

# The Study on Divide about Data Traffic Use between Mobile User Groups

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## Abstract

*Mobile data traffic has been rising rapidly caused by spreads and development of smart devices As a result, it brought a lot of changes throughout our life and usage pattern for mobile users, as well as mobile technology advance and market alternation after data bandwidth growth and decline of mobile rate for data. Recently, the “Unlimited mobile tariff” has been released due to the severe competition between domestic mobile carriers, thus, the user of unlimited mobile tariff system increases while users have mobile tariff cost relief. Also, the various devices are connected to each other everywhere in our life, not only past mobile phone and tablet. It is overly connected in one IoT era, then users of its services increases sharply, so that the data traffic of IoT devices are regarded as significant element to find out next mobile data traffic usage and pattern study. The Goal of this study is to analyze the traffic of Korean mobile and wired line internet statistics by user group upon the network development and mobile tariff progress. And it is required to find out IoT devices market state and influence for mobile market based on empirical data and statistics in Korea.*

**Keywords:** *Digital Divide, Mobile User-group, Mobile data traffic and Smartphone, IoT*

## 1. Introduction

Since Smartphone is released in market, it has brought tremendous alternation and influence around Global Telecom Market. Mobile Data Traffic is increasing drastically while a smartphone is regarded as an essential item of an individual's life. After mobile network has had huge movement from 3G network to 4G network, data speed has also improved. It was available to provide 300Mbps as maximum bandwidth for mobile data service during change over into 4G Network, besides mobile Data charge for Telco service is sharply reduced. It was expanded for data traffic alongside voice call during 3G era, whereas voice call had been a major issue for a 2G network age. By the time, expensive volume rate data charge system was a general pattern for method of data service, caused by restricted network infrastructure. Most mobile B data traffic was tended to be consumed by Heavy user group. Afterwards, 4G Network era began in earnest while needs for large data spread for public with video or game. Particularly Korea has completed to establish the fastest 4G network infrastructure in the world. It results to the reduction of mobile service fee, though Bandwidth and Data speed are advanced. Moreover, unlimited data plan is on the telco market during severe competition

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among major Telcos and handset shows remarkable progress caused by HW and SW technology development. It seems that various services appeared regardless of mobile internet connection restriction from area with network coverage improvement. Unlimited data plan is high ranked service for mobile users due to mitigation of mobile rate burden. As a result, mobile data traffic soared quickly during massive data contents consumption through a smartphone.

It is predicted that mobile data behavior is changed by the alternation of users from harsh and expensive condition into unrestricted and cheap mobile circumstance. Aim of this study is to find out mobile data consumption pattern as per user's behavior influenced by network development and transform of mobile fee. And it is looked for suggestion upon traffic analysis and data by real each user groups. Also it is dealt with how newly next IoT tech influences mobile data traffic usage.

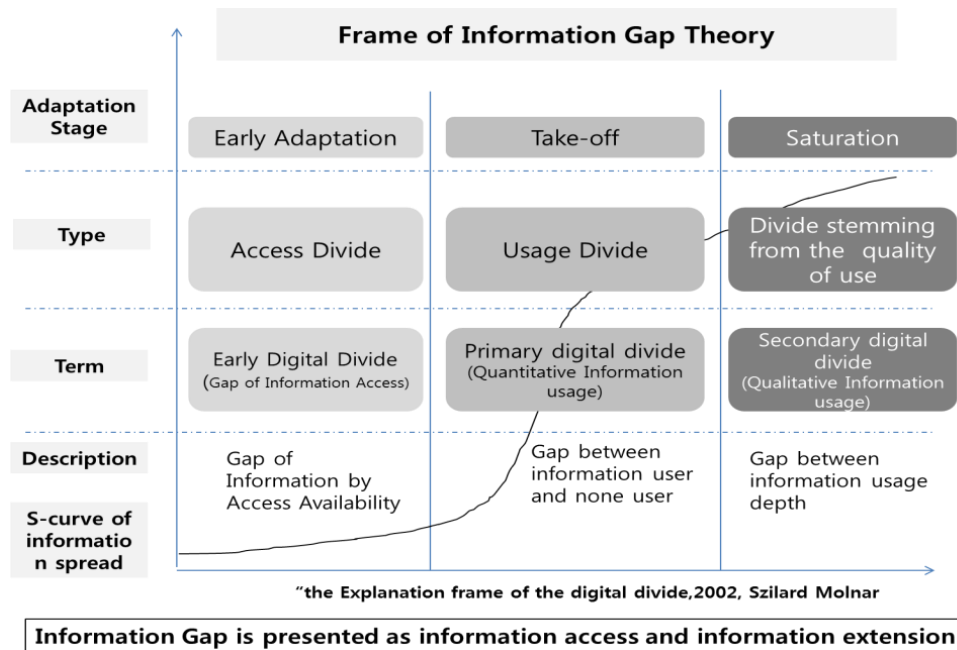
## 2. Related Works

It is called as Digital Divide which is scientific field for study of differentiation as social group with Internet information access and utilization. This terminology has been expressed with diverse worlds, such digital Gap, Information poverty and knowledge gap. It was focused on social structural inequality bring about by ICT progress. Recent articles are concentrated on qualitative and qualitative influence through social class and group about internet communication concerning ICT Digitalization provided emphasizing information gap about individual and social group after Internet economy structure governance stride has come (Jasoon Koo. 2007)

Digital divide is analyzed into diverse perspective. This concept is based on 3 elements. These 3 concepts are; Opportunity Difference (Access of information), Utilization Difference (Information Use), and Acceptance Difference (Information notion).

