2020
Taiwan Internet Report

Entrustment Organization:
Taiwan Network Information Center
Executive Organization:
Taipei Civil Education Foundation
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Executive Summaries

The Internet has developed rapidly since the 1980s, and the convenience and efficiency that the Internet has brought to daily life, make it an inevitable tool in the modern world. At present, Internet applications and services are really common for Taiwanese people. According to Internet World Stats (2020), Internet use rate of Taiwan is the 3rd in Asia. With high use rate and penetration rate in Taiwan, we can understand more about the current status of the Internet from the aspect of Internet Service Provider, ISP and the services used by Taiwanese Internet users.

Figure 1 Ecosystem of Taiwan Internet¹

¹This research is conducted based on 3 orientations, including Internet Service Provider, Networking Platforms, and Applications to portray the current ecosystem of Taiwan Internet use and inspect the main services and connections of it. According to the research conducted by Alexa Internet on Taiwan Websites in 2020, the top 30 websites include Google, YouTube, Ettoday, Pixnet and Yahoo...etc. (Each circle is drawn according to the percentage and rankings, brands that have more usage/view rates have a larger area.)
Taiwanese People Have a High Internet Use Rate and Use Mobile Phones as the Main Devices

According to Taiwan Internet Report 2020, the basic statistics of Taiwan Internet Usage show that the Internet use rate of the people aged over 12 in the past 6 months is 83.0%, and the Wi-Fi use rate is 79.3%; Out of these 79.3% of people using home Wi-Fi, 77% of the people use mobile Internet, and 27.3% use public WLAN. Out of the all people aged 12 and up that use Internet, mobile Internet has the highest use rate at 82.9% with a monthly cost at NT$686; regarding Taiwan household Internet use statistics, household Internet coverage rate is 82.8%, broadband use rate is 99.9%; and the major connection method is mobile Internet and ADSL/VDSL.

Taiwan Internet Logical Layers Develop Steadily

The registration of the domain name “.tw/台灣” has decreased this year, but IPv4 addresses, ANS issues and IPv6 addresses application has increased steadily. Statistics show that the IPv6 application in Taiwan is ranked 21st in the world. The use rate of IPv6 is 50.25%, ranked 6th in the world, indicating that logical layers of Taiwan’s Internet and application is in the front and steadily developing internationally.
People Use the Internet to Gather and Exchange Information

The main purpose of the Taiwanese people using the Internet is to gather and exchange information online, and for audio/video recreation purposes. “Unfixed Time” is ranked number one out of the major time sections of the Taiwanese people using the Internet is ranked at a rate of 46.9%, the second is between 18:00~23:59, which indicates that most people use the time after work until sleep for online activities. The top 4 services used online is “Instant Messaging” (14.2%), “Social Media” (13.0%), “Recreation” (11.1%) and “Lifestyle and News” (9.7%), which shows that people majorly participated in exchanging messages, information and recreation at night. The percentage of recreation increases slightly after 20:00.

Investing “Digital Assistance” to Rural Areas to Improve Social and Economic Lives

The difference of Internet usage in Taiwan between rural and non-rural areas is reflected in the possession of resources. However, resource possession might not be the most major difference between the two areas. Since Wi-Fi is already widely popular, the Internet use rate is also popular in rural areas, but regarding the services used, non-rural areas have a higher percentage of using services that bring convenience to life and work compared to those in rural areas. In the future, it is important to focus on how to provide more services aimed to provide “digital assistance” to rural areas, and emphasize on how to implement Internet technology to improve the social and economic lives of people in rural areas.
COVID-19 Acts as Catalysis for Digital Transformation in Taiwan

Although COVID-19 pandemic had a great impact on the world from the start of 2020, most Taiwanese people did not experience significant changes in Internet usage habits. If we look closer at the impact of COVID-19 on Taiwan’s business virtualization ability, it plays the role of catalyst to accelerate the pace of digital transformation and to test the industries’ ability to react. The sense of crisis brought by the pandemic forces the corporations to start planning digital transformation in order to be prepared for future impacts. The Government and the industry should work together and seize this chance to upgrade our industry.

Focus on the Ability to Acknowledge Fake Information and Cyber Security

Taiwanese people are generally suspicious towards the safety of the Internet and are especially concerned if their privacy could be well protected. Research shows that Taiwanese people highly rely on Internet for communication and social media, which indicates that it is an inevitable part of Taiwanese people’s daily life to receive information online. Since most people receive information and news online, it is our government’s priority to assist people to recognize false information, and to prevent any loss caused by it. It is also top priority to make the people understand the importance of cyber security in order to protect oneself online. The government and private sectors should also focus on fortifying cyber security to protect the privacy of our people and should also prevent gathering too much information that is unnecessary in order to decrease the chance of leaking personal information or infringing privacy.
Introduction

2020 Taiwan Internet Report is issued to show the development of the Internet and related services in Taiwan. Through understanding basic logical layers and the user profiles, we can build up a full picture of the use of the Internet in Taiwan. Furthermore, we also analyzed the impact of COVID-19 towards Taiwan Internet status and the digital divide of Taiwan society, in order to bring out future development trends and direction of the Internet in Taiwan.

This research is conducted based on mobile phone and land-line combined surveys, in-depth interviews and secondary data in order to analyze the current status of the Internet in Taiwan and related services. Domain name and IP/ASN statuses are also included to compare the status of Taiwan and other countries around the world.

To summarize, this research not only took account of quantified data to understand the current status of the Internet in Taiwan, but also took account of the Internet logical layers and secondary data to show the big picture of the current development situation of the Internet in Taiwan through different perspectives. Moreover, we also discussed issues such as digital divide in Taiwan, the impact of COVID-19 and business virtualization ability of the industry in Taiwan, to review how the Internet industry is coping with Taiwan society, giving a preliminary view of the Internet phenomenon.
Current Internet Status in Taiwan

Regarding the current Internet status in Taiwan, this research will provide analysis through 3 perspectives - Infrastructure, Logic, and application.

