence (tangible), reliability, responsiveness, assurance and empathy. The Servqual approach integrate the two construct and suggest that perceive service quality is an antecedent satisfaction. Servqual metode designed specifically for community services and looked at the quality of public services as a measure of the gap between perceptions and expectations of users, and in principle the definition of the principle of quality services addressing the needs and desires of the user and accuracy of delivery to keep pace with user expectations [10]. While for comparison between expectations (hope the community) to perceived performance (the performance of the municipal/city government) to measure customer satisfaction using Importance Performance Analysis [2]. It can also be known to attributes of poor flood control and complaints from the surrounding community, from which can be determined in a planned corrective measures ranging from attributes that are important but the handling is still poor, so that the local community still have confidence in the government of Surakarta.

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Based on the background described above, the problems can be formulated as a basis for this research is: How Flood Control Model using the Servqual method in Surakarta City – Indonesia and How performance model can meet the expectations of society in Surakarta using Importance Performance Analysis

## 2. Literature

### 2.1 Controlling

According to Terry (Hasibuan, 2005:42) says that the control can be defined as the process of determining what standards should be achieved is what is being done implementers. The concept that control them assess the implementation and, if necessary, to make improvements. In addition, according Horald (Hasibuan, 2005:41) control is the measurement and improvement of the implementation of the work of subordinates, so that plans have been made to achieve the objectives can be held. It can be concluded that the control is a measurement of the implementation of the work and then assess the implementation if there is a mistake, improvements can be done so in accordance with the provisions in the plan.

### 2.2 Flooding

In Big Dictionary of Indonesia language says that the flood is a natural phenomenon commonly taking place in a region that is fed by many streams. In simple terms can be defined as the presence of flood water sector in a large area of the earth's surface so that it covers the region. "A flood is an event that occurs when the flow of excess water to soak the land". When you look at the lessons of Natural Sciences when at primary school, we often get a lesson that flooding is the result of denuded forest. Flooding also caused because of the water has no place to stay so had to move out and find a new place. Flooding can be a puddle on land that is normally dry as on agricultural land, residential, downtown. Flooding can also occur because of debit / volume of water flowing in a river or drainage channels exceeds or above capacity up streaming. If puddles occur quite high, for a long time, and often then it will interfere with human activities. In the last ten years, the area and frequency of floods is increasing with an increasing loss (BNPB, 2013).

### 2.3 Flood Occurrence Causes

Flooding caused by natural phenomena and conditions, topography, rainfall, geographical conditions and human activities that have an impact on changes in the spatial or land use in an area. Flooding in parts of Indonesia, which usually occur in January and February, among other things due to the rainfall intensity is very high, e.g. rainfall intensity in DKI Jakarta more than 500 mm (BMKG, 2013).

Kodoatie and Syarief describe factors that cause flooding

- Changes in Land Use.
- The garbage disposal,
- Erosion and sedimentation,
- Slum area along the river,
- Improper flood control system
- The high rainfall,
- River Physiography
- Inadequate river capacity
- The effect of the tide
- Land subsidence
- Water Building
- Damage of the flood control building

Based on geographical conditions, the area located in the flood plain has a big risk flooded. Flooding also affected by human activity or development which less attention to the rules of environmental conservation. A lot less attention to utilization of space capabilities and exceed the carrying capacity.

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In urban areas, green open spaces and city parks extent there is still much below the ideal area for a city, is now on the wane pressured by settlements or other uses that are considered capable of providing economic benefits higher. When it was raining hard in a long time, then most of the rain water will flow above the ground with great speed and volume and then accumulated into a flood. In terms of behavior or public awareness on the environment, there are still many people who do not or were not aware that everyday behaviors or activities that may do harm to others, both in the region and in other regions. Flooding also caused by a variety of problems such as deforestation of upstream watershed, land subsidence due to the use of excessive water, sedimentation, and the behavior of people around the river is less good in treating the environment, especially in throwing garbage into water bodies (Kodoatie and Sharif, 2006)

#### 2.4 Servqual Method

This method was developed by Negri (2009) using the user-based approach, which quantitatively measure service quality in the form of questionnaires and contain dimensions of service quality are tangibles, reability, responsiveness, assurance and empathy.

This method is broadly divided into two parts:

- Expectations, which contains questions to find out for sure expectations or the expectations of the general public to a service
- Perception, which contains questions - questions to measure the public perception of services provided by a company with a particular category.

