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Market opportunity of China Telecom 3G toward 4G

-A social-technical analysis for its future development

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ABSTRACT

In the Information and communication Technology (ICT) field, the success a new player will face is the challenge for the opportunity of new market development. China's mobile subscribers grew by 9.93 millions to 1.132 billions in February 2013. The convenience of communication prompted China's growth, but there is little information available in literature about how it happened and what the next development steps will be for the China Telecom Industry.

The purpose of this paper is an attempt to picture the future growth path of China Telecom market opportunities from 3G toward 4G and beyond, including viewing this from the angles of telecom/internet e-commerce regulation development; globalization of values; and telecom universal services in China. By investigating the development of TD-SCDMA networks as well as the TD-LTE and FD-LTE current status and also the mobile-TV/ cloud computing trends of China, it is estimated that the country's settings of objectives for telecom growth may drive fast new market developments. Both technology and management growth of the three operators will mature.

This paper relies heavily on the ideas of economics, governmental regulations and social responsibility from Professor: Joseph Eugene Stiglitz (a recipient of the Nobel Prize in Economic Science 2001). In this research, the Actor-Network Theory (ANT) will act as an important tool to understand the Chinese way of new technology implementation, and will use the TD-SCDMA networks case study as a model. The ANT, Michael Serre's work influenced Bruno Latour and others like Michel Callon.

This paper is based on work done in China since 2001 in Beijing by the author. It draws on industry and academic sources, interviews with friends from telecom industry elements and governmental policy making departments in China. Due to the time frame, difficulty of access to any of the actual decision making processes, and frequent 'off-the-record' sources this type of research faces acute methodological challenges.

This paper suggests that the convergence across internet, telecommunications, TV broadcasting networks etc. will form a new market beyond the traditional telecommunications industry. The pervasion of the huge popularity of the internet will continue to involve all aspects of society as China presses forward to establish its innovation credentials.

Key Words: TD-SCDMA, TD-LTE, FD-LTE, Social-technical analysis, China Telecom Industry.

Author Biography:

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Since March, 2001 I was a representative of a branch office of a Telecom Company of U.K. registry, in Beijing China. Due to job requirements I started to collect all possible information on the China telecom industry since 2002. My M.Sc degree received from Drexel University, Philadelphia. US in 1989. By Aug 24, 2004 I joined the RF China M.Sc / PhD Program conducted by Nokia China and courses (UMTS) lectures in Beijing held by the Institute of Communications Engineering of the Tampere University of Technology (TUT) Finland. Starting from October 1, 2010 I was accepted as PhD student of the Dept. of Computer Science and Information Systems. University of Jyvaskyla. Finland. My Supervisor: Professors. Jari. Veijalainen and Kalle. J. Lyytinen and Professor Jari encouraged me to participate in this TPRC student paper competition. jari.a.veijalainen@jyu.fi.

1. Introduction:

In 2008, China formed three telecom operators and followed by the reorganization of the Mega Ministry of Industry and Information Technology (MIIT). Many related information industries merged into one body. In 2009 there were three different 3G standard licenses issued covering operation requirements for these three operators. [1] The 2008 revamp of the Telecom sector covered four major telecom companies. These four operators were formed in 2002 by seven different telecom operators. Included were China Unicom started in 1994, and China Mobile started its separation from China Telecom in 2000. [2]. It's hard to change the direction of a big ship in harbor as several steps will be needed before it can be turned around. China Telecom industry reform activities was a similar situation but much more complicated. Three new full service operators are using three different 3G standards. The challenges and advantages with new e-market opportunities were existed simultaneously.

MIIT announced in February 2013 that the Chinese mobile subscriber hit 1.132 billion. The 3G subscriber base grew by 14.04 million to reach a total 3G user base of 259.92 million. The TD-SCDMA subscribers counted total 104.18 millions around 40.1% of all 3G users. Mobile voice ARPU was RMB 31.1 down from 33.8 RMB a year before, while Mobile data and internet ARPU was RMB 11.3, up from RMB 8.1 a year before. But the revenue of the three operators was not the same. [3].

China's Three Telecom Operators' Market Share by Revenue

| Operator | Feb 2013 | Feb 2012 |
|-----------------|-----------------|-----------------|
| China Mobile | 50.9% | 52.6% |
| China Telecom | 27.2% | 26.5% |
| China Unicom | 21.9% | 20.9% |

In fact there are approximately 4-5 times more mobile subscriber differences in numbers between the three operators, for example: In July 2011 reported :China Mobile: 621.85 million subs, including 37.60 million 3G TD-SCDMA subscribers and ca. 580 millions GSM subs. China Unicom: 183.74 million, including 25.82 million 3G WCDMA subscribers. China Telecom: 110.94 million, including 23.56 million for 3G CDMA-2000 subscribers. [4] . This will cause a fair competitive environment in the future. Will government urge China Mobile to concentrate on the development of TD-SCDMA networks rather than jump into the TD-LTE/ FD-LTE developments? Has anyone said anything about the return on this huge investment? Or does the government consider the construction of telecom networks as a basic component and part of universal services for the country? The population of China today is around 1.34 billions; the mobile teledensity in 2012 rose to 82.6 up from 73.6 at the end of 2011.[5] Will the government fulfill the needs of the rest? This is a real social-technical balance question? Will the future market benefit the poorer people? Will the globalization enhance the global society in harmony?