Opportunity means that difference of Information access occurred from economical elements. It is also called "Utilization Difference" which is a gap of information gadgets usage based on IT spreads. And there is "Acceptance Difference" which is information understanding notion.

The concept and characteristics of Digital divide have been changing into every level of IT expansion within informatization tide. It shows the two aspects from S-Shaped time path of I.T spread. First aspect is gap of "Information Access and Information quantitative use" from early adaptation and Take-off period. Afterwards, it is found about gap of qualitative usage and access from Post Adaptation and Saturation period of S-Shaped time path figure. (Research of Information Gap Index and fact-finding, (NIA, 2014))



**Figure 1. S-curve Digital Divide Concept (NIA, 2014)**

Most studies are described as “Digital divide” about wired internet about a PC. However, this study is focused on “Digital Divided” of mobile data usage and gap of Mobile user group differences in Korean market based on the major tide of Mobile data with Smartphones. Previously, Information Gap theory shows that information access gap was key factor in entry stage, and then the difference between user and non-user groups is critical in midst phase, finally Information Qualitative gap is getting significant in saturator phase.

South Korea is a leading country for most developed mobile network and wide coverage. Moreover, it is the highest internet usage in accordance with cheapest Data charge and lowest gap between groups. Korea also has the highest smartphone population users in the world. It regards as initial country for analyzation of mobile user groups gap in the matured mobile data market in Korea. This study delivers the insight about qualitative gap with Mobile divide by analyzing data tariff system which causes the phenomena that top 20% traffic is occupied by a heavy user group. And it is surveyed the portion of IoT and each industries throughout up-to-date IoT market and broadband internet service traffic progress. Moreover, it has reviewed the new divide phenomenon appearance briefly.

### 3. Trend of Mobile Heavy User Group Data Usage

#### 3.1. Data

This research is based on KT monthly data traffic statistics (KT occupies 30% Market share in Korea mobile market) including broadband internet reference from Jan. 2013 to May, 2015. This statistic figures have an absolute disregard for personal information, because whole data is extracted Total Data usage and portions.

#### 3.2. Mobile Subscriber Number and Market Characteristics

Korea is the first movement country for LTE service commercialization in 2011 after 3G service diffusion since 2003. It has scored thirty-eight million users among fifty-seven

million mobile users and forty-one million lines smartphone users. Smartphone has become popular and a necessary item for people.

KT has led this trend and popularization since KT adopted i-phone in 2009 as pioneer. The 4G users rapidly increased from Jan, 2012 when 4G service launched. Its users overtook behind 3G subscribers by 2 years in Jan, 2014, and then traffic also passed over the 3G traffic. Today, 4G service is popular in public. The reason for 4G data traffic growth is its network bandwidth development and Data fee decline. Also Multimedia files upsurge and handset advancement also is one of the main reasons for 4G service surges. (Figure 1)

Network speed is provided as more than 1Gbps after Giga LTE tech introduction which is a combined LTE and Wi-Fi connection which is 3times faster Broad LTE Tech adoption rather than before. Another reason for Data usage explosion is price reduction in data service. Especially, Unlimited Data tariff system which was released in April, 2014, which brings data traffic huge explosion. For instance, subscriber of unlimited data tariff increased into 14% of whole members of KT for few months. Subsequently, data traffic of unlimited system also covers 53% of while data traffic now. It gives rise to data traffic burst.

Basically, share of traffic of flat rate system is a bit increased due to unlimited data system traffic growth although the number of flat rate system user is a bit declined caused by middle-aged class who prefer the metered rated system, such as economic rate system. (Table 3)

**Table 1. Progress of Total Data Traffic for 3G / 4G Service (Ministry of Science, ICT and Future Planning, Korea)**

| Index |                           | Jan, 2013 | Jan, 2014 | Jan, 2015 |
|-------|---------------------------|-----------|-----------|-----------|
| 3G    | Subscriber (Unit : 1,000) | 11,189    | 7,323     | 5,689     |
|       | Total Data Traffic (PB)   | 8.5       | 4.3       | 2.4       |
| 4G    | Subscriber (Unit : 1,000) | 4,231     | 7,612     | 9,788     |
|       | Total Data Traffic (PB)   | 7.0       | 14.9      | 29.6      |