Taiwan Has a High Internet Use Rate and High Application Use Rate

First, we divided the infrastructure into two parts, personal Internet and household broadband. Individually, the Internet use rate amongst Taiwanese people aged 12 and up in the past 6 months, is 83.0%, with a 79.3% Wi-Fi use rate. Out of all people that use Wi-Fi, 77.0% uses mobile Internet and 27.3% uses public WLAN. Out of all people that uses Internet which are aged 12 and up, mobile devices has the highest use rate at 82.9%, next comes PC’s at a rate of 31.5%, and the third is laptops at a rate of 29.5%; regarding mobile Internet, the monthly dollars spent per person in NT$686.

<table>
<thead>
<tr>
<th>Device</th>
<th>Use Rate</th>
<th>Number of Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet</td>
<td>83.0%</td>
<td>17.61 Million</td>
</tr>
<tr>
<td>Wi-Fi</td>
<td>79.3%</td>
<td>16.83 Million</td>
</tr>
<tr>
<td>Mobile Internet</td>
<td>77.0%</td>
<td>16.35 Million</td>
</tr>
<tr>
<td>WLAN</td>
<td>27.3%</td>
<td>5.79 Million</td>
</tr>
</tbody>
</table>

*Average Monthly Cost is conducted as followed: Please advise how much you spend on mobile internet per month. Interviewee mostly replies that mothly spent amount includes internet and mobile fee.

Figure 2 Individual Internet Use Rate in the Past 6 Months
Regarding the Internet users in Taiwan that are aged 12 and up, the use rate does not have a significant difference between different genders. The Internet use rate is over 90% amongst people aged 55 and below, and the overall use rate throughout the whole country is above 70% except Eastern Taiwan, Kinmen and Matsu.

Household Internet use rate is 82.8% according to our survey conducted this year. Broadband Internet use rate is 99.9%; major devices used to connect the Internet are mobile phones and ADSL/VDSL. The average satisfaction grade level is 3.9 out of all people that can access household Internet.
Taiwan Internet Development is Steadily Rrowing on Logic Perspective

Regarding the basic logical layer of the network in Taiwan, until the end of October 2020, the registration of the Domain Name “.tw/台灣” is 1,514,000.

Figure 5  Domain Name Registration Counts

Source: TWNIC (10/2020)
The statistics of IPv4 addresses assigned were gathered till the end of October 2020. Total IPv4 addresses assigned in Taiwan is 35,710,000.

![IPv4 Addresses assigned in Taiwan](image)

**Figure 6** Numbers of IPv4 Address in Taiwan

Until the end of October 2020, the number of ASN issued in Taiwan is 364.

![Number of ASN assigned in Taiwan](image)

**Figure 7** Numbers of ASN issued in Taiwan
Taiwan is ranked 21st in the world for IPv6 applying. IPv6 addresses are counted by the unit "$2^{96}$, approximately $7.0 \times 10^{28}$." Until end of October 2020, Taiwan's applying count for IPv6 addresses is 2,562/32.

![IPv6 Addresses assigned in Taiwan](chart)

Source: TWNIC (2020/10)

**Figure 8  Numbers of Taiwan IPv6 Address**

The use rate of IPv6 addresses in Taiwan is 50.25 %, ranked number 6 in the world. (10/15/2020)

![IPv6 Percentage in Taiwan](chart)

Source: TWNIC (2020/10)

**Figure 9  Use Rate of IPv6 Address in Taiwan**
Resource Public Key Infrastructure (RPKI) is a framework based on public key infrastructure that is used to protect Internet routing infrastructure. Using RPKI, legal holders of number resources can master Internet routing protocols to prevent route hijacking and other attacks.

**Figure 1  Number of IPv4 Class C**

- **Valid**: 204,910 (99.6%)
- **Invalid**: 205 (0.1%)
- **NotFound**: 553 (0.3%)

**Total: 205,668**

Source: TWNIC (2020/10)

**Figure 2  Number of IPv6 /64**

- **Valid**: 10,372,310,171,648 (99.5%)
- **NotFound**: 47,244,902,400 (0.5%)

**Total: 10,419,555,074,048**

Source: TWNIC (2020/10)
Taiwanese People Use the Internet to Gather and Exchange Information, and for Recreational Purposes

After understanding the profiles of Internet users in Taiwan and the basic logical layers, we can now analyze more on the application perspective. Overall, out of the top 5 Internet services used, Instant Messaging are over 90% in any generation, Internet News are mainly used by people aged 25 to 55, the main audience that use Audio/video and streaming are aged between 12 to 39, the main users that uses E-mail and Search are aged between 25 to 39 and User counts of social medias are inversely proportional to age group, younger generations have a higher use rate.

![Figure 3](image-url)  
Top 5 Internet Services Used and the Difference Between Different Generations

<table>
<thead>
<tr>
<th>Service</th>
<th>All (Age 12 and Up)</th>
<th>Generation Z Age 12-24</th>
<th>Generation Y Age 25-39</th>
<th>Generation X Age 40-55</th>
<th>Age 56 and Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Instant Message</td>
<td>95.6%</td>
<td>90.2%</td>
<td>97.2%</td>
<td>97.8%</td>
<td>95.1%</td>
</tr>
<tr>
<td>2. Online News</td>
<td>80.3%</td>
<td>79.0%</td>
<td>85.3%</td>
<td>84.2%</td>
<td>71.0%</td>
</tr>
<tr>
<td>3. Social Media/Forums</td>
<td>80.1%</td>
<td>95.6%</td>
<td>92.5%</td>
<td>79.5%</td>
<td>54.4%</td>
</tr>
<tr>
<td>4. Video/Streaming</td>
<td>77.0%</td>
<td>87.4%</td>
<td>88.6%</td>
<td>77.3%</td>
<td>54.9%</td>
</tr>
<tr>
<td>5. Email/Search</td>
<td>70.7%</td>
<td>76.6%</td>
<td>89.0%</td>
<td>73.6%</td>
<td>40.0%</td>
</tr>
</tbody>
</table>
This research also aims to understand the time slot that Taiwanese people mostly use the Internet. "unfixed time” has the highest rate at 46.9%, followed by the time slot of “18:00~23:59”, indicating that most people participate in Internet activities during off-work till sleeping time.