China expected that the digital data transmission speed has been and will be further enhanced dramatically. The audio/video and e-news/book will be able to receive data in real time. The software makes simultaneous language translation possible. iPhone has also demonstrated how much we can achieve by digital technology. New technologies or standards of ICT will require high merging capability for the future new markets.

2. Current status of new telecom technology development in China:

2.1. TD-LTE future market opportunity:

MIIT announced in late October 2012 that China will allocate 60 MHz in each 1800 MHz and 2100 MHz spectrum ranges, or a total 120 MHz for FDD-LTE use and MIIT earlier assigned 2500-2690 MHz spectrum, a range of 190 MHz for TD-LTE needs. [6]

Early on May 17, 2010 at the press conference for the commemoration of 2010 World Telecommunications Day in Shanghai, China Mobile said that TD-LTE will attract three kinds of operators: PHS operators, Wimax operators, and asymmetric frequency band operators. Japan's third largest wireless operator Softbank recently announced it would deploy a next-generation PHS network utilizing China Mobile's TD-LTE technology, US-based Wimax operator Clear wire and Motorola's Yota Wimax network announced in March they will employ LTE technology, and operators using asymmetric frequency band networks. Many companies in Europe are using TD-LTE technology. China Mobile Research Institute also revealed at the Shanghai 2010 World Expo's TD International Development Summit that ten TDD-licensed overseas mobile operators have been in discussion with China Mobile about building TD-LTE trial networks. Eight operators around the world will deploy trial TD-LTE networks this year [7].

2.2. TD-LTE / FD-LTE trial projects:

China Mobile reportedly will begin its first 2013 tender for 4G terminals in late April 2013, the expanded 2013 TD-LTE commercial trials will set up around 200,000 new base stations, the bids worth RMB 20 billions for key TD-LTE equipments, China Mobile is expected to spend RMB 41, 7 billions on 4G this 2013 year. The operator will concentrate on the F-Band (1880 MHz -1920MHz) for TD-LTE development. They plan to purchase 160,000 TD-LTE terminals, including 30,000 MiFi terminals, 100,000 customer-premises equipments (CPE) units, and 10,000 TD-LTE mobile handsets. China Mobile chairman Xi Guohua announced that by the end of 2013 the operator would have TD-LTE network coverage in more than 100 cities to serve more than 500 million people. [8-9]

On Feb 17, 2011 China mobile and Chinese telecom equipment/ terminal manufacturer ZTE will both participate in German wireless operator E-Plus Group's TD-LTE field trial in 2011. China Mobile will provide technical support while ZTE will provide FD-LTE/TD-LTE base stations. Many other countries reported trials of this kind. On Feb 16, 2011. Australian operator the Vividwireless reported they had the license for 70 MHz and 100 MHz of 2.3 GHz and 3.5 GHz spectrum in every Australian city, with the exception of Hobart and Darwin. They are currently using their 2.3 GHz spectrum for the Wimax network in Perth and providing service with the Huawei USB modem. They have plans to upgrade their Wimax network using TD-LTE technology (TD stands for time division multiplexing). They will partner with Huawei in network deployment.

Vividwireless boasts they can achieve download speed of 40-70Mbps and upload at 4-7Mbps with its TD-LTE network. (Olivia 2011).

2.3 TD-SCDMA / TD-LTE terminal models:

China Mobile TD-SCDMA handsets sold 42.59 million by October 2012, and on end of February 2013 the number increased to 104.18 million. [10].

The number of TD-SCDMA terminal models and TD-LTE terminals has increased 70 % during the past 3 Years [11]. At the end of May 2011, TD statistics show; China Mobile's TD-SCDMA terminals have reached 581 models, including 269 handsets, 130 wireless landline, 75 data cards, 60 notebooks, 14 readers and 33 home gateways. According to GSA's latest report: 218 mobile operators in 81 countries and regions are preparing to invest or to construct LTE networks, 166 commercial LTE networks and 52 trial networks are already under construction. Global operators are now accelerating the deployment of TD-LTE technology. In June, two operators joined the TD-LTE camp increasing the operator numbers to 12.