**Table 2. Subscriber and Traffic Ratio for 4G Unlimited Data Service (KT)**

| Classification                          | Jan, 2013 | Jan, 2014 | Jan, 2015 |
|---|-----------|-----------|-----------|
| Unlimited data service subscriber ratio | 0%        | 1%        | 14%       |
| Traffic of Unlimited data service ratio | 0%        | 5%        | 53%       |

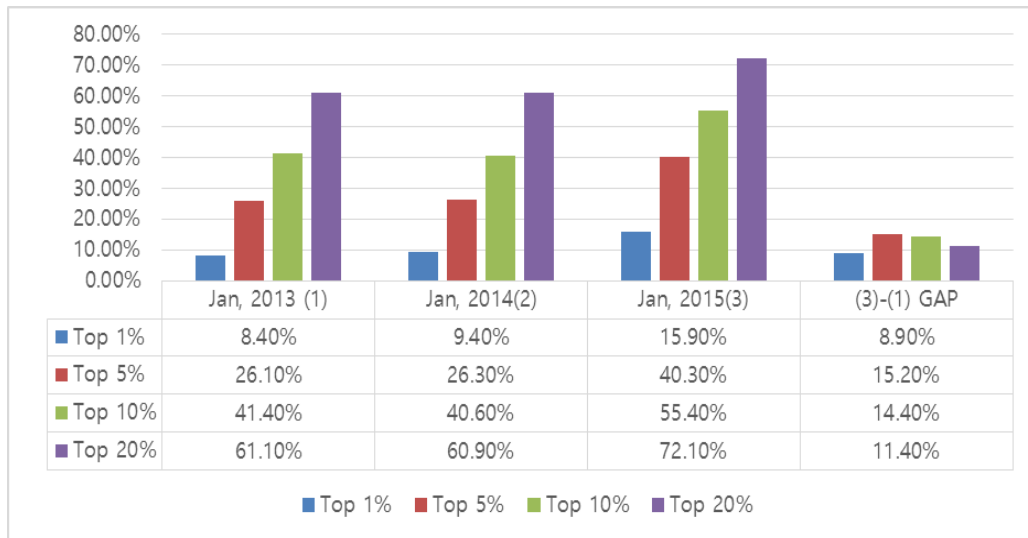
**Table 3. Ratio of 4G Data Service Traffic and Subscriber (KT)**

| Classification                  | Jan, 2013 | Jan, 2014 | Jan,2015 |
|---------------------------------|-----------|-----------|----------|
| Subscriber of Flat rate service | 89%       | 87%       | 84%      |
| Traffic of Flat rate service    | 94%       | 94%       | 95%      |

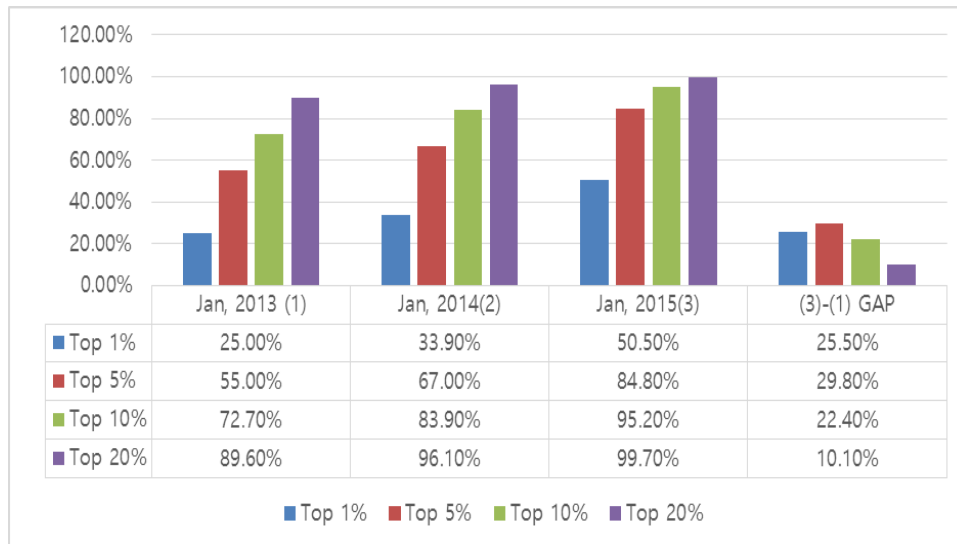
**3.3 Data Traffic Occupation Deviation of Mobile Heavy User**

It is analyzed about mobile data traffic statistics for 4G network. User group of Upper 20% increased drastically their traffic occupation after unlimited data tariff system launched in April 2014 by studying the data share with mobile heavy user group. They used to be stable and stationary before unlimited data system. It is found in [Figure 2]. It shows that none of progress for data traffic usage portion until January 2014, although Mobile network coverage has been expanded and speed is also advanced. On the other hand, Data usage occupation of heavy user is suddenly increased rapidly after unlimited data tariff system release. The data occupation of upper 1% group has appeared 8.9% growth, 5% group increased 15.2%, 10% group is 14.4% growth and 20% group recorded 11.4% growth for mobile data usage occupation.