#### 2.5 Important Performance Analysis

Importance Performance Analysis Method is used to compare the rate of interests of consumers regarding the quality of service (Importance) with the level of performance. Analysis aims to display information relating to factors that according to the customer service greatly affects their loyalty and satisfaction, and the services factors that according to the customer's needs to be improved because the condition is not currently satisfy the customer. The average of the results of the overall assessment of the consumer then can be described by Matrix Importance Performance Analysis or so-called Cartesian Importance Performance Diagram.

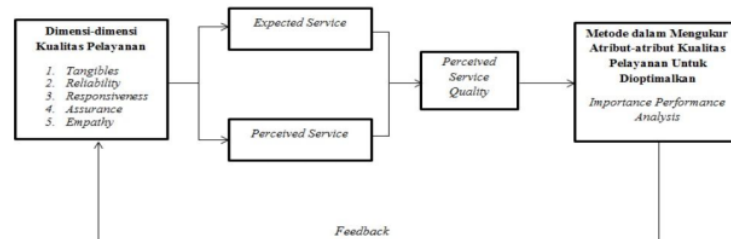


Figure 1

Framework for Thinking Service Quality with Servqual Method and Importance-Performance Analysis  
Source: John L. Crompton (2000), Purnamawati (2007), Triwibowo (2014), Yuniar (2014)

### 3 Research Methodology

#### 3.1 Research Objects And Location

Objects in this research is communities affected by flooding which located in the city of Surakarta in 2015 consisted of five districts, namely:

- districts Pasar Kliwon : 4 village
- districts Jebres : 5 village
- districts Banjarsari : 5 village



- districts Laweyan : 4 village
- districts Serengan : 2 village

### 3.2 Research Type and Methods

#### 3.2.1. Data Types

- Primary Data: Head of Family in Surakarta City - Indonesia
- Secondary Data: files

#### 3.2.2. Methods and Data Collection Techniques

- Questionnaire Methods
- Methods of Observation
- Documentation Methods

#### 3.2.3. Population and Sample

The population used in this research is the urban community of Surakarta City - Indonesia in flooded areas totaling 10 812 respondents, with respondents each village as follows. The sample is a fraction of the number and characteristics possessed by this population (Sugiyono, 2007: 62). The samples in this research using the formula Slovin (Ridwan, 2005: 65) as follows:

$$n = \frac{N}{N(d^2)+1} \dots\dots\dots(1)$$

n = sample; N = population; d = precision values 90% or sig. = 10% (or 0.10).

The number of samples in this research  $n = \frac{10.812}{10.812(0,1)^2 + 1} = 99,0835$  rounded to 100

#### 3.2.4. Operational Variable Type

In the theoretical conceptual model, this research consists of exogenous variables endogenous variables. (Olorunniwo.2006)

##### 3.2.4.1. Endogenous Variables. Satisfaction of the people against the Surakarta government's flood prevention

3.2.4.2. Exogenous variables to determine the level of community satisfaction and quality of government services to flood prevention which is used as model (service quality) that consists of five (5) variable with the following indicators (Olorunniwo.2006)

##### 3.2.4.3. Tangibles Dimension

- Drainage
- dikes and floodgates
- Pump
- Trash

##### 3.2.4.4. Reliability Dimension

- True Service Procedure to the community
- complete knowledge about flood-prone areas
- Knowledge of the correct installation techniques
- Knowledge of the risks of use of equipment
- The hospitality service to the community

##### 3.2.4.5. Responsiveness Dimension

- Improved comfort community service
- Deft services

- **1** Fast Service

**3.2.4.6. Assurance Dimension**

- The need for the socialization of flood control
- Convenience flood control equipment repair services
- Security flood control equipment used

**3.2.4.7. Empathy Dimension**

- Courtesy officers in serving the community
- Good response in receiving reports from the public
- The same service regardless of age

**3.2.5. Data Analysis**

**3.2.5.1. Instrument Test**

**3.2.5.1.1. Instrument Test: Validity**

Test Validity is a test for question items to be used as a research tool that shows the accuracy of the data

**3.2.5.1.2. Instrument Test: Reliability**

Test Reliability is a test of data consistency so that item questionnaire can be used as a measuring instrument where the measurement is done with Cronbach alpha