China Mobile Communications Corporation Terminals, the terminals subsidiary of China Mobile, revealed recently that China Mobile will release approximately 30 operator-customized TD-SCDMA handsets in H2 2011. China Mobile is co-developing the handsets with Samsung, Motorola, Nokia, HTC, and Research in Motion (RIM), Huawei, ZTE, Lenovo and Yulong Computer Telecommunication (Coolpad). High-end models will include the Samsung Galaxy S II, Motorola 870, Nokia T7 and HTC Z710t, while mid-range handsets will include the Huawei T8300 and ZTE U880. Samsung's Galaxy S II phone is expected to reach mainland China's shelves sometime in August 2011. [12]. China Mobile is very aggressive toward the advancement of LTE development, as shown above.

2.4 Mobile TV Regulations and Plans:

For the Mobile TV; the standards need to be approved through the different authorized departments. The main reason is that China concerns for the safety of society.

On March 10, 2013 it reported that China's General Administration of Press and Publication (GAPP) and State Administration of radio, Film and Television (SARFT) will merge into a new agency, combining the roles of the two for overall planning of the development of the press, publication, radio, film, and television industries, as well as oversight /management of news, print, broadcast, and film and television organizations and services, and the content and quality of their publications, authorship rights management and other responsibilities. The

new agency will report to and under the purview of the National Copyright Administration of the People's Republic of China (NCAC). [13].

This is a typical way of parent-care style of management with Chinese characteristics, people will take actions depend on his/her thoughts and the thoughts came from what he/she heard and saw. China government decided to open the door by the real situation. Only the appropriate content will be accepted.

China newly formed General Administration of Press and Publication, radio, Film, and Television (GAPPRFT) (unofficial translation) is currently drafting "triple-play" network convergence plans for 2013-2015. the plan will be released in mid-2013. the core goal of the plan is to achieve full digital conversion for all cable TV networks by end of 2015, with 80% or 2 million of household will be capable of bi-directional functionality, internet access services, and other network services including IPTV, VOD, and interactive entertainment. [14]. This is a universal project for the poorer people lived in country side.

On April 9, 2013 MIIT said Chinese Government will conduct research plans to draft a unified standard for Terrestrial DTV receivers, a national accredited inspection and certification will need to pass the review, and the related high-tech innovation capabilities will be asked.[15]

Early on Sep 9, 2011, China's State Administration of Radio, Film and Television (SARFT), disclosed that China's 12th Five-Year Plan (2011-2015) calls for direct-broadcast satellite (DBS) to reach 10 million households in rural areas lacking cable TV access this year. It is hoped to reach 50 million in 2012, 100 million in 2013, 150 million in 2014, and 200 million by 2015. According to SARFT, approximately 200 million of China's 400 million households rely on analog broadcast TV and receive at most 6 channels. DBS trials began in rural areas of Ningxia, Inner Mongolia, and Hebei in April. Users who purchase a receiver have free access to 25 TV channels and 17 radio stations. Each trial area is subsidizing receiver purchases. In Ningxia, each household receives a RMB 100 subsidy, while in Inner Mongolia users receive RMB 200.

SARFT has submitted a proposal to China's State Council to establish a consolidated national cable TV operator "China Radio and Television Network" as a commercially-oriented state-owned enterprise (SOE) under State-owned Assets Supervision and Administration Commission (SASAC). The State Council rejected an earlier proposal that the "China Radio and Television Network" be made a government-funded entity. [16]. the content of Mobile TV will be closely monitored. The merger mentioned before for GAPP and SARFT combine as (GAPPRFT) was a sign that the government wanted this be done by the schedule, anyone disagree the plan will be moved to other position.

The Department of Publicity and Administration of SARFT said before that regulations limiting the amount of entertainment programming on satellite TV channels will come into effect on January 1, 2012. Details of the regulations t have been decided and posted on the SARFT website. An industry source revealed that SARFT issued "SARFT Guidelines for Strengthening Management of Satellite TV Programming," which calls for the establishment of a satellite TV programs broadcast and control system, specifically to curtail excessive entertainment programming during primetime hours (7PM to 10PM). The regulations state that satellite TV channels must primarily engage in TV news programming, and take steps to improve news gathering and broadcasting capabilities. [17]

2.5 The impacts of I Phone

A report released by Beijing-based mobile application analytics platform Umeng on March 26, 2013. The number of active iOS user in China grew to 85 million as of the end of 2012, while the number of active Android users grew to 160 million. iPhones accounted for between 74%and 82% of iOS devices in 2012, while iPads reached a peak of 23% of iOS devices. .iPads accounted for 82% of all tablet computers in Q4 2012. [18].

