

# User Perceptions of Mobile Internet Services Performance in Borneo

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**Abstract**— The study tries to assess the Quality of Service (QOS) for mobile internet services in the ways assessment involves identifying user perception to assess consumer experience of the mobile internet services they were using. A survey led to the gathering of important information on QOS for mobile internet, which has been analyzed further. The information from the survey pertains to the awareness levels among consumers regarding their data plans, overall satisfaction, Indonesia Telecommunication Regulatory Authority (BRTI) and its regulations on QOS, etc. Some of the key overarching observations are highlighted in the section. Through user perception-based survey that complements and supplements the rigorous evaluation of the Quality of Service provided to customers in a variety of geographies during the delivery of several different types of information, the study in this paper has filled a major gap in the understanding of the current scenario.

**Keywords**—mobile-internet; performance; QOS; user-perceptions; borneo.

## I. INTRODUCTION

Wireless mobile telecommunications technology continues growing, from 1G, 2G, 3G and currently into the 4G evolution. Even some vendors of telecommunication devices have been preparing to welcome the 5G era. The development of technology is the answer of the needs of the world community will access information that is also increasing and growing.

Significant impact of the rapid development of data services technology is the development of mobile phone technology that not only serves as a means of long distance communication, but also as a way of life in meeting the needs of user information. The main indicator of the rapid development of mobile phone technology is with the advent of smart phone devices (smartphones).

The growing technology of smartphones, then the technology of data services can be increasingly utilized. 3G data services or higher technology can support the features of the smartphone if the quality of data services and network performance provided by mobile operators can satisfy the desire and in accordance with the expectations of smartphone users. Networks performance, such as network availability and internet connection speed become the need and satisfaction of every consumer.

However, the expectations of this consumer seem still not fully achieved. Internet access with guaranteed connectivity that is always connected, guaranteed durability and security of information, and has the ability to triple-play with a minimum speed of 2 Mbps for fixed access and 1 Mbps for mobile access according to reference [1-2] is still a variety of perceptions of its availability among users.

On the other hand, some reports of research surveys such as the Akamai survey [3] in IV-quarter 2016 reported that the average internet connection speed in Indonesia was 6.7 Mbps. In the South East Asian Nations region, the speed is still less than Singapore (20.2 Mbps), Thailand (13.3 Mbps), Malaysia (8.2 Mbps), and Vietnam (8.3 Mbps). And internal surveys conducted by the Indonesian Internet Service Provider Association (APJII) reported that 94.3 million or about 71.1% were highly satisfied with mobile internet, 15.5% satisfied, and the remaining 10.8% less satisfied and not satisfied [4].

The gap between the perception of service providers to customer expectations and service quality specifications will certainly have an impact on consumer loyalty, and this is due to various aspects of mobile internet services. Lack of knowledge such as knowledge of usage and bandwidth provided by operators, knowledge of sectoral regulators and existing regulations for mobile internet services, opinion about the Quality of Service (QOS) for mobile internet service, consumer service and complaint handling by operators and others [5-6].

The paper focuses on the Description of Users' Perceptions of the Performance of Mobile Internet Services in Borneo that includes the Service Providers that are Used for Mobile Internet, Awareness of Plan in terms of usage and bandwidth, and The Indonesian Telecommunications Regulation Authority.

## II. METHODOLOGY

### A. Previous Research

Almost a decade of Indonesian telecommunications entered a new era. Through Law No. 36/1999 on Telecommunications [7], this sector officially abandoned its monopoly privilege to immediately transition into the era of competition. New competitors are invited to enter into network operators and services in this sector. Many circle hearts welcome the birth of

the telecommunications law. Moreover, that year was born also Law No. 5/1999 on Prohibition of Monopolistic Practices and Unfair Business Competition [8].

Furthermore, in 2013 the Ministry of Communications and Informatics issued PERMENKOMINFO No. 16/2013 on the standard quality of basic telephony services on mobile cellular networks [9]. The regulation enlists the benchmarks for mobile internet services, for service providers as well as cellular mobile telephone service. On the basis of their performance against the benchmarks, service providers are required to submit monthly performance reports to Indonesia Telecommunication Regulatory Authority (abbreviated: BRTI). The regulator, based on monthly performance reports, releases a quarterly report for all operators for all service areas in Indonesia.

but there is no clear explanation of QOS parameters with Benchmarking value variables technically related to cellular network performance as well as International Telecommunication Union [10-11] and ETSI [12].

