

The Metric System of Social Benefit Evaluation of Telecommunications Industry

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Abstract: “Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation” is one of the 17 goals made in the 2030 Agenda for Sustainable Development formally adopted by the 193-Member United Nations General Assembly last September. More exactly, dramatically improving access to information and communication technology has been highlighted as the main target to achieve, and telecommunications industry plays a vital role in this area. However, with the continuous development of broadband infrastructure deployment, a huge number of Internet applications have played a dual role in grasping and stimulating the revenue of telecom service providers simultaneously. Because of the lack of a method system which can evaluate social benefits of telecommunication service industry, its fundamental role of promoting the development of the Internet economy, as well as its positive contributions such as increasing employment opportunities has not been widely accepted in Chinese society. This paper proposes a system for CSPs to conceptualization, measurement and quantification their social contribution under the environment of broadband internet and gives advice on how to perfect the present performance evaluation of national basic industries.

1 INTRODUCTION

With the rapid promotion of mobile Internet and the increasing popularization of Wireless Fidelity (WIFI) both as conveniently available platforms for instant communication, entertainment and commerce, the role of Communication Service Providers (CSPs) in China has shifted to a bland toll collector position in the Internet era. In the meantime, a range of issues appeared within these enterprises, such as the decrease of innovation capability and the outflow of talent. In addition, the public also complained about their high charge and low quality of broadband and mobile broadband services. Therefore, the government and the Industry stakeholders alike are concerned about how these state-owned telecommunication operators are going to reform their operation mode and performance review in the future. This discussion on the future of CSPs has many facets and one of the key issues is industry contribution assessment. Like many project

appraisals it is too much often focused on direct and monetized values rather than a close analysis of indirect, social or public contributions. This paper provides an index system to evaluate and measure social benefits for telecommunications industry. To begin with, it is important to review some facts about Chinese CSPs and their operation, in order to be able to understand the developing situation of the industry.

In China, Communication Service Providers (CSPs) or telecom operators usually refer to state-owned enterprises providing fixed telephone, mobile phone and Internet access services. At present, there are four leading telecom operators which are China Mobile, China Unicom, China Telecom and SARFT (State Administration of Radio, Film, and Television, authorized in 2016). According to the bulletin of Communication Operation Statistics in 2015, there were 1.3 billion mobile phone users and 4G user made up for 29.6% of the total. The consumption of Mobile Internet access traffic were 4.187 billion G (Giga), with year-on-year growth of

103%. Monthly mobile Internet access traffic per capital reached 389.3 M (Mega), with year-on-year growth of 89.9%. In 2015, three CSPs (China Mobile, China Unicom, China Telecom) had a total of 213 million fixed broadband Internet users. Among them, the subscribers of optical fiber access (FTTH / O) were 120 million, accounting for 56.1% of the total number of broadband users. Broadband users of “8 M plus” and “20 M plus” bandwidth accounted for 69.9% and 33.4%. The usage of Fixed Internet at the same time maintained rapid growth, and the access time of fixed broadband were 50.03 trillion minutes, with year-on-year growth of 20.7%. Thus it can be seen that the revenue from voice calls and text messaging are falling gradually, while the access and usage of the Internet, especially Mobile Internet, are becoming the core income.

It is an irreversible trend that the services offered by telecom operators are experiencing the evolution from final consumption goods to intermediate products (Xiuqing Huang et al, 2012). Unfortunately, because of the lack of a method system which can evaluate social benefits of telecommunication service industry, its fundamental role of promoting the development of the Internet economy, as well as its positive contributions such as increasing employment opportunities has not been widely accepted in Chinese society. This paper is thus organized along the following central questions: what are the connotation of the social welfare of CSPs when the Internet become an indispensable part for human lives? And how to build an evaluation index to measure those contributions? It can be said in advance that this paper will not pay special attention on perceptual or subjective experiences from consumers when discussing these questions. Rather, the paper is meant as an objective and data-based study that deals with direct and indirect social benefits and provides a guideline for CSPs on how to detail their operation and evaluation metrics.