China's Active Android Device Market Share by Brand

| Brand | Q4 2012 | Q3 2011 |
|----------|---------|---------|
| Samsung | 21% | 28% |
| HTC | 11% | 25% |
| Lenovo | 7% | 3% |
| Huawei | 7% | 9% |
| ZTE | 5% | 8% |
| Coolpad | 5% | 1% |
| Xiaomi | 5% | N/A |
| Motorola | 4% | 12% |
| Sony | 4% | 6% |
| OPPO | 3% | N/A |
| LG | N/A | 3% |
| Meizu | N/A | 2% |
| Others | 28% | 3% |

iPhone's arrival in the world has changed the living habits of ordinary people, Beijing sub-way for instance, 5 out of 10 young adults in his/her early morning classes use iPhone's either reading or gaming. China Mobile and China Telecom may accelerate 3G growths by receiving iPhone 4, 5, 6, etc, since it is expected to further push down the pricing of Android smart phones. Android growth in China has received a boost from cut-rate models from ZTE and the sub-\$150 smart phone market is expected to bloom. Already, Android smart phone market share in China has expanded from 3% to 80% in these years. Even as Europe seems to be sliding into a genuine handset market slump, China is still acting as a counterbalance, continuing to beat handset and particularly 3G device volume sales projections made since at the beginning of 2011. [19].

2.6 The cloud computing city:

China Alibaba Group's cloud computing e-commerce platform Cloud Tmall recently announced its 2013 development strategy. Cloud Tmall will position itself as an open cloud e-commerce services platform comprising three layers: a low-level cloud infrastructure layer, a higher level "container" layer, and an upper-level Cloud Tmall market offering merchants a cloud platform for SaaS. There will be five operation principles: Order status Transparency; Clearer Financial Data; Targeted Customer Services; Scientific management of sales and Stock; Providing Solutions for the complete Industry Chain.[20]

China is building a super-sized data complex with that will rival entire cities. Government officials have allotted 6.2 million square feet in the country's Hebei Province for the project, which includes 646,000 square feet for a data center that will be Asia's largest. IBM has partnered with China-based Range Technologies to build the data center to be completed in 2016. The complex will also feature office buildings and perhaps some residential homes. The move is a sign that the Far Eastern nation is stepping up efforts to expend its IT infrastructure to meet a surging demand for cloud computing and other data services. Chinese investment in data centers have tripled over the past four years and the country has already surpassed Japan as the number-two data center building customer, according to Information Week.

China's increased investment in data centers will likely give environmentalists more sleepless nights, since the nation is already the world's top producer of CO2 emissions and has had a reputation for relentlessly industrializing with little regard to the environmental consequences that come with it.

There are some encouraging signs that China is at least motivated to improve data center energy-efficiency. The government has recently passed a mandate to reduce the economy's energy consumption. The energy costs saved through more energy-efficient technologies is a stronger incentive for China than some other economies. [21].

3. Materials and Methods

3.1. Literature review

3.1.1. Technical Definitions:

This paper referenced and followed the definitions from mainly: The white paper from the UMTS Forum "Towards Global Mobile Broadband Standardizing – the future of mobile communication with LTE (Long Term Evolution)" (UMTS Feb, 2008), and the final white paper titled "Mobile TV: The Groundbreaking Dimension" by mobile TV UMTS/GSMA joint work group (UMTS 2006); UMTS Forum 2nd white paper "Sustainable Economics of Mobile TV Services" by Mobile TV joint UMTS Forum/GSMA (UMTS Jan, 2008).

3.1.2. Regulator and regulation:

For the leader's (regulator's) responsibilities, Stiglitz discusses the causes of the 2008 recession/ depression and goes on to propose reforms needed to avoid a repetition of a similar crisis, advocating government intervention and regulation in a number of areas. Among the policy-makers he criticizes are George W. Bush, Larry Summers, and Barack Obama. (Stiglitz 2010).

Stiglitz's recent paper talked about China "Towards a new Model of Development" that China's circumstances have changed, and that requires a different model because China's circumstances are different from that of other countries, it inevitably requires a different model than elsewhere. Some three decades ago, China set forth on a new course "Crossing the river by feeling the stones." The pragmatism that underlies this approach is partially responsible for China's enormous success.

Now that China has gone more than half way across the river, what is on the other side is clearer. It is clearer that there are many different forms of a market economy—many different places to land on the other side of the river. China can now see that it can make a great deal of difference when deciding which direction it takes. What kind of market economy it chooses will affect what kind of society it will create? Even as China crosses the river by feeling the stones, creating a Market Economy with Chinese Characteristics that is consistent with China's distinct circumstances and values, will require a New

Economic Model. China's 11th five year plan reflected this New Economic Model. In this paper, it is hoped to show some economic foundations underlying this New Economic Model, and to suggest some of the implications it may have for the design of policies and institutions. (Stiglitz 2009).