<table>
<thead>
<tr>
<th>Time Slot</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unfixed</td>
<td>46.9%</td>
</tr>
<tr>
<td>00:00-01:59</td>
<td>4.3%</td>
</tr>
<tr>
<td>02:00-03:59</td>
<td>2.8%</td>
</tr>
<tr>
<td>04:00-05:59</td>
<td>1.4%</td>
</tr>
<tr>
<td>06:00-07:59</td>
<td>5.1%</td>
</tr>
<tr>
<td>08:00-09:59</td>
<td>11.3%</td>
</tr>
<tr>
<td>10:00-11:59</td>
<td>11.0%</td>
</tr>
<tr>
<td>12:00-13:59</td>
<td>13.4%</td>
</tr>
<tr>
<td>14:00-15:59</td>
<td>13.4%</td>
</tr>
<tr>
<td>16:00-17:59</td>
<td>17.3%</td>
</tr>
<tr>
<td>18:00-19:59</td>
<td>32.7%</td>
</tr>
<tr>
<td>20:00-21:59</td>
<td>40.1%</td>
</tr>
<tr>
<td>22:00-23:59</td>
<td>28.5%</td>
</tr>
<tr>
<td>No response</td>
<td>0.2%</td>
</tr>
</tbody>
</table>

Figure 4 Internet Usage Time slot

(n=1852, multiple choices)
Observing the population that chose their Internet usage time slot during "18:00~23:59", the top 5 Internet services are "Instant Messaging" (14.2%), "Social Media" (13.0%), "Recreation" (11.1%), "Lifestyle and News" (9.7%), "Email and Search" (9.5%). This indicates that most people use the Internet at night mostly to communicate, exchange information, and for recreational purposes.

The top services used online in the major time slot between 18:00~23:59 are “Instant Messaging”, “Social Media”, “Recreation” with similar proportions. The percentage of Recreation increases slightly after 20:00.
We explore more about the Internet from 5 different perspectives including financial applications, recreational applications, social media, educational applications and cyber security.

**Financial Applications**

In our survey, we discovered that 59.6% of Taiwanese people have the experience to shop online. The average money spent is NTD$3,217 in this year. The average money spent has increased NTD$55.6 compared to last year (2019).

![Figure 7: Average Money Spent Shopping Online (Annual Comparison)](image)

We also found out that the use rate of mobile payments has increased 0.8% compared to last year, coming to a new high in history at 25.8%.

![Figure 8: Mobile Payment Use Rate (Annual Comparison)](image)
Amongst all Interviewees that have used mobile payment, we discovered that throughout the years, the most used payment applications are: Line pay (57.9%), Apple Pay (41.7%), and JKO pay (17.5%). The use rate of Line Pay and Apple Pay has come to a new high point this year.

Females have a higher rate of using mobile payments compared to male. People aged from 20 to 44 have a higher use rate.

User profiles of mobile payment

Figure 9   Mobile Payment Use Rate (Annual Comparison)

Figure 10   User Profiles of Mobile Payment
Recreational Applications

Observing the recreational applications, use rate of audio/video media is 77.0%, the highest rate of content is Music (89.3%), Shows and Plays (82.2%), Movies (62.4%), and Streaming (56.6%). If we look into the profiles of recreational users, the gender difference is minor for music listeners and users aged between 12 to 29 and 45 to 49 accounts for higher proportions. Females have a higher rate than men when it comes to watching shows and plays, and people aged 12 to 29 also have a higher rate; male have a higher use rate than females for watching movies and streaming. Aged 20-29 has a higher rate in watching movies; people aged 15 to 19 and 35 to 39 have a higher rate to watch online streaming.

Figure 11  User Profiles of Video/Audio Usage
Observing the video/audio usage preference over the years, the content with the highest use rate is Dramas (53.7%). Noticeably, the use rate to News has significantly increased to 52.5%, probably due to the impact of COVID-19, leading to a growth of news watching rate. Coming next is Music Video (45.0%) and Variety Shows (33.9%).

Over the past 6 months, the overall rate of paid users for recreational content is 22.5%. Music comes first at 12.2%, Movies (12.1%), Shows and Plays (11.1%), and Streaming (1.5%) following.
Gaming is also a big portion of online recreation. 46.2% of people play online games, of which 28.7% of them spend money in games with an average of NTD$3,190 spent each month and the medium is NTD$500 every month. Regarding online game user profiles, 46.2% of the interviewees have played online games before. Male users have a higher use rate than females. Younger interviewees have a higher rate of playing online games than those at an older age.

Mobile phones are the device that is most likely used to play online games at a use rate of 91.6%, growing 3.2% compared to last year (2019). Next come PC (25.0%), and Laptops (11.5%).

Looking into devices used over the years, the use rate of mobile has increased, and the use rates of PC and laptops have dropped instead.
Social Media

Use rate of instant messaging is as high as 95.6%, and showing insignificant difference in gender or age (except those aged 12 to 14, which has a lower use rate); social media use rate is 80.1%, in the age group from 12 to 39, it is up to 90%.

The most used social media site over the years is Facebook (94.2%), decreasing 4.7% compared to last year. Next come Instagram (39.2%) and Twitter (6.4%), which is similar to the past years.
Educational Applications

The use rate of “E-Books” and “Online Learning” is 31.8% and 26.3% respectively. Males aged from 12 to 14, 35 to 39 and 45 to 49 have a higher use rate to read e-books; females aged from 15 to 24 have a higher use rate to participate in online learning. This indicates that younger age groups have a higher rate of using educational applications.

Figure 17  User Profiles of Educational Applications
Cyber Security

Cyber security is not an independent issue. In fact, it should be widely discussed due to the growth of all kinds of online services. Through the concerns of the public towards security breach in different circumstances and services, it is easy for us to recognize the concern towards cyber security breaches. 61.6% of people are afraid that their privacy would be infringed online, 61.5% of people are afraid that companies or enterprises would infringe their privacy online, and 55.6% of people are afraid that the government would infringe their privacy. To sum up the statistics we have gathered in this research regarding cyber security, they show that people are still concerned about cyber security online, which creates a dilemma between safety and convenience. This makes cyber security to continue to be one of the most important issues when we discuss online services.

Figure 18  The Comparisons of Cyber Security Concerns

(n=2209, multiple choice)
Worldwide Status

In this section, we will compare the development status of the Internet between Taiwan and other countries around the world. First, regarding the Internet use rate, South Korea and Japan have the highest rate in Asia, with Taiwan coming in third place (The Internet use rate here is based on international sources, and is different from this research, only for ranking reference).