**3.2.5.2 Servqual**

Data Processing of Service Quality based on SERVQUAL method. Steps to be taken in calculating the value of service quality based on SERVQUAL method, namely: Against each respondent, determine SERVQUAL Score (Si) for each statement or attributes with the following equation

$$Si = Pi - Ei..... (2)$$

Annotation:

*i* = 1, 2, 3, ..., n

*Pi* = perception value given by consumer for the statement to-*i*

*Ei* = expectations value given by consumer for the statement to-*i*

Against each respondent, add the SERVQUAL values obtained for each dimension, and then divide that number by the number statement. The equation used is as

$$Sk_i = \frac{\sum_i^n Si}{n} ..... (3)$$

Annotation:

*i* = 1, 2, 3, ..., n

SERVQUAL weighted value (SQI) for each dimension. The equation used is as follows:

$$SQ_i = \frac{\sum_i^n Sk_i \times W_i}{100} ..... (4)$$

Annotation:

*i* = 1, 2, 3, ..., n

*n* = the number of dimensions

100 = amount total weight of the interests of quality dimensions

Against each respondent

$$TSQ = \sum_i^n SQ_i ..... (5)$$

Annotation:

*i* = 1, 2, 3, ..., n

SERVQUAL (Average TSQ) by the following equation:

$$\overline{TSQ} = \frac{\sum TSQ}{N} ..... (6)$$



<sup>1</sup> Value (TSQ) is what identifies whether or not the quality of service provided service provider to the customer. Quality of service is said to be satisfactory if the value (TSQ) the value is greater than zero ( $> 0$ ), and unsatisfactory if the value is less than zero ( $< 0$ ) Data Processing of Service Quality Based on

*3.2.5.3. Importance-Performance Analysis The steps are.* Respondents were asked to answer the questions of each attribute in the list, namely: How much interest (importance) that assessed consumers about the quality of services provided by the service provider based on attributes that have been given? How good achievement or performance (performance) is perceived consumer about the quality of services provided by the service provider based on attributes that have been given. Creating a Cartesian diagram. In Supranto (2011) it is explained that Diagram Kartesius is a diagram formed into four parts separated by a horizontal line called absis (X) is performance and a vertical line called ordinate (Y) is importance where each part can be explained as follows:

*3.2.5.3.1. Concentrate Here (Concentration / Priority).* In this column people feel that the element of service quality is very important and can give satisfaction but city government officials do not implement it so cause dissatisfaction in the community who live in the location of flood

*3.2.5.3.2. Keep Up The Good Work .* In this quadrant the community judges that the element of service quality is very important and satisfying if the officers of the city government really do

*3.2.5.3.3. Low Priority (Priority Low) .* This column shows that the quality of service is less important but still applied by the city government as a result the community does not care or can be said for the interest of the community is less and also less satisfactory

*3.2.5.3.4. Possible Overkill (Overload).* In this condition, the community considers that the importance of the quality of this service is less important but in the execution is very excessive which can then satisfy some people

#### **4. Discriptive Data Analysis**

Overview of Surakarta

##### *4.1. Geographical Condition and Administrative Area of Surakarta City – Indonesia.*

Surakarta city is geographically located between  $110^{\circ}45'15''$  and  $110^{\circ}45'35''$  east longitude and between  $7^{\circ}36'$  and  $7^{\circ}56'$  South Latitude. Kota Surakarta is one of the major cities in Central Java that support other cities such as Semarang and Yogyakarta. Generally Surakarta is located between lowland and meeting times / rivers Pepe, Jenes with Bengawan Solo, which has a height of  $\pm 92$  from the sea with an area of 44.04 km<sup>2</sup>.

##### *4.2. Topography and Climatology Condition of Surakarta City – Indonesia*

Topography Surakarta located in the lowlands at an altitude between 80 - 130meter above sea level, slope between 0% to 15%. Surakarta is located around 65 km northeast of Yogyakarta and 100 km southeast of Semarang and surrounded by Merbabu and Merapi (altitude 3115 meters) in the west, Mount Lawu (tinggi2806 meters) in the eastern and southern mountains sewu. Kota Surakarta classified as an area that has a relatively flat topography.