2 LITERATURE REVIEW AND THE CONNOTATION OF SOCIAL BENEFIT

Despite a rising number of studies calculating in great detail about the direct and indirect economic contributions made by the ICT investment, less attention has been paid to the social benefit contributed by telecommunications. Firstly, domestic scholars have failed to reach consensus on

the connotation of social benefit and the dispute is mainly at the boundary of social benefit, economic benefit and ecological benefit. Secondly, available research on evaluation index system of social benefit is diverse and more concentrates on projects in the fields of expressway, journalism and forestry. Furthermore, present quantitative evaluation methods of social benefit domestic and overseas includes system dynamics method, structural equation modelling (SEM) techniques (T. J. Gerpott et al, 2015) and input-output analysis and it has been applied to industry level and corporate level, such as competitive analysis. Nevertheless, there hasn't been much scientific studies on the foundational telecom industry contributing to social development under the era of mobile internet yet. Therefore, it is necessary to carry out systematically research on the issue of measuring and evaluating telecoms' social benefits.

Based on a wide range of literature reading on the present papers, in this paper, a strict definition of Social Benefit on industrial level is described as follows:

Definition 1: Social Benefit refers to all aspects of social progress result from the development of certain industries.

When comes to Telecommunications Industry, social welfare means the improvement of access to information and communication brought by the promotion of infrastructure and the updating of communication technology. Like other benefits such as economic and ecological, Social Benefit also could be divided into two parts that are direct and indirect values (V. D. W. Marlies et al, 2015). With the development of Broadband and Mobile Broadband, the internet has replaced voice calls and text messaging to some extent since internet applications such as instant communication and email become the dominant tools to live and work. Moreover, people are able to get these telecommunication services regardless of time and place. In other words, the wide spread of network signal expands the space of handling official business, getting entertainment and obtaining information. These are all direct values comes straight from the development of CSPs. In addition, the presence of the internet is the essential condition for the development of Internet enterprises, such as Baidu, Tencent and Alibaba. The promotion of Mobile Internet contributes to the booming of applications satisfying the diverse demands of users. Furthermore, the overall enhancement of the levels of Information and Communication will create social economic value and provide more

opportunities of employment generally. And all these welfare are indirect.

In short, four aspects account for the Social Benefit of Telecommunications Industry. The first key term is cost. The development of the telecommunications industry and the advent of mobile Internet era have greatly reduced the cost to communicate. Secondly, the improvement of serviceability broadens human activity space. Thirdly, the stability of the Internet lead to the creation of various internet products and business models. Finally, social productivity and employment are influenced by this industry.

3 LITERATURE REVIEW AND THE CONNOTATION OF SOCIAL BENEFIT

The Index of Social Benefit consists of four sub-indexes which are Cost Value, Spatial Value, Functional Value and Creation of social Value (Feng Luo, 2013). Under each sub-indexes, there are two to three indicators. These indicators represent a selective subset of the full set possible with other indicators were omitted owing to limited data availability or difficulties in their measurement. Required data are selected from Ministry of Industry and Information Technology of the People's Republic of China (MIIT), China Internet Network Information Center (CNNIC) and National Bureau of Statistics (NBS).

3.1 Social Benefit Indicators

3.1.1 Cost Value

Definition2: Cost value refers to values produced by the decrease of communication cost.

Before the wide spread of 3rd-Generation, fixed and mobile phones are some of the main means people used to communicate the work contents and contact with their families and friends. And there are certain limitations. A long-distance call is usually expensive and has high possibility of getting a busy signal. Moreover, frequent telephone communication also generates a mass of fees. However, all these limitations are greatly improved in the era of Mobile Internet. It is undeniable that the costs of communication, working, time spending are all reduced. This introduces a broader definition of the factors influencing the costs of new communication technology, beyond narrow monetary costs.