Internet Use Rate

Source: Internet World Stats (2020)

Figure 19   Internet Use Rate by Country
In Asia, Japan and Singapore have the highest use rate in mobile broadband; South Korea and Japan have the highest use rate of fixed-line broadband.

According to the data provided by the National Communications Commission (NCC) for the 108 years of network speed measurement, the average download rate of the national 4G fixed-point measurement in 2019 was 108.33Mbps.
In most countries, the major devices used to access the Internet are mobile phones, PCs and laptops. The use rates of smart tablets and other devices are significantly low. In Asia, the use rate of mobile phones is significantly high in India, China and Singapore, the use rates of PCs and laptops are higher in Japan and Vietnam. It is worth mentioning that the use rates of PCs and laptops are over 80% in Vietnam.

Regarding the contents used, Taiwan is ranked first in Asia in social media use. The use rate of social media is higher than global average in Asia except for India.
The average time Taiwanese people spend on social media is 2 hours, lower than most Asian countries. Japan and South Korea have even lower rates in using social media. The average time that Japanese spend on social media is less than one hour. On the other hand, Filipinos and Indonesians spend more than 3 hours on social media.

**Hours Spent on Social Media**

![Hours Spent on Social Media](image)

Source: Digital 2020 (We are social 2020)

Figure 23  Hours Spent on Social Media

The average use rate of E-commerce of Taiwanese people is higher than the global average, and is only lower than Indonesia, Malaysia and Thailand in Asian countries. Mobile commerce is around 20% lower than e-commerce, which is different from Indonesia, Thailand and The Philippines where the two have similar use rates. The United States of America, the United Kingdoms, Australia and Japan have a big difference between E-commerce and mobile commerce.

**E-Commerce**

![E-Commerce](image)

Source: Digital 2020 (We are social 2020)

Figure 24  E-Commerce Use Rate
Another aspect of e-commerce is about shopping applications. Shopping app use rate of Taiwanese people is 55%, which is 11% lower than the global average, and is only higher than Japan in Asian countries. China has the highest use rate in the world.

To look closer, we can also observe the mobile banking use rate. Mobile banking use rate in Taiwan is 44%, an average rate in Asian countries and is 9% higher than global use rate. Thailand has the highest use rate in the world. (The Internet use rate here is based on international sources, and is different from this research, only for ranking reference).
Devices in most countries for gaming are multi platforms or mainly on mobile phones and the second place is PC. However, in Japan, the United States of America and the United Kingdoms, multi platforms and mobile phones come first and consoles come second.
Digital Divide Analysis

The Internet is a new communication technology and a media revolution. Although the Internet brings convenience and efficiency for communicating and exchanging information, it also creates a new type of society difference. The Internet is getting much more popular than before, but the increase of Internet users does not mean that digital divide has been solved. Most users are still located in certain areas (such as developed urban areas), or specific groups (younger age, highly educated). This research focuses on the comparison of the Internet use rates between rural and non-rural areas of Taiwan.

Overall, according to this research, the difference of the Internet usage between rural and non-rural is mainly on the resources possessed. Non-rural areas tend to have more Internet access compared to rural areas, including Internet access rate and accessible devices. The difference can also be observed on individual spending on the Internet and the cost/income ratio. On average, the ratio of affordability is slightly higher in rural areas compared to non-rural areas, probably related to Internet usage habits. Regarding the Internet services, those that are related to work and life convenience, for example, payment, shopping, e-mail, mobile payments, finance, food delivering...etc. non-rural areas have a higher use rate compared to rural areas. On the other hand, there are no significant differences regarding recreational services such as audio/video and online games.

Future development of the Internet in rural areas should focus on “digital assistance”, enhancing on how to implement Internet technologies to improve the social and economic lives of people in rural areas, instead of providing sufficient Internet access.
The Internet in Non-rural Areas is More Accessible with Abundant Resources

Wi-Fi is Also More Popular

First of all, according to the research this year, in terms of the overall Internet usage, the Internet use rate of age 12 and up is 83.9% in non-rural areas and 69.8% in rural areas. The Internet use rate in non-rural areas is higher than that in rural areas.

Taking a closer look at individual Internet use rates in the past 6 months based on the research this year, the Internet use rate is 82.2% in non-rural areas and 56.0% in rural areas. The percentage using Wi-Fi access is 78.0% in non-rural areas and 54.0% in rural areas; moreover, amongst people using Wi-Fi, 73.9% of people in non-rural areas use mobile Internet and 52.1% in rural areas. 29.4% of people use public WLAN in non-rural areas and 22.5% in rural areas. No matter in which areas, the percentage of using mobile phones as the device of accessing the Internet is highest, followed by PCs and laptops. In addition, the average monthly cost of mobile Internet for one person in non-rural areas is NTD$653 and NTD$736 in rural areas.
Regarding individual usage of mobile Internet and WLAN, from the interviewees using Wi-Fi in the past 6 months, we can have a better understanding of which Wi-Fi methods they use. First of all, in non-rural areas, most people use mobile Internet, accounting for 75.1% and the percentage of people using WLAN is 29.5%. The people only use mobile Internet, accounting for 46.5% and the percentage of people both using mobile Internet and WLAN is 28.6% and using only WLAN is 0.8%.

Figure 29  Individual Internet Use Rate in the Past 6 Months (non-rural and rural areas)

Figure 30  Percentage of Individual Mobile Internet and WLAN (non-rural areas)
In rural areas, most people use mobile Internet, accounting for 85.3% and the percentage of people using WLAN is 22.5%. The people only use mobile Internet, accounting for 43.2% and the percentage of people both using mobile Internet and WLAN is 22.1% and using only WLAN is 0.4%.

Figure 31  Household Internet Use Rate (rural areas)

In addition to the individual Internet use rate, household Internet use rate is 83.0% in non-rural areas and 70.6% in rural areas. 99.7% of people use broadband Internet in non-rural areas and 100.0% in rural areas. The main method of accessing the Internet is mobile Internet, accounting for 52.6% in non-rural areas and 75.0% in rural areas. The average Internet satisfaction level is both 3.9 grades in household Internet.