Also, it shows that data traffic portion is gradually up by heavy user group compared with 2013 about 3G network service from total mobile user group (Figure 3). Especially, most data traffic (99.7%) is made by upper 20% heavy user group in.



**Figure 2. High Consumption Mobile Data User Group Traffic Usage Traffic for Each Year for 4G Network Service (KT)**



**Figure 3. Data Traffic Portion by User Group for 3G Network Service (KT)**

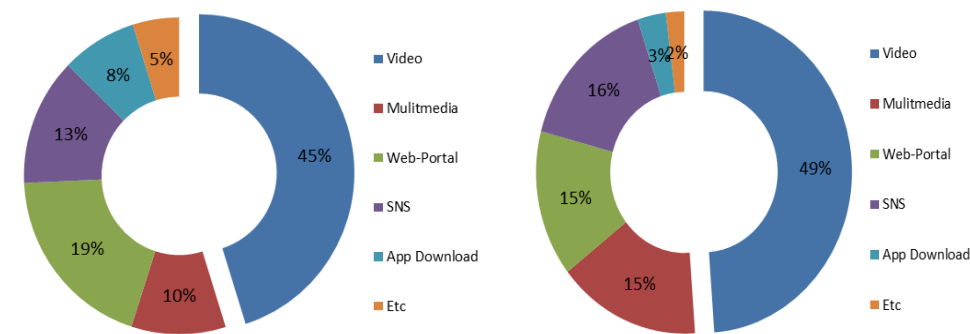
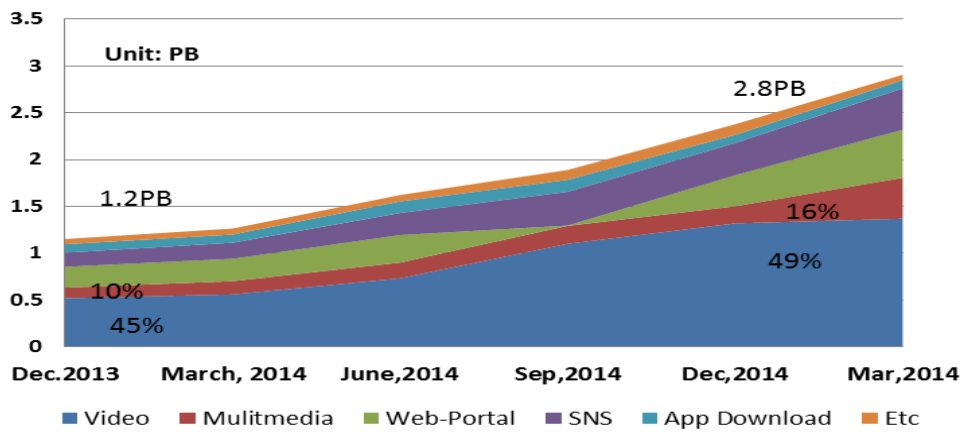
### 3.4. The Pattern of Data Traffic by a Mobile Heavy User Group

It is raised 2.3 times up in March 2015 contrast to March 2013 about contents usage traffic caused by LTE Data bandwidth advance.

The reasons of growth for contents usage are quite diverse, such as diversity of mobile contents floods, device development and mobile bandwidth evolution.

It is increased for mobile traffic led by vast bulk contents rise; such as video, game or streaming music. Various SNS diffusion is another element which leads mobile traffic, but Web-portal usage and Mobile App downloads relatively decreased from past (Figure 4).

The SNS and video Play are supposed to be increased as per mobile podcast spread and various SNS services create huge data traffic from now on. In addition, huge content through Cloud service transfer gets commonly operated in the market.