The research on China's government leaders and their authority indicates that since 1949, Mao Zedong was the overall decision maker for most of the important issues until his death in 1976, and the Cultural Revolution came to an end. (Bachman, 1986; Barnett, 1985:7). After 1978 Deng Xiaoping initiated political reform, a new bureaucratic form of government departments arose. (Paltiel, 2001; Lin 2004) and (Unger ed., 2002). A "Fragmented authoritarianism" was described by Lieberthal and Oksenberg's (1988) and (Lieberthal and Lampton eds., 1992). The appointed state leaders: Jing zeming and Hu jintao retained the ultimate decision making power whilst having three roles, as political, state and military heads. (Breslin, 2005; Goldstein, 2001: 837-8; Few-smith, 1999; Swaine, 1995). An indispensable new technocrat-style bureaucracy force team was formed in 1990 in the decision making group for technical and economic policies as Presidents Jing and Hu were from technical backgrounds.

3.1.3 China Telecom Reform and development:

The literature on the China telecom sector reform covered the telecom organizations, telecom resources management, technology development, WTO requirements, and Market competition. (Voon, and Mitchell, 2011; Balleisen, and Moss, 2009; Yeo, 2008; Yu, Sanford, Guo, 2004; Wu, 2004; Wan, 2001; Jain, Raghuram, and Morris, 2000) and (Femandez, 2007; Nolan, 1996; Petrazzini, 1995; Child, 1994; Cronbach, 1980). The literature seldom touched on the need for strict telecom safety control that was required because of the large size of the country and its huge population, and the problem of the overlapping responsibilities and authorities among the government ministries and departments. This caused the building of walls between them, and reduced the efficiency of the growing environment needed for economic development.

China took seriously all the literature on the telecom regulation and law establishment, the western telecom law, the WTO required regulations for entry into a market, and its standardization. (Genlzoglanis, and Henten, 2010; Fomin, and Lyytinen, 2003; Paul, 2006; Paolo, 2006; Colin 1997; Cauley, 1996.). At first China tried simply mapping them, but soon found the system of western telecom laws could not be adopted properly.

3.1.4. The Actor-Network Theory

We will use the Actor-Network Theory (ANT). While analyzing the development in China (Callon, 1991, 1986; Latour, 1996, 1987) and (Shin,

2010). According to theory the actors can be both human beings and non-human entities. The theory examines the motivations and actions of human actors and the requirements of non-human actors (such as technology). They will need to align their interests. ANT was used for finding out why and how a technological solution was created. Others were (Shin, 2010; Gao 2005; Akrich, 1992).

3.2. Methodology:

3.2.1. Data gathering- Anonymous interview and notes:

The author has worked in Beijing since 2001. As head of the Beijing branch of a U.K. Telecom company, he talked to many telecom experts, operators, vendors, and academics.

It was normal to take notes, but, these experts wished to remain anonymous fearing that if their names were exposed, they may be liable to charges, because restrictions were in place concerning leaking messages.

The notes covered approximately 220 interviews. Although this cannot be viewed as formal interviews, they were found highly valuable for this research.

They would help filter the information and messages obtained from newspapers, websites, Telecom policy argument articles in Chinese magazines, and help decipher the propaganda from the real situations. The reference information listed should be reliable.

3.2.2. Some observations:

Often people missed the core differences of society and of the cultural background of China. And often people lacked sufficient knowledge of the specific political background of communist China.

On the other hand, the China insider would not freely express any sensitive information due to the policies and laws of the country.

The research on China's government leaders and their authority indicates that since 1949, Mao Zedong was the overall decision maker for most of the important issues until his death in 1976, and the Cultural Revolution came to an end. It may be the most serious damage to the people's heart -- the Culture Revolution.

3.2.3. Actor-Network Theory

In this research, ANT will act as an important tool for the TD-SCDMA case study. It is trying to investigate the process of translation, where actors align the interests of others with their own. ANT is a popular tool and was used in many other fields such as: organizational analysis, information technology, health studies, geography analysis, human sociology, feminist problems, anthropology and economics. The Actor-Network Theory tries to explain how social-technology actors within a network, come together as a whole body with

different components. According to the actor-network theory, these networks emphasize the performance of the actors, sustained within the related networks, showing their relationship and transformations.

The Actor-Network Theory (ANT), was first developed by Michel Callon, Bruno Latour and John Law in the early 1980s [22-23] and is an effective tool for describing the relationship between technology and society. This shows the process between technical and social mechanisms, including the government's role while going through a decision making process, and covers negotiations preceding agreements. ANT explores technical implementation in organizational settings, and socio-technological changes occurring in dynamic and global settings. The key component to ANT's analysis is trying to investigate the process of translation, where actors (CPC/ MIIT/ TDIA/ Operators/ Vendors/ Academics/ Subscribers/ etc.) align the interests of others with their own.