Figure 32  Household Internet Use Rate (non-rural and rural areas)

*Satisfaction is calculated through Likert Scale - giving each choice a grade from 1-5. Greatly Satisfied as 5 - Satisfied as 4 - Average as 3...and added up to come to an average score.
Continuously Investing "Digital Assisting" Resources into Rural Areas to Improve Social and Economic Lives

From observing the Internet user behavior after reading the situation of overall Internet use, in the aspect of “Internet Time Usage Sections” and “Internet Service and Usage”, the percentage of “Unfixed Time” is highest, accounting for 43.8% in non-rural areas and 35.9% in rural areas. The second highest percentage of time section is during “18:00-23:59”, and people in rural areas participate in more Internet activities than people in non-rural areas. People in non-rural areas are a little more active on the Internet during “00:00-05:59” than in rural areas.

"Digital divide should move with time and go on from the aspect of access. I realized that officials in the EU are discussing digital opportunities, and when they mention Internet popularity, it’s not about the access of wire or wireless Internet or even broadband, which is really a basic for Internet stuff, but the popularity of services and how much coverage they have."
About the Internet services and usage, the top 5 in non-rural areas are “Instant Messaging” (95.3%), “Lifestyle and News” (82.5%), “News” (81.1%), “Social media, Forums or Blogs” (77.6%) and “Online Videos, Streaming or Music” (77.3%); on the other hand, in rural areas, the top 5 are “Instant Messaging” (95%), “Social media, Forums or Blogs” (82.4%), “Lifestyle and News” (72.6%), “Online Videos, Streaming or Music” (72.6%) and “News” (68.4%).

Figure 34  Internet Services and Usage (non-rural and rural areas)
The investment of digital resources should focus on the actual need for the rural population, especially the services applied to the Internet in their daily lives and works, which need continuous investment to provide the equal digital opportunities. In other words, in the future, the development of Internet services in rural areas should emphasize on “digital assistance”, focusing on how to use the Internet to improve the social and economic lives, showing the real benefit to Internet expansion, instead of just providing sufficient Internet access.

"Maybe people do not need it or even if they want, their social and economic status doesn’t allow it. What now? You have to design the service!"

"How does it help? If we do not provide the assists, for these Internet users, the Internet is just for fun and access to some info. If we cannot change their social and economic status, we can’t improve their quality of lives."

"This is not the issue of digital divide; the ultimate cause is social and economic status. It is about money. The present business model is changing. I can learn to build a website by myself but actually, I still have to count the cost of it."
The Affordability of Internet Use Comparison Between Non-rural and Rural Areas

About the investigate digital applications, the research is based on the results of surveys and the collection of secondary data with reference to “The Inclusive Internet Index”² (Taiwan is ranked 20th in global, the 5th in Asia) released in 2019 by Economist Intelligence Unit (Great Britain), EIU. The analysis can be divided as 4 aspects of “Availability”, “Affordability”, “Relevance” and “Readiness”, which are used in the research to compare and analyze the surveys for investigating Internet use of rural areas in Taiwan. However, since the surveys only aim at individual Internet use with lack of overall resources and policy research, with different methods and content applied, this investigation is only for references.

The first aspect “Availability” includes “Usage”, “Quality”, “Infrastructure” and “Electricity”. For “Usage”, we can look at the parts of “Internet Use Rate” and “Devices used to access the Internet”. The percentage of Internet use rate is 83.9% in non-rural areas and 69.8% in rural areas.

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² EIU(2019).The Inclusive Internet Index. From https://theinclusiveinternet.eiu.com/
For “Devices used to access the Internet”, the highest percentage is “Mobile Phone”, accounting for 98.4% in non-rural areas and 99.4% in rural areas. The second is “PC” (41.7% in non-rural areas and 33.6% in rural areas), followed by “Laptop” (35.0% in non-rural areas and 20.3% in rural areas), “Tablets” (23.6% in non-rural areas and 19.2% in rural areas).

For “Quality”, we can look at the parts of “Individual Internet Satisfaction”. 81.8% of interviewees in non-rural areas using mobile Internet feel “Satisfied”, 3.9% of them feel “Average” and 14.3% of “Unsatisfied”; in rural areas, 83.1% of interviewees feel “Satisfied”, 2.3% of “Average” and 14.6% of “Unsatisfied”. On the whole, there are only slight differences to satisfaction of individual Internet use in both areas.

Figure 35 Devices Used to Access Internet (non-rural and rural areas)

Figure 36 Individual Internet Use Satisfaction (non-rural and rural areas)
The second aspect “Affordability” includes “Price” and “Competitive Environment”. In the research, we view the affordability proportion of “Price” in relation to the questions of affordability.

The affordability proportion of Internet cost and income is based on the calculation of “Individual Mobile Internet monthly cost” divided by “Individual Monthly income”, showing the ratio of Internet cost to income per month. In both areas, the percentage “Below 1%” is highest which accounts for 97.4% in non-rural areas and 95.7% in rural areas, followed by “1%-2%” (1.9% in non-rural areas and 4.1% in rural areas), “2%-3%” (0.3% in non-rural areas and 0.2% in rural areas) and “3%-4%” (0.4% in non-rural areas).

Overall, the affordability in rural areas is a little higher than it in non-rural areas, but the percentage of high affordability proportion in non-rural areas is higher. (Affordability proportion is 0.4% in terms of percentage 3%-4% in non-rural areas). It may be because the household Internet use rate in rural areas is lower than it in non-rural areas (70.6% in rural areas and 83.0% in rural areas). It is possible that some rural residents do not have Internet at home and rely on mobile Internet to access. Due to the increase of network traffic and limited data plans, Internet users in rural areas tend to have higher affordability proportions.

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3 Have excluded interviewees without stable income or have no reaction to questions of income.
The third aspect “Relevance” includes “Local Content” and “Relevant Content”. In the research, we view the questions of “Internet Service and Usage” in relation to the questions of “Relevance”.