Against this backdrop, this study attempts to bring together secondary and primary data to sift issues and provide evidence-based policy recommendations towards better enforcement of the QOS for mobile internet services.

This paper is a continuation of a study "Measuring quality of service of mobile internet services [13-14]". The study focused on collecting measurements from urban areas from various service providers in Samarinda.

### B. Quality of Service Regulation

The measurement of network performance of a service is quite difficult, because the nature of the service itself is abstract and intangible. To display the measurement dimensions in mobile network performance is used QOS network standard ITU-T Recommendation E.800, which is defined as the "Collective effect of service performance, which determines the degree of satisfaction of a user of the service" [10].

Thus, to get internet user satisfaction, performance criteria of internet access service is not only influenced by network performance alone, but also service performance from service provider. In line with the results of previous research, this study will look at the indicators of Service Performance and Network Performance that affect the level of user satisfaction with the quality of internet access services. According to ITU [11], QOS can be seen from 4 points of view as shown in Fig. 1.

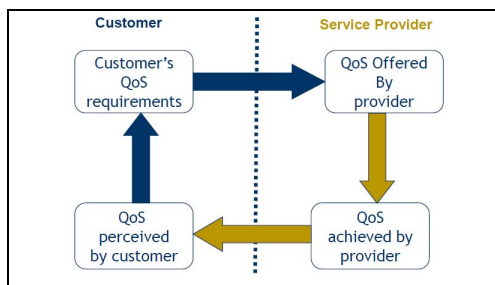


Fig. 1. The Four viewpoints of QOS by ITU. [11]

In this paper the presentation of results and discussion data focuses on the user's point of view.

### C. Data, Sources, and Collection Methods

The research consists of primary and secondary data, primary data sources collected by survey online to mobile data service users on smartphone in East-Borneo, Indonesia. while secondary data from literature studies, such as Internet Service Provider (ISP) data, parameter data and QOS performance standards, and other data related study.

Method of sampling research using purposive sampling technique with criterion of respondent; age between 15 to 25 years, this is based on survey results [4] the level of customer satisfaction with the penetration of Internet users based on the dominance of users among students. smartphone used android or iPhone; as well as mobile operators in the research sites.

Respondents for the Survey, a total of 250 respondents were surveyed from across 10 sub-districts of Samarinda City. The respondents were randomly identified and their responses were collected through undertaken as online surveys.

The districts covered by the survey were sub-districts; Loa Janan Ilir, Palaran, Samarinda Ilir, Samarinda Kota, Samarinda Seberang, Samarinda Ulu, Samarinda Utara, Sambutan, Sungai Kunjang, dan kecamatan Sungai Pinang.

### D. Data Analysis Methods

The analytical method used descriptive statistics analysis approach that is data analysis by describing or explain the collected survey data as it is, and conclusion not for generalization. The next analysis was triangulated with secondary data.

## III. RESULTS AND DISCUSSION

### A. Results

#### 1) Tests of Correlation Coefficient

- Correlations between devices with user's perceptions of network performance

In the ETSI document TS 102 250-1 [12] mentioned that the satisfaction of wireless communication service users is influenced by the quality of service that are technical and non-technical. Technical QOS is divided into 2 things, i.e. network performance and device performance. This correlation test is intended to see whether there is a link between device performance and user satisfaction with network technical parameters. It is assumed that device performance will be affected by device age and device condition. This means that the longer the device and the condition of the device then the performance will decrease.

TABLE I. RESULTS OF THE DEVICE PERFORMANCE CORRELATION TEST AND QOS PARAMETERS

Network Performance	Device Age	Device condition at purchase
Quota accuracy (packet loss)	0,02	0,01
Connection Speed	0,01	0,03
Network Reliability	0,03	0,00

Based on the test results show in Table I that the resulting correlation is very small means that the performance of the device almost does not affect the level of user satisfaction of QoS technical parameters.