March, 2013: 1.2PB

March, 2015: 2.4PB

**Figure 4. Data Traffic for Contents Usage by Year (Ministry of Science ICT and Future Planning)**

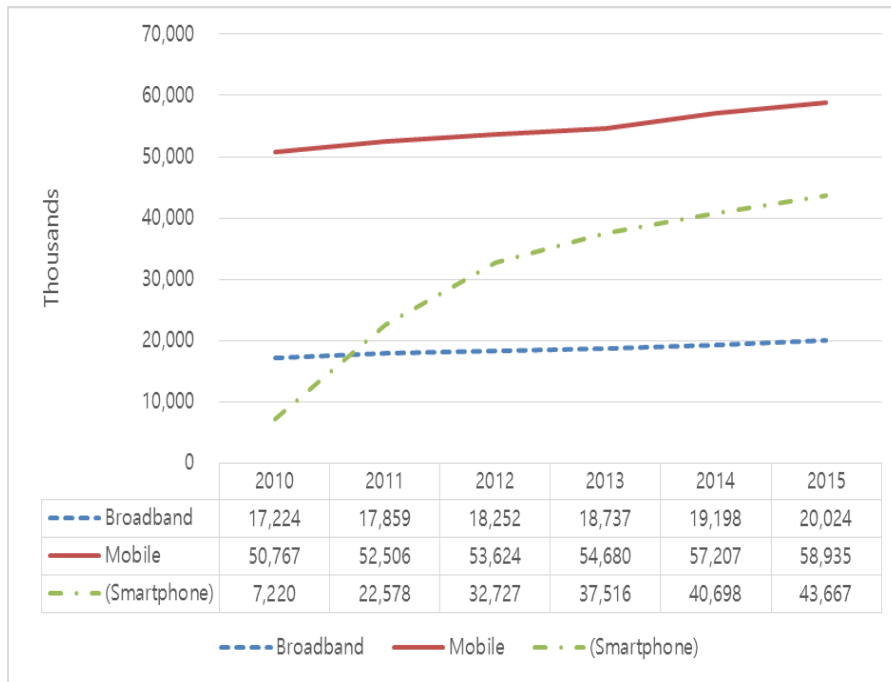
### 3.5. The Correlation Between Broadband Internet and Mobile Traffic Growth

It is available to find out that the share of mobile traffic by heavy user is grown up for mobile data traffic. Then it is required to research about Broadband Internet service traffic by each user groups.

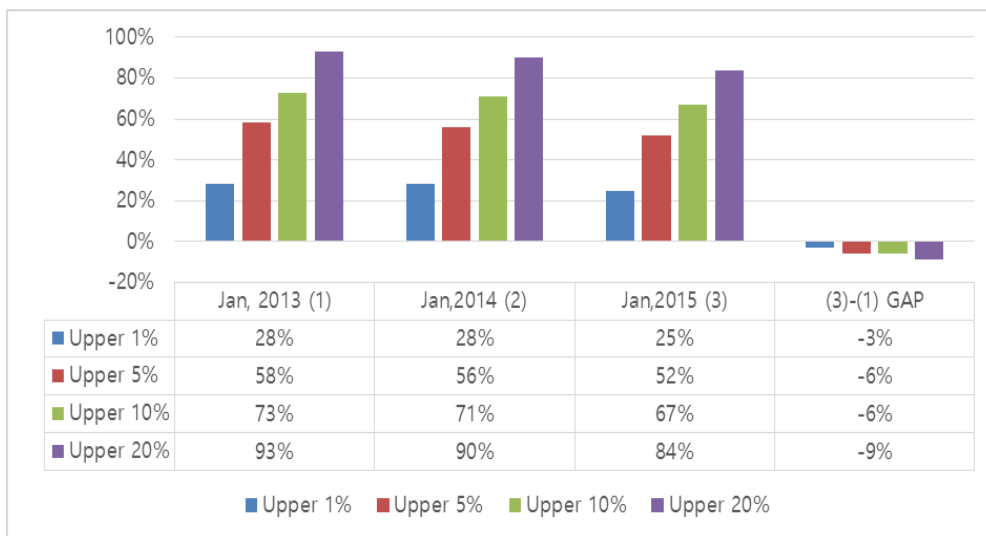
The share of broadband traffic declined a bit while mobile traffic has grown. It means that the user groups are moving from broadband internet service to mobile internet data service, especially into a smartphone (Figure5), and the share of broadband service traffic for 20% heavy user group has been down sharply, compared with 1% heavy user group. In fact, the mobile traffic and broadband internet service is inversely proportion (Figure6). And it seems that the gap of traffic gets shrinked in matured market circumstance, but it was further in growing market.

As though mobile data traffic is dramatically increasing, we can see that the weekly internet usage time has been slightly decreasing(Figure7).

However, Internet usage time of both heavy user group and light user group is increasing from 2010 when smartphone has been introduced (Figure8).