There are no huge differences between Internet services and usage. The percentage of the services used in non-rural areas for bringing more convenience to life and work is higher. However, the difference is insignificant when it comes to recreational use in both areas. Only the percentage of “Email/Search” in non-rural areas is significantly higher than non-rural areas. (21.6%)

Figure 38  Internet Services and Usage: Top 12 (non-rural and rural areas)
The fourth aspect “Readiness” includes “Literacy”, “Trust & Safety” and “Policy”. In the research, we can view the questions of “Trust & Safety” in relation to the questions of “Readiness”, which are mainly about Internet privacy. In the survey, the highest percentage in privacy breaches from people in non-rural areas is “Privacy Infringe online”, followed by “Privacy Infringe by private sector” and “Privacy infringed by government”; on the other hand, people in rural areas worried “Privacy Infringe by private sector” the most, and followed by “Privacy Infringe online” and “Privacy infringe by government”. No matter in which areas, people trust the government more than private sectors.

Figure 39  Online Privacy Concern (non-rural and rural areas)
Taiwan's Business Virtualization Ability Under the Impact of COVID-19

Starting from the end of November 2019, COVID-19 epidemic has spread to more than 120 countries and religions all over the world. Based on the released data from the World Health Organization, as of October 11, 2020, more than 37 million people are infected with COVID-19 and the pandemic is still out of control. Every country took measures to evacuate overseas citizens, prohibit flights and even close borders etc. The outbreaks occurred so quickly that all the countries took actions of lockdown and quarantine, causing a serious impact on the global economy. There are incalculable losses in all businesses, which completely change people’s lifestyle.

The research intends to examine if COVID-19 changes Internet use behavior of Taiwanese people and affects Taiwan’s business virtualization ability. The following are some discussions.
No Significant Impact on Internet Use Behavior in Taiwan Under COVID-19 Pandemic

First, Taiwanese people hardly changed their Internet use patterns for COVID-19 pandemic, which may have something to do with quick actions implemented by the government and the effectiveness in preventing. Among various Internet services, the top 3 that have increased the most due to COVID-19 are “Food Delivery” (36.5%), “Online Learning” (25.1%) and “Online News” (19.0%).

Regarding consumer behavior, the percentage of “Online Shopping” and “Mobile Payments” have increased 12.4% and 17.9% respectively, which may indicate that people reduce outdoor activities and avoid contacting other people. For mobile payments, if we look closer at the research results over the years, we can find out that the proportion of using mobile payments has increased 0.8% this year and has come to a new high in history.
Due to COVID-19, there are 10% of people working from home. Female, university or above, management or professionals, northern residents are the groups that tend to work from home. Learning more about the patterns of working from home, “email” accounts for the highest percentage 70.07%, followed by “Conference Call” (62.6%), “Telephones” (55.2%), “Connecting VPN for Business” and “Instant Messaging” (11.6%). Since “Connecting VPN for Business” accounts for 40%, Taiwan’s business virtualization ability still has a long way to go.

From this research, in Taiwan, most people hardly change their Internet use patterns for COVID-19 pandemic because of the quick actions implemented by the government and the effectiveness in preventing pandemic. The society and business still go on normally, and people can maintain their lives with slight influences.
COVID-19 Acts as Catalyst for Digital Transformation in Taiwan

Regarding the impact on Taiwan’s business virtualization ability from COVID-19, the issue of digital transformation has caught people’s eye in recent years with the trend of globalization and digitalization. At present, COVID-19 works as a catalyst to speed up the process of digital transformation and examine enterprises’ ability to react, and most operators will have to find a new way to communicate with their clients and related stakeholders.

"I think the pandemic is like a catalyst as you just said, and the effect of the catalyst and why it works so well is self-explanatory."

When viewing the perspectives in foreign countries, Microsoft CEO Satya Nadella said, “We’ve seen two years’ worth of digital transformation in two months.” It shows the progress of digital transformation with the boost from COVID-19, and in 2020, the investment in digital transformation from the government of Japan is estimated to increase by 15.8%. According to the survey conducted by Twilio⁶, a cloud communications service Company in the United States of America, COVID-19 has boosted the average speed of corporate digital communication strategies all over the world by 6 years while the average speed of enterprises in the United Kingdoms is increased by 5.3 years, and 96.0% of decision makers in companies think the pandemic does help the digital transformation in their business. The top 5 types of business accelerated significantly are “Technology” (78.0%), “Energy” (77.0%), “Healthcare” (74.0%), “Architecture” (71.0%) and “Retail” (70.0%).

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⁵ Source: Japan Economics Newspaper. It inspects 948 Japanese companies with a capital of more than 100 million yen, and the results show that the amount of IT investment in 2020 will increase by 15.8%. (Dates: Sep. 30, 2020.)
⁶ In June, 2020, Twilio conducted an online survey of 2,569 business decision makers. There are 300 interviewees of the United Kingdoms and other 225-300 interviewees from Australia, France, Germany, Italy, Japan, Singapore, Spain and the United States of America.
From the reaction of Taiwanese companies to COVID-19, small or middle-sized companies of Taiwan have great interest in and demand for digital transformation after the outbreak. Meanwhile, the government and some large companies provide the service of evaluation and guidance for them. Due to the changes in industries, the demand for software and hardware equipment of network resources has been increased simultaneously, which also causes the huge demand for network spaces recently.

**Sense of Crisis is Accelerating Digital Transformation Pace in Taiwan**

We can look at the Internet use behavior from people to examine if Taiwan has the business virtualization ability. The percentage of purchasing facemasks online is 15.9% and working from home is 10.8%. Meanwhile, as of July, 25th, 2020, the ratio of stimulus vouchers received digitally or by paper is 90% and 10% respectively, showing there is still room for improvement. For people’s lives and works, the business virtualization is not capable of providing online applications which are better, convenient and satisfying for the requirements. Most of Taiwanese people are still used to doing daily business in person. However, the industries in Taiwan have great interest and acceptance embracing digitalization with great assistance from the government.

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Moreover, Taiwanese people are very opened to embracing new technologies and business models and the society is highly positive about the development of digital transformation. The one thing we are concerned about is that since the pandemic is slowing down, it will cause low demand and interest in digital transformation. It is the best time for the government to plan the digitalization for all industries since the companies are more than willing to cooperate under these circumstances. To sum up, although COVID-19 did not bring severe consequences to the Taiwanese society, the sense of crisis brought to our world, still created the perfect timing to promote digital transformation, and no matter corporations or our government should seize this chance to make it happen.