- *The correlation between the length of use of data service per day, access location and access time with perception of respondent to connection speed*

Correlation test results show in Table II that the length of access per day, location and access time has no relation with the perception of the customer to the speed of data service connection. This can be seen from the value of correlation between the parameters.

TABLE II. CORRELATION OF SERVICE USAGE WITH CONNECTION SPEED

Service User	Speed Connection
Length of access per day	0,09
Most time using data packets	0,04
Locations most often use data services	0,06

## 2) User's Perception from Survey

The survey was envisaged to provide evidence to the anecdotal thoughts, bearing consumers dissatisfaction for the mobile internet services. The survey was framed in order to gauge consumer experiences and their awareness levels on the features of the mobile internet, the regulatory authority, and perception about various aspects of mobile internet services. For the respondent, who despite being consumers of mobile internet services, had limited knowledge about the same, were also educated by the surveyors on the concepts, the information that exists in public domain and their right to demand better services for the cost they were incurred for the services.

For this, an extensive survey was conceptualized, and a detailed questionnaire was drafted. it was implemented using both web based surveys. The questionnaire consisted of 35 questions pertaining to get feedback from mobile internet users.

### a) Characteristics of Respondents

As mentioned above, the respondents were randomly identified from across sub-districts in Samarinda, East-Borneo. An attempt was made to cover respondents from all educational groups.

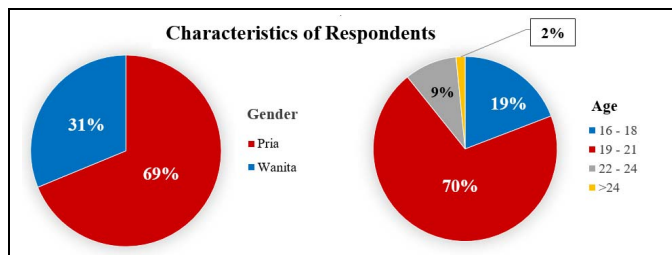


Fig. 2. Characteristics of respondents: age and gender

In Fig. 2, it can be explained that:

- **Age:** Majority of the respondents surveyed (70 percent) belonged to the age bracket of 19-21 years. Out of the remaining, 19 percent belonged to the age group 16-18,

9 percent belonged to the group 22-24 and two percent were of 24 years or above.

- **Gender:** in terms of gender, most of the respondents are gendered men (69 percent), the remaining 31 percent of women.

### b) The Service Provider That Used for Mobile Internet

Once the demographics were captured, the respondents were asked which service provider they used for mobile internet services. Multiple service providers provide mobile internet facilities in research locations. Table III provides a snapshot of the data obtained from the respondents.

TABLE III. THE SERVICE PROVIDER THAT USED FOR MOBILE INTERNET

Parameter	Respondents
The rationale for selecting service provider	
QoS	38,8%
Cost	42,8%
Others	18,4%
The service provider used for mobile Internet	
Telkomsel	57,2%
3 (Three)	30,8%
Indosat Ooredoo	6,4%
Axis Telekom	3,6%
XL Axiata	2,0%
Level of Satisfaction with QoS	
Very satisfied	10,4%
Satisfied	45,2%
Ok	35,6%
Dissatisfied	4,8%
Very Dissatisfied	4,0%
Level of Satisfaction with tariff is good	
Very satisfied	3,6%
Satisfied	24,8%
Ok	41,6%
Dissatisfied	18,8%
Very Dissatisfied	11,2%

Analysis of respondents:

1) *The Rationale for Selection of Service Provider:* When respondents were asked for the reasons behind selecting their respective mobile internet service provider, the tariff for services (cost) was the leading answer (42,8 percent) followed by QoS (38,8 percent).

Some respondents (18,4 percent) mentioned that they did not have any other option to choose from and hence selected their mobile internet service provider. Therefore, the tariff and quality for services were the propellants for selecting the mobile internet service provider. The students have always been cost sensitive and considerate to after-sales service before opting for services and same is the case with mobile internet services as well.

2) *The service provider:* It was seen that majority of respondents (57,2 percent) used Telkomsel for their mobile internet services. The next popular mobile internet service provider was Three (30,8 percent) followed by Indosat Ooredoo (6,4 percent) and Axis Telekom (3,6 percent). The other notable service providers were XL Axiata (two percent).