##### *4.3. Climatology Condition of Surakarta city – Indonesia*

Images of Surakarta climate is as follows: Surakarta has tropical climate with an average temperature of  $24.8^{\circ}C$  to  $18.1^{\circ}C$ . Air humidity ranged between 66-84%. The highest solar radiation occurs in August or September with solar radiation between 80-84%, while the lowest radiation occurs in December or January with solar radiation of about 48-50%. The air pressure between 1.007-1011 atmosphere, an average of 1.010 atmosphere. Rainfall in 2011 was 2548.50 mm / yr, which is smaller

1 than in 2010 amounted to 3,408 mm / yr and in 2009 amounted to 2332.5 mm / yr. The number of rainy days reached 163 days. Number of dry months to 5 months (May to September) and wet months were 7 months (October to April) with an average temperature of 24.8 ° C to 18.1 ° C. The highest solar radiation occurs in August or September to 84% of solar radiation, radiation while the lowest occurred in December or January. The highest wind speed of 8 knots occur in September and October, The highest air pressure 1011.3 atmosphere in September, an average of 1008.8 atmosphere.

#### 4.4. Land Use

Surakarta City area reached 44.06 km<sup>2</sup>. District which has the largest area is the District Banjarsari i.e. covering 1481.10 ha, while districts that possess at least the land is the District Serengan i.e. covering 319.40 ha. Land use in Surakarta in 2011, the most widely used for residential land is an area of 2841.36 ha, with the land use designation of the service area of 365.46 ha, while the use of land for paddy only an area of 101.95 ha. The use of paddy fields is only available in three (3) sub-district the District Laweyan measuring 22.45 hectares, District Jebres 17:10 ha and District covering an area of 62.40 ha Banjarsari. Land use in Surakarta least is the land with the designation as a city park that is an area of 12.59 ha in Sub Laweyan 0.25 hectares, District Jebres area of 8.85 ha and 3.49 ha area of the District Banjarsari.

#### 4.5. Drainage Management of Surakarta City – Indonesia

The drainage system in the city of Surakarta was originally built for the benefit of the palace and further developed as city drainage system. Drainage network in Surakarta is divided into two parts, namely the natural drainage and city drainage. Generally, nature drainages are the rivers that crossed the middle of the city such as Kali Source, Kali Pepe, and Kali Anyar, which serves as a container for city drainage and rainwater are forwarded to the sea through the Solo River. While the city drainage is draining surface water either inundation of rainwater and wastewater from households The length of drainage are as follows: primary drainage 35.7 km; secondary drainage 67.5 km; 455.3 km tertiary drainage. Drainage city are equipped with sluice gates at 30 locations and water pumps of flood control. Besides other infrastructure which is the main building which includes stations in six locations, 30 locations floodgates, dikes 5 units, and the dam 2 units.

The problem that occurs is

- Wild Residential on water channel
- Damage to the inlet channel
- corrosion due to water pollution
- Embankment Damage

#### 4.6. First Data Analysis

From the results of the initial questionnaire which we distribute to see the real condition of the respondents showed. Factors floods observed are:

Changes in Land use: the house is always flooded when heavy rains and for a long time, Home location close to the river, Floods that inundated homes due to the flooding river water, d. building houses in the neighborhood already crowded/ populous, Around the house there is no green open space (rice fields, gardens, large trees), Flooding also caused the shipment of other districts

- *Garbage Disposa* Inundation of that can be attributed throwing garbage in the river *drainage Network and catchment area*
- The neighborhood already has drainage network
- The condition of drainage network in good condition
- Closed drainage network sedimentation / less infiltration
- The flood waters are not black, not caused by household waste / industry
- Age Drainage installed are still relatively short

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## 5. Dams

Home environment existing in the water dam / levee water, embankment condition good. From the answers that respondents give can be concluded that the floods caused by changes in land use and Drainage. The second data collection was based on first questionnaire data processing. The results of second data processing are as follows:

### 5.1. Quantitative Analysis

#### 5.1.1. Servqual Method

5.1.1.1. *Tangibles*. To obtain / generate differences in people's perceptions and community expectations to services provided are used formula  $S_i = P_i - E_i$ . From Table (attached) above shows that the dimension that has the largest positive gap between perception and expectation is responsive dimension with an average of 6.41 then the dimension of Reliability 5.8, dimension of Assurance 4.93, 3.47 and finally empathy dimension. Tangible dimension 3.1 all dimension meet society's expectations

