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Exploring the influencing factors of QoE for Cloud Services

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ABSTRACT With the development of products such as Computer and Communication and Consumer Electronics, more and more users use these products to surf the Internet. When users continue to accumulate the experience of using cloud services, the traditional way to assess the quality of experience of users has been unable to fully show the user's feelings and satisfaction. At present, in industry or academic research, the Quality of Experience (QoE) is often used to measure user experience and satisfaction with Cloud Services, and QoE is used to evaluate these Cloud Services for users, whether it is really easy to use or meet the expectations of users. Based on the existing literature, this study sums up a more comprehensive definition of QoE factors to complement the deficiency of traditional QoS assessment factors in order to be closer to the user's feelings and satisfaction. The results of this study can provide academic, industry and national policy of three aspects of the contribution.

KEYWORDS : Cloud Service, Cloud Computing, QoE, QoS

INTRODUCTION

The National Institute of Standards and Technology (NIST) has proposed the definition of Cloud Computing. The NIST definition characterizes important aspects of cloud computing:

"Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model is composed of five essential characteristics, three service models, and four deployment models."

Three service models: software as a service (SaaS), platform as a service (PaaS), and infrastructure as a service (IaaS). According to the above three service models, the service providers design and develop the cloud services. The applications of cloud services are accessible from various devices through an interface, such as a web browser. Cloud services can provide businesses or consumers through the Internet (Internet) to use, such as: Youtube, Gmail, Hicloud S3 ... and so on.

With the rapid development of technology, the performance of Internet communication technologies (e.g., 4G, 5G, and Wireless) and handheld mobile devices (e.g., Smart phone, tablets, laptops) continues to improve. It makes the emerging and innovative cloud services also continue to increase, such as Google Drive for Work, Line App, HicloudBox App, Dropbox App. Users can easily use these services through the PC or mobile devices, using the Internet (Internet) to use these cloud services. Whether in recreation, learning, working on ... and so on, emerging and innovative cloud services have changed the way most people live.

In recent years, quality experience (QoE) has been paid more and more attention. The International Telecommunication Union (ITU) defines QoE as "the overall acceptability of a user's subjective perceived application system or service". Quality experience (QoE) is the user on the equipment, network, system, service quality of the whole process of subjective feelings. It can be said to be comprehensive subjective feelings. The entire process of QoE is also associated with Quality of Service (QoS). ITU-T Rec. E.800 defines the quality of service as "the collective effect of service performance, used to determine the satisfaction of service users". Many literatures refer to network quality of service (QoS) measurement parameters, such as packet loss, delay, jitter, and so on. These parameters can be measured and collected, and further information on objectivity analysis.

LITERATURE

QoS is generally considered to be the predecessor of QoE. The International Telecommunication Union (ITU-T) Rec. E.800 (1994) defines QoS as "*The collective effect of service performance which determine the degree of satisfaction of a user of the service.*" ITU-T, Rec. E.800 (2008) defines QoS as "*Totality of characteristics of a telecommunications service that bear on its ability to satisfy stated and implied needs of the user of the service.*" ITU-T, Rec. E.800 (2008) defines QoS experienced/perceived by customer/user (QoSE) as "*A statement expressing the level of quality that customers/users believe they have experienced.*" QoSE can be influenced by the complete end-to-end system effects (network infrastructure) and can be influenced by user expectations, ambient conditions, psychological factors, application context, etc. ITU-T P.10/G.100 Amendment 1(2007) defines Quality of Experience (QoE) as "*The overall acceptability of an application or service, as perceived subjectively by the end-user.*

NOTE 1 – Quality of Experience includes the complete end-to-end system effects (client, terminal, network, services infrastructure, etc.).

NOTE 2 – Overall acceptability may be influenced by user expectations and context. "

So, later researchers use the user as the center to define QOE. For example, Diepold (2012) points out that QoE is the level of delight or annoyance that a user perceives for a particular application or service. That is the user's overall subjective perception of the quality and performance of equipment, networks and systems, applications or services (including aspects of effectiveness and availability). That is from the comfort of service applications to define QOE. Based on the background of voice service, ITU-T (1996) Rec. P.800 proposed ACR (absolute category rating) test method for a subjective evaluation method. In the subjective assessment of the video, ITU-T (2012) provides a method which was proposed by the ITU-T Rec. BT.500-13. The tester subjects subjectively score the image. Gong et al. (2009) define five QoE factors, namely usability, availability, service instantaneousness, service integrity and service rate ability. And in order to obtain user acceptance, the research focus on the relationship between QoS and QoE. Lagrari et al. (2012) proposed a model of a complete communication ecosystem that presents all interactions present in this ecosystem, and the model takes into account the relevant factors in technology, manpower, and commerce.

METHOD

This study collected the influencing factors of the relevant QoE literature. The research literatures were based on three databases: IEEE / IET Electronic Library (IEL), Science Direct Online (SDOL) and Springer Link. There are five main keywords for the search: QoE, Quality Of Experience, Quality Of User Experience, Cloud Computing, Cloud Service. And then according to the contents of the literature summarized, summed up the factors that affect the QoE.

CONCLUSIONS

In the evaluation of the use of cloud services after the user experience and satisfaction, the use of QoE will be more appropriate with the QoS. The factors that measure the impact of users using cloud services QOE are more important to service providers. Often, the QOE impact factor for cloud service assessment is more accurate, and the user's experience will be good, and can bring good results to service providers. For example: brand reputation, business opportunities, market share and so on. The current cloud service attributes can be categorized using three generalizations: Data over IP, Voice over IP, and Video over IP. More and more consumer electronics products can be used through the Internet to provide users with cloud services. The QOE impact factor of this study can provide a better design reference for cloud service providers, and more close to the user's feelings and ideas and satisfaction.

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