"But the impact of COVID-19 is not that severe in Taiwan, so are there any possibilities of promoting digital transformation here? I would say that this research result has shown that when the situation is fine, there is no urgency doing this. For some countries, it originally will be a model transformation and there are bigger markets and greater business opportunities for digital transformation; however, it is just slowing down in Taiwan..."

For the impact on Internet use patterns from COVID-19, it really changes the way we live. For example, we use conference calls to replace physical meetings, and we use remote control instead of physical control etc. Although the pandemic is well-controlled in Taiwan and people’s lives go on smoothly, the way of working and lifestyle have changed, and then they change people’s perceptions as well. The level of acceptance of new lifestyle has been boosted, which offers so much scope for the imagination of digital society for people and accepts digital services instead of physical contacts.

“I believe there is a long way to go when we mention business virtualization. Because the society in Taiwan... I mean there are many unspoken rules in eastern society, and you will need to find them out with observation in interactions. Their body language will show if they are close or distant. Everyone is watching but no one will talk about it. It is terribly difficult to present in the virtual environment.”
The Impact of the Horizontal and Vertical Integration from Internet Companies

With advances in Internet technology, more and more industries have implemented integration and business operation with the Internet. Some enterprises expand horizontally and integrate their upstream and downstream supply chains to organize resources and diversify the business. By eliminating competitors and strengthening themselves, large enterprises attract diverse groups internally to increase the chance of survival in the related business area. If the model runs successfully, for example, the large E-commerce platforms combine big data to make faster delivery and precise advertisement algorithms, allowing customers to have the same experiences as they do in bricks-and-mortar stores. The innovation of delivery and cash payment can provide a faster process and better experiences of shopping, and then change and establish a new consumer behavior and style, which leads to “The Big got Bigger ” and “The Winner Takes it All ” eventually. This situation allows major enterprises to obtain market share oligopoly or monopoly.
Main Service Providers Control the Market with Horizontal and Vertical Integration? However, This Does Not Mean to Create Barriers to Other Smaller Corporations

From the Internet use behavior conducted in this research, the mobile payment tools, news websites and social media used frequently in Taiwan are the dominant brands in the world and the use rate is much higher than smaller brands and websites.

"We should see it from the antitrust side, the barriers are quite different for large and small enterprises. Therefore, E-commerce is easy to get into the market with an antitrust viewpoint. There must be entry barriers in the whole system, and the first thing a government should do is to analyze the entry barriers to see if they are formed naturally; however, if the reasons for forming entry barriers are related to policies, that will be a real issue for the government. Secondly, under the situation with the same service and the same rules, it is possibly good for newcomers without some inevitable limits. For example, when Sony started to launch the product of Walkman, Sony did not practice anything to protect; therefore, at that time, every company did Walkman all together, but Sony still had top 1 sales. It’s because of the brand, not the market, which seems not to have any antitrust effect on small companies."

Furthermore, from the perspectives of some professionals, they think the E-commerce markets are mostly controlled by a few large corporations. The trend of “The Big got Bigger” is obvious. Compared with large enterprises having more resources and platforms, small and middle-sized enterprises face the insufficient funds and manpower and lack of brand awareness and reputation. Moreover, basically, large E-commerce websites gain more viewers and will thrive with the benefit of resource integration. For small
or middle-sized companies or manufacturers, it is much easier to cooperate with E-commerce platforms due to the low barrier to entry and sufficient product exposure for better advertising and to increase sales and popularity. The professionals also mention that for the consumers, using E-commerce platforms makes it easier to see different and diverse products and much more convenient to get what they want.

“The challenge has always existed. So, going online is always an option for these traditional shops to consider in order to transform their business and to stand out in the market.”

“They have to expand their markets. We may just know some iconic brands instead of some small and unknown brands, but these small ones also have their own core markets for cosmetics or clothing etc. These are their centric E-commerce fields.”

It is crucial for small or middle-sized companies to maintain product uniqueness and to add product value. Products that can provide unique value are much more difficult to be replaced and easier to target specific consumer groups and then strengthen market position. With unique interactions in Taiwan society, it will help some stores to increase the chance of survival since people will support them with consumption.

“You can see how people use stimulus vouchers as an example. Most people still use paper vouchers to make purchases and to express, “I am here to support you.” What I am trying to say is that Taiwanese people are warm and friendly, and for those enterprises having a hard time, people will really show up and give you their support instead of giving a note without any contact. I believe some people will do this note thing, but maybe just a small number. Many of them still want the face to face interaction.”
Trend Analysis for Prospective Insights

With advances in Internet technology, it gradually changes people’s daily lives and social interaction patterns, bringing people closer without time limits. Moreover, modern societies have conveyed abundant information through the Internet, which brings diversity and high convenience to people’s lives.

With the overview from this research, which provides preliminary understanding of Internet use in Taiwan, we can further analyze and explain the current situation of Internet use with the aspect of basic logic and the collection of secondary data and analysis. The research not only includes the data of Internet services and usage of people but various topics including digital divide, COVID-19, Internet business virtualization ability, Internet-relative industrial integration in Taiwan society and Cyber security.
Continuously Investing "Digital Assisting" Resources into Rural Areas to Improve Social and Economic lives

Regarding the digital divide in Taiwan, through this research, we found out that the differences of using the Internet between non-rural and rural areas are all about the resources possessed, which means in non-rural areas, it is easier to access the Internet with better quality. However, resources might not be the most significant cause since wireless Internet is now extremely popular (especially mobile Internet), so the Internet use rate has also increased in rural areas. Yet the different preferences show when we review the services used. For example, the non-rural population has a higher rate of using services that would make work and life more convenient. On the other hand, slight differences in recreational contents in non-rural and rural areas. We suggest that we should provide services that meet the needs of the rural population in their daily lives and work, and continuously invest resources into creating new contents to decrease the digital divide and provide equal opportunities. Also, it is important that we could use Internet resources to improve the social and economic lives of those in rural areas. To conclude, we should focus more on providing "digital assistances" to rural areas, emphasizing on how to use the Internet to improve social and economic lives, instead of just providing sufficient Internet access.
COVID-19 Does a Small Impact on Lives of People in Taiwan

Does COVID-19 pandemic change Internet use behavior of people? Or does it make an impact on digital transformation of business in Taiwan? Does COVID-19 influence business virtualization ability? The issue of digital transformation has caught people’s eye in recent years with the trend of globalization and digitalization. At present, COVID-19 pandemic works as a “catalyst” to speed up the process of digital transformation and examine enterprises’ ability of problem solving. From the survey data in the research, most people in Taiwan do not change their Internet use patterns for COVID-19, and this is because the pandemic is well-controlled in Taiwan; therefore, there is only a small impact on people’s lives.