Actor-Network Theory (ANT) was originally used in science studies, but through its approach to the sociology and related research it became a popular tool and was then used in many other fields such as: organizational analysis, information technology, health studies, geography analysis, human sociology, feminist problems, anthropology and economics. The Actor-Network Theory tries to explain how social-technology actors within a network, come together as a whole body with different components. According to the actor-network theory, these networks emphasize the performance of the actors, sustained within the related networks, showing their relationship and transformations. [24].

There are mainly four steps for the translation. During the first step called Problematization the Primary Actor (PA) will emerge and the common goal for all actors is determined. It tries to establish itself as an Obligatory Passage Point (OPP) during this step, which means that the PA becomes a central entity in the network. The second step is called Interessement. During this stage, the Primary Actor (PA) will try to get the other actors interested in the designed roles and the negotiation started. The third step is called Enrolment. During this stage all actors accept the roles that have been defined for them during the previous steps by the Primary Actor. The Fourth step is called Mobilization of Allies, in which the actors try to get support from wider social environment for their course. The theory further assumes that the network is not stable and static, but it is re-established and reshaped continuously. It can also cease to exist for various reasons.

The Actors in the case studies shown in this research can be broadly categorized into three groups: the government related organizations/departments, the telecom operators, the telecom equipment/handset manufactures. In this research, ANT will act as an important tool for the TD-SCDMA case study, investigating the strategies and policies held

by actors and showing how the China Telecommunication Regulations may become a good model for future policies concerning China Telecommunication developments. [25].

4. The translation process of actor network development around TD-SCDMA

4.1. The complicated interests among the actors

4.1.1 The non-human actors:

The Actor–Network Theory (ANT) in this paper is used to describe the formation and diffusion of technical implementation for the TD-SCDMA services system. [26]. It is a new telecom 3G standard; and a complete industry chain will be needed to provide the technology-intensive telecom services. Mainly it will include R&D of the chips, the mature telecom equipment manufacturers and the reliable terminal devices (hand sets) providers etc. Domestic and international resources were jointly required to tackle the complexity of the different technologies. These technological requirements formed the basic successful factors needed for these non-human actors.

4.1.2 The governmental actor:

The Government actor is composed of eight Ministries and some independent research departments. All ministries were empowered with the same grade level, and therefore, the Ministry of Industry and Information Technology (MIIT) lead as head for the TD-SCDMA development project had to face the most challenging issues for this development strategy. That is the coordination of the overlapping responsibilities between the government departments. For example: In a joint statement issued by the Ministry of Industry and Information Technology(MIIT), the National Development and Reform Commission(NDRC), and the Ministry of Finance(MOF), it said the government encourages China Mobile to take control of China Tietong and China Telecom to combine the basic telecom services unit of China Satcom. Also the government encourages China Telecom to buy China Unicom’s code-division multiple access (CDMA) network and China Unicom to incorporate with China Netcom. This was the typical way China governmental ministries worked together to make things happen and everyone was involved and also shared the responsibilities. The CEO of each operator was nominated by MIIT, with the agreement of the State-owned Assets supervision and Administration commission (SASAC); the State Development and Reform commission (SDRC); the Ministry of Science and Technology (MST) and the Ministry of Industry and Information Technology (MIIT). The functions of these departments had overlapping responsibilities and their decisions were jointly agreed.

Confusion between government departments led to unclear areas of responsibility without clear lines of delineation, and no one department wanted to take overall control. Especially as the TD-SCDMA technology is still in the developmental stage, with no government department willing voluntarily to take/share the risks involved. [27] Therefore, it is common to see that China's TV news announcements, from the Chinese government, were co-signed by many departments. A joint effort will be the best approach for the development of TD-SCDMA systems, as friction can be avoided when the related departments work as one unit.

4.1.3 The telecom operator as actor:

China Mobile had more than 700 million GSM 2G mobile subscribers today. From the cash income point of view, China Mobile's income was many times larger than the other two operators, making them financially unequal. The government's expectation was that there should be a competitive environment operating, but measures for the balanced growth of these three state owned operators needed to be in place. However, China Mobile wanted to up-grade its GSM 2G directly to a more mature WCDMA system for financial advantages. It was therefore unwilling to adopt the uncertainty of TD-SCDMA the third 3G standard. The re-organization (Re-Vamp) is a must for the uneven resources distribution.