#### 5.1.1.2. Responsive Dimension

- Officers routinely clean the drainage network of garbage and other sediments (P13)
- Officers quickly respond to public reports with regard to flood control (P14)
- Officers always routinely check flood control equipment (pumps, dikes, drainage) (P11)
- Officers deftly repair damage to flood control devices (P12)
- Officers friendly in serving the community (P15)

#### 5.1.1.3. Reliability Dimension

- Officers has the ability to socialize on flood control (P9)
- Officers has the ability to build a green open space in collaboration with other agencies (P10)
- Officers have complete knowledge about the flood-prone areas (P7)
- Officers master community service procedure (P6)
- Officers has the technical knowledge of flood control equipment (drainage, levees, pumps) (P8)

#### 5.1.1.4. Assurance Dimension by sequence

- Officers provide socialization regarding the cleanliness of the river (P16)
- Officers disseminate to the public to keep together the means of flood control (P19)
- Officers ensures clean drainage from plant waste and household waste (P17)
- The clerk gave community socialization so that the culvert is not covered with concrete (P18).

#### 5.1.1.5. The fourth dimension is Empathy.

- Officers provides the required information (P22)
- Officers provides the same services to the community (P21)
- Officers should be polite and respect the people (P20)

#### 5.1.1.6. Tangible or physical

- Installed flood control pump (P5)
- dike and floodgate (P2)
- Well infiltration / well rained (P3)
- River clean from garbage (P4)
- Drainage smoothly (P1)

$$TSQ = (\sum S_i \times \text{boot}) / n / 100 \dots\dots\dots (7)$$

Based on the Seroquel total value (TSQ) resulted from the multiplication of weights and different expectations and perceptions generated is 8% of the 100 respondents stated the quality of service is not good because it is worth the negative, namely the respondent to 9,46,53,54,56,59,60,66. Which means

1 that 92% of respondents said that the service quality of Surakarta city government is good in doing Flood Control. From the TSQ and Yield TSQ calculations obtained 1.061058 which means satisfying because  $TSQ > 0$ ; Discussion of the results and graphs can be created flood control as the following formula

Satisfaction = Response Officers Flood Control + Reliability Flood Control Officers + Guarantees Flood Control + Empathy Flood Control Officers + Phisicant Flood Control

Importance Performance Analysis. Produced Average - Average satisfaction of the people = 63.38, which means lies between 41-79, which means the satisfaction of being. While the performance is in conformity with societal expectations for  $2.88 > 1.81$ , while the quality of service both as worth  $1.59 > 1$ . For the quality of services that need to be repaired or maintained can be seen in the Cartesian diagram (attached) which results are as follows:

- This indicates that the elements underlying the service have been successfully applied and must be improved in order to be more satisfactory that item in Question 5,9,10,11,12,19
- It is important but not yet implemented is 2,3,7,8
- The less important factor in general is 1,4,6,20
- elements that are considered unimportant in determining performance but are the most satisfactory element of the community in the location of the flood is 13,14,15,17,18,21,22
- From the Cartesian diagram can be made Flood Control formula as follow:  
Food Control = High performance

## 6. Conclusion

With Servqual method produced following sequence:

1. From 100 respondents, 8% stated that quality of service is not good because it is worth the negative, Which means that 92% of respondents said that the quality of service of the Government of Surakarta is good at doing Flood Control. Discussion of the results and graphs can be created flood control formula as follows: Satisfaction = Responsiveness+ Realibility + Assurance + Empathy + Tangible
2. With Importance Performance Analysis Method obtained the following results: With Cartesian diagram on Importance Performance Analysis method is generated that people's satisfaction of the performance is quite good (fairly satisfied)
  - a. Quality of service needs to be improved, namely drainage is smooth, strong dikes, river clean of trash, their flood control pumps.
  - b. The principal services that have been successfully implemented and must be maintained and very satisfying, Officers has the ability to socialize on flood control, Officers disseminate to the public to keep together the means of flood control. Officials always routinely check flood control equipment (pumps, dikes, drainage), Officers deftly repair damage to flood control devices, and Officers has the ability to build a green open space in cooperation by other agencies. Performance can be enhanced by an increase in indicators that are in a quadrant. From Cartesian diagram can be made Flood Control Formula as follow:
    - Food Control = High performance

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