COVID-19 is Accelerating Digital Transformation Pace in Taiwan

The industries in Taiwan have great interest and acceptance embracing digitalization, especially after the pandemic outbreaks, a lot of companies are worried about the impact of COVID-19, and are trying to accelerate the pace of digitalization and transit more business interactions onto the web. In other words, it is now the best time for the government to plan digitalization for all industries since the companies are more than willing to cooperate under these circumstances and the Taiwanese people are very opened to embracing new technologies and business models, and the society is highly positive about the development of digital transformation.. To sum up, although COVID-19 did not bring severe consequences to the Taiwanese society, the sense of crisis brought to our world, still created the perfect timing to promote digital transformation, and no matter corporations or our government should seize this chance to make it happen.
Main Service Providers That Possess Vertical Integration Power Control the Market

However, This Does Not Mean It Necessarily Creates Barriers to Other Corporations

Regarding the impact of Internet companies’ horizontal and vertical integration, the E-commerce market in Taiwan is mostly controlled by a few large corporations. These big names have enough power to integrate different resources under one brand to create a team-effect. For small or middle-sized companies or manufacturers, it is much easier to cooperate with e-commerce platforms due to the low barrier to entry and sufficient product exposure for better advertising and to increase sales and popularity. For the consumers, using E-commerce platforms make it easier to see different products, making it much more convenient to make comparisons and come to a decision. It is crucial for small or middle-sized companies to maintain product uniqueness and to add product value. Products that can provide unique value are much more difficult to be replaced and are also easier to target specific consumer groups. According to our research, we concluded that the Internet corporations in Taiwan still have limitations and are still a long way from global platforms such as Amazon. Integration is an ongoing and inevitable trend; however, the platforms in Taiwan do not have to act as a barrier to small or medium-sized companies. In fact, they might even lend a hand to help the development of small and middle-sized businesses.
Focus on the Ability to Acknowledge Fake Information and Cyber Security

The high Internet use rate has raised the awareness of cyber security for people, and the government and the public should take more action. 95.6% of Taiwanese population uses communication services, and over 80% are on social media. This indicates that receiving information and news online is now very common in daily lives. Knowledge and information coming from social media means that the opportunity for individuals to speculate and analyze has decreased. Social media selects the feed according to user preferences and only shows the information that the platform selectively guesses what the users want to see, leading to the users now only seeing information from so-called "filter bubbles" and separated from information that disagrees with their viewpoints. What makes it worse is that there is a lot of fake news and false information online, and spreading fast due to eye-catching titles. It is top priority for our government to figure out how to help the users to distinguish truth from false, preventing misleading to the Taiwanese society. It is also crucial that users raise the concerns about their own privacy and learn the knowledge on cyber security to keep them safe. The people are also worried about how the government and enterprises could possibly infringe privacy through online services and skeptical of how they keep and use personal information. Therefore, governmental organizations and enterprises should carefully protect users' personal information. And in the process of collecting personal information, they should avoid over-collecting unnecessary information, which can quell doubts and gain trust from users. It can not only ensure information security but improve people's willingness to use online services.
**Research Methodology**

This research collected different information through many methods including landline survey, mobile survey, Internet survey, in-depth interviews and analysis of secondary data to combine and analyze various data to understand Internet use behavior of people and Internet environment in Taiwan. The survey items are summarized in the following table:

<table>
<thead>
<tr>
<th>Research Area and Objects</th>
<th>Computer Assisted Telephone Interview</th>
<th>Internet Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Period</td>
<td>August 3rd, 2020 to August 16th, 2020</td>
<td>August 3rd, 2020 to August 16th, 2020</td>
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</table>

| Survey Population         | The whole nation (Including 6 Municipalities and 16 Counties), all people that are 12 years and older, total 21,213,710 people (Dec. 2019, Ministry of the Interior) | The whole nation (Including 6 Municipalities and 16 Counties) All people that are 12 years and older using the internet, no population info for reference. |

| Research Sample Quantity (Size) | Mobile and land line surveys were conducted simultaneously. 1,076 surveys were conducted by land line (Non-Rural areas), 507 surveys were conducted by land line (Rural areas), and 1,081 surveys were conducted by Mobile. Under 95% confidence interval, the sampling error are within ±2.9%, ±4.4% and ±2.9%. | 1,067 effective sample surveys Under 95% confidence interval, the sampling error is within ±3.0%. |

<p>| Sampling Design            | Stratified random sampling was applied to the whole nation (including 6 cities and 16 counties) population that are 12 years and older. | Random sampling |</p>
<table>
<thead>
<tr>
<th>Literature Review</th>
<th>Computer Assisted Telephone Interview</th>
<th>Internet Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Source</td>
<td>Data from entrusted organizations, national research papers, public data such as: National Development Council, National Communications Commission, World Economic Forum, Digital 2020...etc.</td>
<td></td>
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<tr>
<td>One on one in-depth interview</td>
<td>Interviewees are experts from the industry, government and academy that are familiar with Taiwan Internet development, industry environment and digital divide.</td>
<td></td>
</tr>
<tr>
<td>Number of Interviewee</td>
<td>6 Experts</td>
<td></td>
</tr>
<tr>
<td>Interview Time and Date</td>
<td>Sep. 2\textsuperscript{nd}, 2020 to Sep. 16\textsuperscript{th}, 2020, 1 hour per session.</td>
<td></td>
</tr>
<tr>
<td>Interview Place</td>
<td>Interviewee's office</td>
<td></td>
</tr>
<tr>
<td>Interviewer</td>
<td>Associate Prof. Eric Chen-Hua Yu</td>
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</tbody>
</table>

The survey data of the research is conducted and collected by Taipei Civil Education Foundation and the statements do not represent the position of Taiwan Network Information Center.