The telecom organization and workers had formed a closed community making it difficult for outsiders to break into the China telecom field. Three generations of members of the telecom industry had participated and worked in this community, which was established many years previously. These series of Telecom reforms were based on data taken from the experiences documented from many foreign countries.[28]

4.1.4 The Primary actor (TDIA):

Before 1998 one government telecom research academy was assigned to carry out studies of the latest telecom technology and telecom future development trends. Later Datang Telecom technology Co Ltd (DTT) was formed. In the late 1990s, Datang Telecom Technology Co Ltd (DTT), presented the TD-SCDMA the third 3G standard to the International telecommunications Union (ITU).

The TD-SCDMA Industry Alliance (TDIA) was transformed from the above mentioned government telecom research academy role and started its own course in Oct, 2002. This functioned as a social organization formed voluntarily by the enterprises actively committed to the development of TDD mobile communication technology and engaged in R&D, production, manufacture and service of the TDD standard and products. TDIA explained the

difficulties caused by the corporation of governmental departments. These Government Departments included: The State-owned Assets supervision and Administration Commission (SASAC); the State Development and Reform commission (SDRC); and the Ministry of Science and Technology (MST) etc. They needed an organization like TDIA for two reasons: (1) It is difficult to initiate talks between the equally held positions in the different government departments. (2) Coordinating the specific roles/jobs is very important. For example: preparing the format for meeting topics, to be circulated before the meetings. Every government department as well as all the industry chain members will express their concerns and ideas. These different opinions will be consolidated by someone who does not belong to any specific department, ready for negotiation. The Primary actor is indispensable in this process.

4.2. Problematization

China's telecom industry used TD-SCDMA to carry the mission of national development forward and leads the international market with its advanced telecom technology. The fact is that most of China's national enterprises are still in the lower stages of the industrial circle and depend on foreign core technology. TD-SCDMA will help China's hi-tech industry realize its "catching-up" strategy, it has great potential, and the development will bring a strong demonstration effect. And form a huge industry group with proprietary characteristics. The evolution of TD-SCDMA industrial groups will demonstrates the spirit of the nation. The developmental of the TD-SCDMA telecom industry serves as a case study of how a nation develops its technology. The achievements of TD-SCDMA may consolidate China's superiority in the TD-SCDMA intellectual property rights and will strengthen the advantages of China's telecom companies in the competition involving TD-SCDMA. [29].

The common goal then will be: The development of TD-SCDMA to carry the national telecom industry forward and lead the international market with its advanced technology for future developments.*

Obligatory Passage Point (OPP)

After ITU approved the TD-SCDMA standard in 2000, in Oct, 2002, China government assigned the bandwidth total of 155 MHz to be used for TD-SCDMA. This freely assigned the use of the national resources of the spectrum, which was very different from many other countries, to run a new system. This could be a sign of the government's intention to support and run the possible new system.[30].

TDIA started with eight (8) executive members in Oct, 2002. After further discussion with different government departments separately and jointly; and

following their mutual agreements, they promised a joint funding for the initiation of testing. Made government and all TDIA members agreed and the Obligatory Passage Point (OPP) reached by the efforts of TDIA. The Secretary-General Yang said to the ** author (June5, 2011 Beijing) that he closely studied the different tasks of each department and found their common interests and beneficial points for each department. [31].

4.3. Interessement

The end of each successful test would draw more companies to join the TDIA membership. A series of tests were conducted: In June 2005, industrialization tests were completed, which has shown that the technical performance and operation value of TD-SCDMA networks possess the capability for large scale network construction. The Chinese Ministry of Information Industry (MII) then announced that TD-SCDMA would become the national technology standard for China Telecom industry, and more members joined. In March 2006 MII conducted six city network technology application tests, the three major operators attended. In March 2007, TD trial networks were planned to be deployed in ten major cities. Behind the task was a need for more technical actors to join the test and the opportunity for future business which would drive the manufacturers to join as members of TDIA.

An international telecom event in November 2007 was also an important interessement factor: the LTE TDD fusion technology program was signed by 27 companies on 3GPP RAN 151 meeting, and its frame structure was identified based on the frame structure of Td-SCDMA. It opens the door for TD-SCDMA to evolve toward TD-LTE and 4G mainstream standards. This acted as a motivation factor for technical company's interest for future developments.

The Chinese government used the Beijing Olympic Games as a driving force to promote the technical developments of TD-SCDMA technology by announcing that TD-SCDMA would be demonstrated during the games. On April 1, 2008 eight host cities of the Games formally launched the networks and the trial test for commercial operation which was preceded by eight years struggle and experiences. China mobile provided 100,000 units of TD-SCDMA handsets for the Olympic staff and volunteers as well as for workers. In June, 2008 China Mobile finally joined TDIA as an executive member. Now all the actors have been persuaded and are willing to be a part of the whole industry chain.