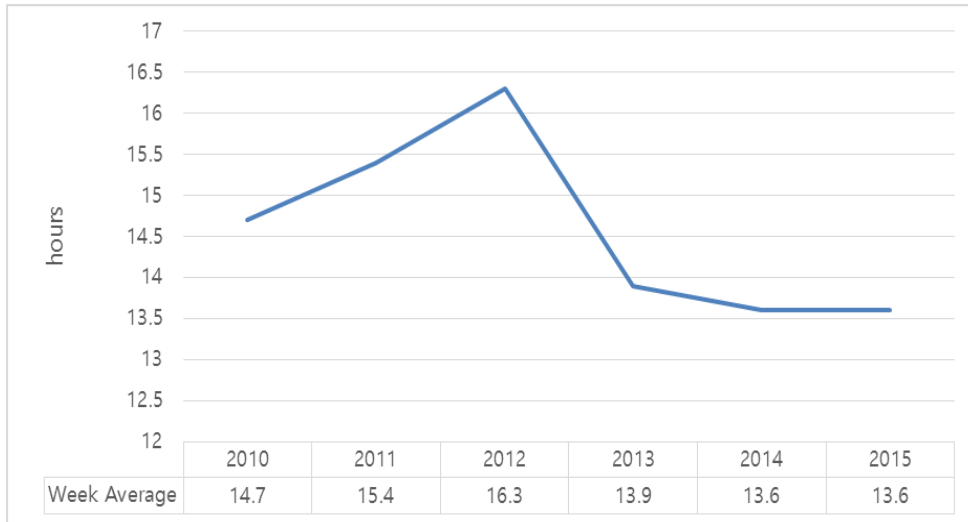


**Figure 5. Broadband and Mobile Subscribers Including Smartphone. (KISA, Korea)**

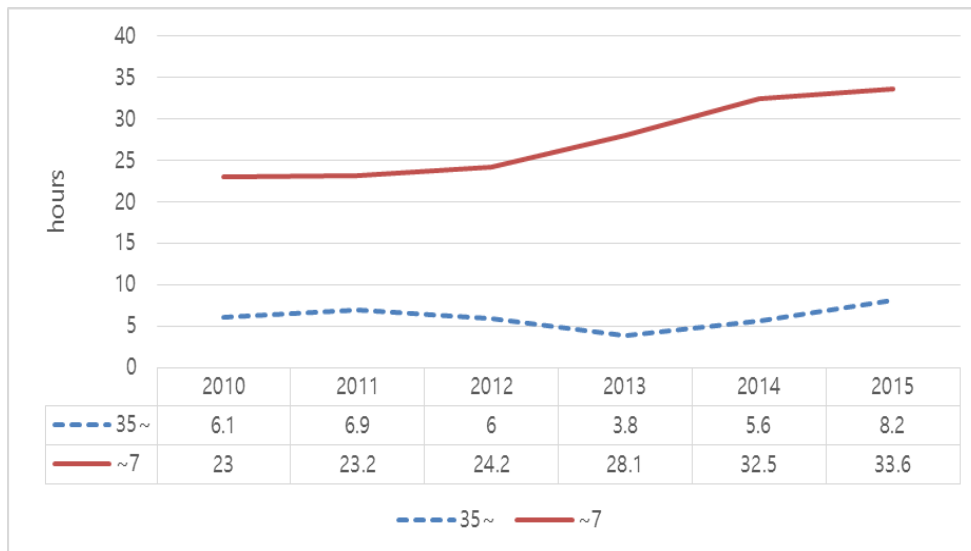


**Figure 6. Broadband Internet Traffic by Heavy User for Each Year. (KT, Sampling Data)**





**Figure 7. Weekly Internet Usage Time (Including Mobile) Per Internet Users (KISA, Korea)**



**Figure 8. Weekly Internet Usage Time Change (Including Mobile) Between Heavy User Group and Light Group (KISA, Korea)**

### 3.6. Perspective of IoT (M2M) Industry Development

The IoT devices are totally 860,000 EA, it charges 5% for total mobile devices. Most devices are operating 3G network (96.5%). It is the fastest-growing market. The main use is wireless security device (34.2%), and Vehicle management is 22.6%, mobile payment is 13.5% and public transportation system charges 10.9% among IoT use.

According to the “Gartner Research” (Global Market Research Firm), it is supposed to reach 4,900,000,000 devices of IoT service by this year, and 25,000,000,000 devices are used until 2020 in global market. Also the budget is USD 69 billion from this year to USD 263 billion to 2020. It is tremendously raised next ages.

It is predicted that IoT industry is main stream among IT market in 2020. A lot of ICT firms, such as Google, Apple or CISCO concerned about IoT Service, then IoT traffic

should be sharply grown. While Ordinary device increased 6T up, otherwise, IoT device has grown 20% up.

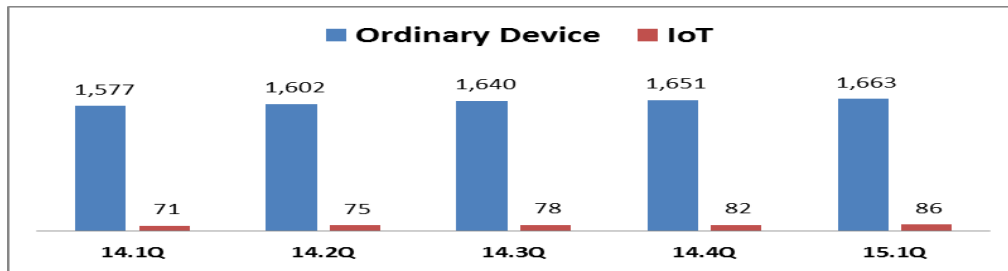


Figure 9, IoT Device Portion Among Ordinary Devices (KT)