It is pertinent to mention that Axis Telekom and XL Axiata were not used by any of the respondents. This may be accredited to the fact that Telkomsel, Three and Indosat, being

leaders in the cellular industry, provide more coverage across the region as compared to others, which contributes to the higher adoption of their services. Since mobile internet is one of the services offered through a mobile connection; other services such as calling, value-added services, offers, etc. also influence the choice making for service provider by the user.

*c) Awareness of Plan in terms of usage and bandwidth*

Perceptions users to Awareness on subscribed mobile internet plans in terms of use presented in Table IV.

TABLE IV. AWARENESS OF PLAN IN TERMS OF USAGE AND BANDWIDTH

Parameter	Respondents
Awareness levels in respondents (regarding data plan)	
Yes, Know	32,0%
Know-little	38,8%
Somewhat	12,4%
Don't know	16,8%
The knowledge about the details of the plan bought	
Service Provider at the time of purchase	65,6%
Subsequent inquiry or info present on bill	21,2%
Others	13,2%
The use of internet data packets every month	
> 4 GB	42,4%
> 2 GB - 4 GB	23,6%
> 1 GB - 2 GB	17,2%
< 1 GB	16,8%
Knowledge of usage and number of data packets actually used	
Yes, Know	42,0%
Don't know, just wear it	44,8%
Others	13,2%
Internet data packet used is appropriate with usage	
Yes	51,2%
No	48,8%
Service providers should regularly alert customers on data usage	
Yes	82,4%
No	17,6%
Knowledge Bandwidth used in accordance with the paid	
Yes, Know	16,4%
Know-little	21,2%
Don't know	62,4%

Analysis of respondents:

Most of the respondents (know:32 percent, know-little:38,8 percent) reported that they were aware of the features offered by their respective subscribed internet plans. The features which were inquired where the knowledge of the data limit and the associated tariffs associated with mobile internet plans. The tariff accounted for applicable charges for usage within the subscribed data limit and post-exhaustion of the data limit. When inquired about the details of the plan bought, common responses were; 65,5 percent from service Provider at the time of purchase, (21,2 percent) Subsequent inquiry or info present on the bill, and 13,2 percent the others.

The survey also required respondents to mention their average mobile internet data consumption for one month. It was found that most of the respondents (42,4 percent), (23,6 percent) consumed more than 2GB to 4GB, 17,2 percent consumed more than 1GB to 2GB of mobile internet data each month followed by those who used less than 1GB of data (16,8 percent).

This mobile internet data consumption information did not include the data incurred from accessing the internet through other services such as Wi-Fi or broadband. It may, therefore, be concluded that most of the consumers were well aware of their subscribed mobile internet plans, and the information was popularly procured from the service operator(s), customer care and other users and friends. Further, it may also be deduced that irrespective of the background, the majority of the users (66 percent) consume more than 2 GB of mobile internet data.

*d) The Indonesian Telecommunications Regulation Authority*

Indonesia Telecommunication Regulatory Authority [15] hereinafter abbreviated BRTI is Directorate General of Post and Informatics Operation, Directorate General of Resources and Equipment of Post and Information Technology, and Telecommunication Regulatory Committee which scope of duties and functions in telecommunication sector. user knowledge of BRTI information from the survey is presented in Table V.

TABLE V. KNOWLEDGE ABOUT INDONESIA TELECOMMUNICATION REGULATORY AUTHORITY

Parameter	Respondents
Knowledge about Badan Regulasi Telekomunikasi Indonesia (BRTI)	
Yes, Know	16,4%
Don't know	83,6%
The knowledge about service provider has to report its performance statistics to BRTI	
Yes, Know	16,4%
Don't know	83,6%
The reports provided by the service provider to BRTI were made available, the same be useful.	
Yes	74,0%
No	26,0%

Respondents were queried on their awareness about the telecom regulator, i.e. BRTI. The responses narrated that 16,4 percent of respondents were aware of BRTI and 83,6 percent were not. Of those, who were aware of BRTI (16,4 percent), 83,6 percent were also aware of the fact that all service providers are required to submit quarterly performance reports to BRTI regarding mobile internet services.