This paper considers Cost Value from a more practical substitution perspective. Hence, Fixed Long-Distance Call duration in total, Mobile Call duration in total and Mobile Message in total are selected to be indicators describing the Cost Value of telecommunications. Reasons why these indicators could be the most suitable are explained as follows. Traditional voice and text message services are gradually replaced by the Internet services. Events and notification, used to rely on text messages and telephones, especially long-distance phone calls, are now solved easily by Internet applications, such as emails or WeChat. Furthermore, communication fees of recent years are unable to describe the decrease of telecommunication cost and are difficult to obtain or separate from traditional business units.

3.1.2 Spatial Value

Definition3: Spatial Value refers to values produced by the differences of spatial location.

Table 1: Construction of Social Benefit Indices

Dimension	Index	Indicators	Source
Direct	Cost Value	D1:Fixed Long-Distance Call duration in total	MIIT
		D2:Mobile Call duration in total	MIIT
	Spatial Value	D3:Mobile Message in total	MIIT
		D4:The number of Internet broadband access port	MIIT
Indirect	Functional Value	D5:The number of base stations for 3G and 4G	MIIT
		D6:The length of Optical fiber cable line	MIIT
	Creation of social Value	I1:The number of Domain name and Website	CNNIC
		I2:The number of users of All kinds of Internet applications	CNNIC
		I3:Gross Domestic Product (GDP)	NBS
		I4:The number of employments in the third industry	NBS

With the development of information technology and network, enterprise management activities as well as social communication activities began to break the limitation of time and space. In this process, the value of telecommunication are mainly embodied in the convenience and flexibility of access to related services. Therefore, Spatial Value focuses on whether communication networks are covering more and more living and working spaces and whether high-quality services could be obtained flexibly at different scenarios.

This paper considers Spatial Value from a more measurable capability perspective. Hence, the number of Internet broadband access port, the number of base stations for 3G and 4G and the length of Optical fiber cable line are selected to be indicators describing the Spatial Value of telecommunications. Reasons why these indicators could be the most suitable are explained as follows. The increase of base stations on the one hand indicates extending the coverage and enhancement of signal. Similarly, the greater the number of access ports, the more population benefit. The personal computers and mobile telephones also become key components for Internet access since 3Generation, 4Generation and Wireless Fidelity access become widely available. However, without the continuous investment on infrastructures, the increase of mobile phone penetration rates doesn't represent the promotion of ubiquity and convenience of telecommunications.

In summary, direct social benefits focuses on values that directly produced by the activities of telecom operators.

3.1.3 Functional Value

Definition4: Functional Value refers to values offered by Internet enterprises based on the continuous development of the Internet and Mobile Internet.

Functional Value focuses on the booming of Internet industry, relating to digital content, e-commerce, mobile Internet and so on. And the rapid development of various Internet applications implies increased ability to discover, serve and satisfy human demands. In other words, people's living demands as well as business needs will be highly fulfilled as long as they connect with the Internet or Mobile Internet.

This paper considers Functional Value from a market performance perspective. Hence, the number of Domain name and Website and the number of users of all kinds of Internet applications are

selected to be indicators describing the Spatial Value of telecommunications. Reasons why these indicators could be the most suitable are explained as follows. Number of Domain name and Website has been taken as a measure of the richness of information resources, Increasing number of website implies increased demand of the Internet. The change of usage rates reflects the importance degree of certain demands in consumer's daily lives. This paper considers four kinds of applications as the core demands of using the Internet. The first kind of applications is instant messaging (IM). For instance, by the end of the third quarter of last year, monthly active users of WeChat has reached 650 million and this number would continue to increase in the future. The second one is online payment. In fiscal year of 2014, a total payment of 3.87 trillion yuan was accomplished by Alipay. Moreover, an increasing number of offline shops, relating to dining, entertainment and convenience stores, are accepting online payment.

The last two applications are online shopping and Network Video (NV).

3.1.4 Creation of Social Value

Definition5: Creation of Social Value refers to social productivity and employment influenced by telecommunication industry.