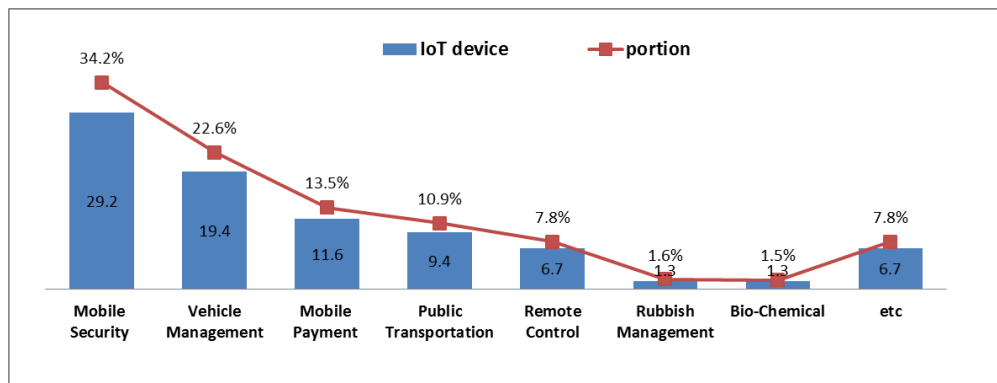


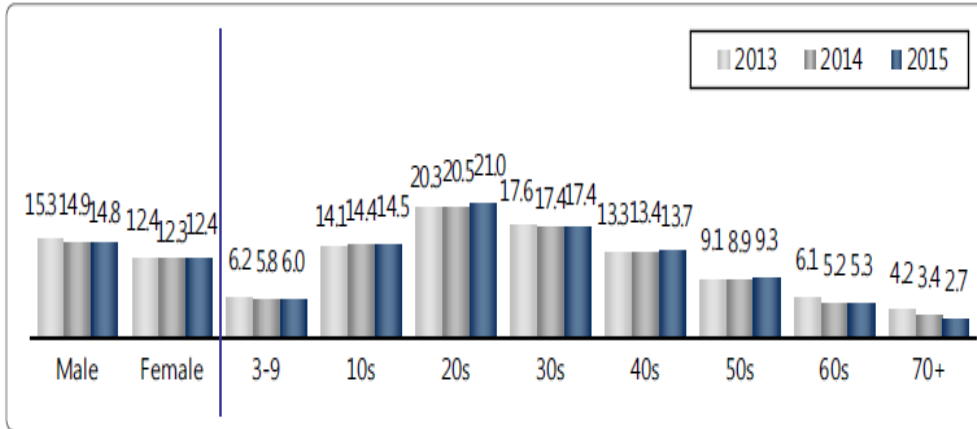
Figure 10. IoT device Usage State (KT)

#### 4. Conclusions

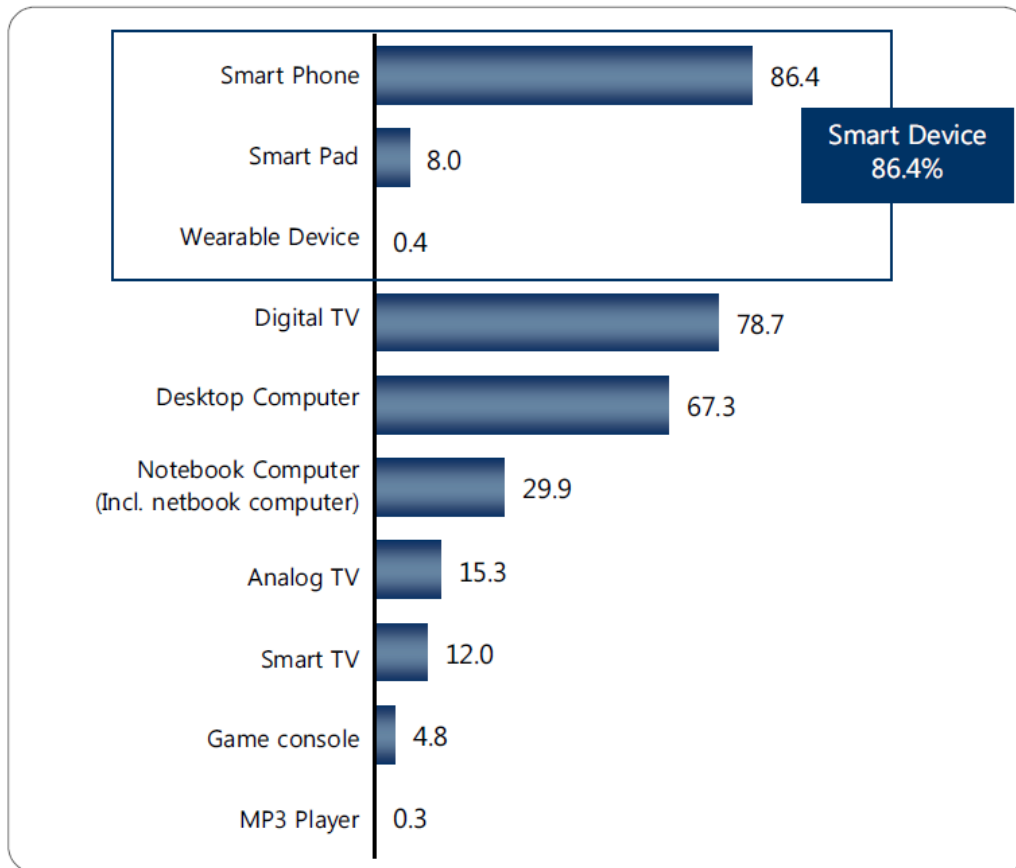
According to S-curve Digital Divide Theory, it is regarded as significant factor about Gap between each user group in mobile tech has been matured enough. It is found how “Smart Divide” has appeared and expanded. First, Polarization of mobile use group usage has progressed rapidly while mobile data tariff diversity, it also results the occupation growth of heavy user group. Second, The Polarization of mobile user group has not occurred in case of mobile data equality caused by feasibility of mobile access for anyone and network development. Third, the gap of usage gets diminished in matured market circumstance between each user groups, such as broadband market. On the other hands, the gap of usage is getting further growing market, such as mobile market. In this study, it was not clearly clarified for the reason why mobile data usage gap by each user groups is extended as data usage availability development. However, it might be a compound phenomenon. Huge data multimedia service expansion, diverse entertainment contents economical business user and generation mobile data needs of difference generations are main reasons for this phenomenon. We may have further study to clarify the distinct reason by category of user service and pattern. Additionally, new IoT era is regarded as most critical issue for coming mobile market also affects data usage gap between diverse use groups. It is required to more in-depth study for use group service usage pattern and market environment factors