The limited awareness of the existence of BRTI and its functions may be attributed to its Jakarta-centered presence. BRTI has no regional representation and hence, there is limited awareness about the institution.

The reports submitted by service providers are collated by BRTI and made available on their official website in public interest. However, the same is not published by the operators on their official web pages. The respondents were asked if they would be interested in perusing the quarterly performance reports of mobile operators if they were easily available. Most of the respondents (74 percent) affirmed that the quarterly reports would be useful for them in choosing between service providers, while only a few (26 percent) said it would not be useful for them.

## B. Discussion

The paper comes at a very important juncture for East-Borneo IT, with issues related to Indonesia's telecom services. The keen interest in consumer protection issues in Indonesia in general, and telecommunication, in particular, such as transformation 3G to evolution 4G LTE to 5G, smart-city, affordability, etc. are on everyone's mind, with the common man at the center of the evolving landscape.

Through user perception-based survey that complements and supplements the research [13-14]. They combine academic rigor with practical import. The Quality of Service provided to customers in a variety of geographies during the delivery of several different types of information, authors of this paper have filled a major gap in the understanding of the current scenario. With providers claiming 100 percent uptime while the customers' experience leaves much to be desired, clearly, we need a study such as this to categorically reveal the reality as is so that the right steps are taken to fix the ills that prevail.

Perhaps the most important part of the report is the set of well thought out, actionable recommendations that are primarily intended for the Indonesia Telecommunication Regulatory Authority (BRTI) to seriously consider and implement. This is essential for the benefits of ICT to reach every nook and corner of Borneo or Indonesia.

Adoption of a nutrition label for the QOS can provide all the key information such as speed variations, service limits and conditions, pricing and other relevant information transparently to the consumers. The adoption of the label would empower consumers with information to compare broadband services in East-Borneo, Indonesia and make an informed decision.

Service providers need to provide complete information to the consumers on mobile internet services, at the time of sales as well as on their websites. Strict rules should be imposed against misleading advertisements by the ISPs, and the reported performance should be compared with the performance that was originally advertised to understand the differences arising between promised and achieved performance.

Finally, BRTI needs to make its presence felt across Indonesia by establishing regional centers. Awareness workshops need to be undertaken by BRTI so as to inform consumers regarding the relevance of QOS parameters for mobile internet services.

## IV. CONCLUSIONS

To gauge user experiences and perception on QOS for mobile internet services, an extensive survey was implemented across 10 sub-districts in region Samarinda City. Based on a structured questionnaire, it was implemented using both web-based surveys and personal interviews. The questionnaire consisted of 35 questions pertaining to awareness/knowledge on terms of usage and bandwidth provided by operators, awareness/knowledge on sector regulator and existing regulations for mobile internet services in East-Borneo, Indonesia, Opinion about the QOS for mobile Internet service, consumer service and complaint handling by operators.

A total of 250 responses were collected with characteristics of respondents is College students with age average 16 to 25 year.

The consumer surveys revealed that the respondents across the ten sub-districts chose their service provider (for mobile internet) on the basis of service Tariff (cost) but were largely unsatisfied with the same. Further, they were unsatisfied with the cost incurred for the same. Furthermore, the respondents were well aware of their data plans but had little information regarding the exact quantity of data being used every month. The level of awareness was significantly low in case of bandwidth usage. Most of the respondents clearly expressed a desire to know more about these issues.

Thus, information asymmetry needs to be dealt with by providing more information to consumers, so as to enable them to make an informed decision. Similarly, most of the respondents were unaware of the regulatory body, i.e. BRTI. Low awareness regarding the regulator implies that the information published by BRTI on QOS for mobile internet services does not trickle down to the consumers. It also indicated the need for the active presence of the regulator at a districts state level, rather than just being confined to Jakarta.

Further, when information regarding an absence of penalty provisions for breach of QOS parameters was shared with the respondents, the majority of them felt it was crucial to introduce and effectively implement the penalties. Lastly, most of the respondents were of the opinion that it would be beneficial to develop a ranking mechanism whereby service providers could be ranked on the basis of their overall performance and the information be shared in the public domain.

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