This paper considers Creation of Social Value from a more abstract perspective. Hence, GDP per capital and the number of employments in the third industry are selected to be indicators describing Creation of Social Value of telecommunications. Communications services are creating great material wealth and improving the overall social productivity. As mentioned in Functional Value, the booming of Internet-related companies creates more employment opportunities, especially for the tertiary industry.

3.2 Index Methodology

Since significant Internet and Mobile Internet diffusion is observed domestically only in the past few years. This paper therefore compiled indicators and calculated indices from 2010 to 2015. Moreover, units of analysis are National Level and national level statistics are collected.

Scores are derived as an index relative to the maximum and minimum achieved in any Indicator:

$$\text{Index score} = \frac{(\text{Value} - \text{Minimum})}{(\text{Maximum} - \text{Minimum})} \quad (1)$$

4 DISCUSSION OF RESULTS

Results in this section are presented as follows:

Table 2: Index Score of Cost Value

Year	D1	D2	D3	In total
2010	1.00	0.00	0.65	1.65
2011	0.64	0.48	0.91	2.03
2012	0.37	0.80	1.00	2.17
2013	0.18	0.97	0.97	2.12
2014	0.08	1.00	0.34	1.43
2015	0.00	0.91	0.00	0.91

The Table 2 shows that social contributions from traditional telecommunication business have fluctuated in recent years, but a downward trend is observed and indicates the decrease of telecommunication cost.

Table 3: Index Score of Spatial Value

Year	D4	D5	D6	In total
2010	0.00	0.00	0.00	0.00
2011	0.16	0.14	0.07	0.37
2012	0.47	0.32	0.03	0.82
2013	0.60	0.50	0.06	1.17
2014	0.76	0.70	0.71	2.18
2015	1.00	1.00	1.00	3.00

The Table4 shows that Spatial Value of telecommunications have improved in the last few years. Furthermore, the latest 3year's annual increment are significantly more than the former years'.

Table 4: Index Score of Functional Value

Year	I1	I2	I3	I4	I5	In total
2010	0.02	0.00	0.00	0.00	0.00	0.00
2011	0.00	0.00	0.23	0.07	0.11	0.11
2012	0.24	0.19	0.42	0.03	0.30	0.30
2013	0.46	0.40	0.66	0.06	0.44	0.44
2014	0.55	0.66	0.87	0.71	0.60	0.60
2015	1.00	0.68	1.00	1.00	1.00	1.00
		1.00	5.00			

Table 5: Index Score of Creation of Social Value

Year	I6	I7	In total
2010	0.00	0.00	0.00
2011	0.28	0.19	0.47
2012	0.47	0.27	0.73
2013	0.67	0.65	1.32
2014	0.85	0.98	1.83
2015	1.00	1.00	2.00

Similarly, Functional Value and Creation of Social Value of telecommunications have also promoted as time passed.

Table 6: Index Score of Direct and Indirect Welfare

Year	Direct	Indirect	In total
2010	1.65	0.02	1.67
2011	2.40	1.12	3.53
2012	2.99	2.42	5.41
2013	3.29	4.09	7.38
2014	3.60	5.32	8.93
2015	3.91	7.00	10.91

The Table 6 shows the total index score of social benefit. Comparing with the base or beginning year 2010, the social contribution of telecommunications almost increased tenfold in 2015. This suggests that the enhancement of telecommunications indeed has created social value and the indirect part should be taken seriously.

5 CONCLUSIONS

Under the age of Mobile Internet, core business of telecommunications has shifted to access and usage of the Internet. However, the concern of telecom operators still focuses on direct values, especially traditional communication services. Hence, Internet-related indicators should be further refined. Moreover, comparing with traditional income contributed by fixed calls, mobile calls, text message as well as other profit model, present profit model of Mobile Internet seems very weak and lack of innovation. In the future, correlation analysis and index calculation on district level could be carried out.

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