### 5. Appendix (Result of Survey on the Internet Usage in Korea)

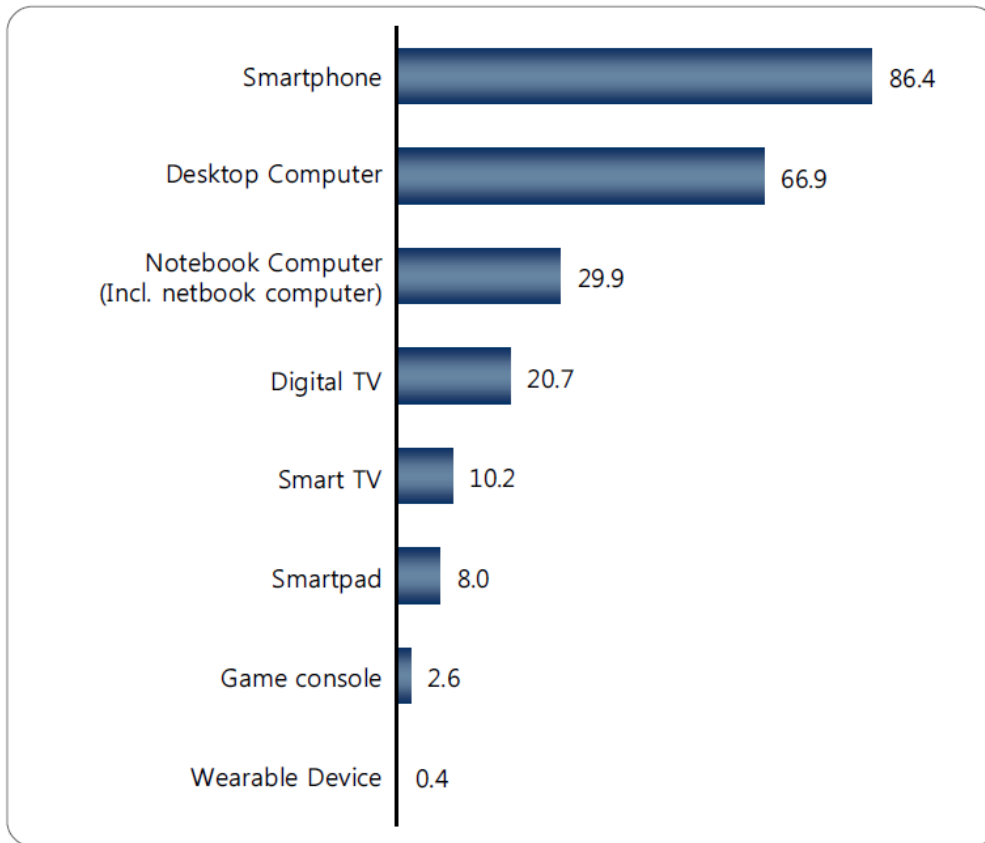
Hours of use of the Internet by gender & age from KISA, Korea, 2015 (unit: hours)



### Household with ICT Devices (Multiple Response) from KISA, Korea, 2015



### Internet Access Device (Multiple Responses)-Internet Accessible Household from KISA, Korea, 2015



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