The TDIA members increased periodically, and the membership has exceeded 84 in 2011, covering all the TD-SCDMA telecom industry chain: 5 in Core Networks; 10 in RAN; 11 in Repeater; 8 in Antenna; 6 in RF Devices; 24 of UE –mobile phone; 18 of Services & Applications; 7 of Terminal solution; 5 in Terminal solution; 5 in Modem IC and 5 in RF IC, several companies were

involved and covered several areas. An industry chain and a multi-vendor environment were formed. [32].

4.4 Enrolments

All actors along with the TD-SCDMA telecom industry chain were motivated when on January 7, 2009, the TD-SCDMA, WCDMA and CDMA2000 the country's three 3G licenses were granted. The China Ministry of Industry and Information Technology (MIIT) granted China Mobile Ltd., China Unicom Ltd. And China Telecom Co., Ltd. Respectively. MIIT, indicated that at least RMB200 billion (US\$29.3 billion) by the three telecom operators would be invested in 3G over the next two years. The most direct beneficiaries would be the upstream and downstream players in the telecom industry. One of the main reasons for the delayed issue of 3G licenses is that China was waiting for the TD-SCDMA industry to fully mature.

TD is comparable to the other two 3G standards, and the gap between them lies in the industrial chain and product maturity. "Only when it is commercially deployed can TD become increasingly mature," said one expert.

The China government is rendering full support and the operator China Mobile is paying close attention to TD-SCDMA, resulting in increased investment in the TD-SCDMA industry by top-brand domestic and international mobile device and handset manufacturers. [33].

4.5 Mobilization of Allies

Independent innovation has become a top-priority policy of the Chinese government, and TD-SCDMA is therefore a path that must be followed. "Only success is acceptable, and no failure will be tolerated," said one minister when giving instructions to China Mobile on TD-SCDMA. Some statistics indicate that the mobile Internet has become the trend of the future mobile communication business. From the perspective of national strategy a long term corporation structure needs to be secured.

The independent innovation idea turned out to act as a country's operational principle. China is run by the government principles, for example the 5 year plan etc. President and the Communist Party of China (CPC) General Secretary Hu Jintao pointed out in his report to the 17th National Congress of the Communist Party of China on Oct 15, 2007 that: "Enhancing the ability of original innovation and building an innovation-oriented country" lies at the core of China's development strategy and is the key to improving overall national strength. TD-SCDMA development was a good match for the country's policy and principle, and "Innovation", which is President Hu's point of emphasis, aims to create and strengthen China's "soft power". The "soft power" of a country

refers to technology and innovation that identifies the entire nation while the “soft power” of an enterprise includes core technology, national standards and brand equity. Actors now worked not only for the business earnings, the mission that the President lifted. Posses a meaning for the task itself.

China’s 3G market investments will reach at least 1 trillion Yuan, some experts forecast that the value of TD-SCDMA is expected to contribute 18 trillion Yuan to China’s gross domestic product. In the past two decades, China’s mobile communication industry has grown to become a telecom giant that can take on any opponent around the world. It has also become a leading component of the national economy. This also can be considered as the demonstration effect of the actors among the industry chain. [34].

5. Discussion:

What kind of Regulator and regulations had China formed to conduct the TD-SCDMA, TD-LTE/ FD-LTE, Mobile-TV, Cloud Computing City implementation? Normally, it would take years for the development of the industry chain elements for upstream and downstream manufacturers. Mainly these covered chips, equipment, handsets, and services. For instance, the WCDMA and CDMA2000 had started this process much earlier. From a global marketing point of view, will there be an opportunity to become compatible? Other 3G networks could have been launched earlier also in China, but China (state, CPC) wanted to have TD-SCDMA ready; postponing deployment of 3G networks is a regulatory act (that implements national policy). Likewise, the LTE, Mobile-TV, Cloud Computing City may be conducted by Chinese government for their development paths.

But the China Government is composed of eight Ministries and some independent research departments. All ministries were empowered equally, and therefore, the Ministry of Industry and Information Technology (MIIT) that led the TD-SCDMA development project had to face the most challenging issue for this development strategy. That is the coordination of the overlapping responsibilities between the government departments. This was the typical way Chinese governmental ministries worked together to make things happen and everyone was not only involved but also shared the responsibilities.

How does the government department make things function properly? This is exemplified by a joint statement issued by the Ministry of Industry and Information Technology (MIIT). The CEO of each operator was nominated by MIIT, with the agreement of: The State-owned Assets supervision and Administration commission (SASAC), The State Development and Reform commission (SDRC), The Ministry of Science and Technology (MST), and The Ministry of Finance (MOF). The functions of these departments/ministries had overlapping responsibilities and their decisions were jointly agreed.

China does have a kind of vertical democracy system: On March 8, 2011 China Daily News reported on page 13: China Mobile will set up more than 1,000 base stations in seven cities in 2011 for the TD-LTE test. According to Bill Huang, President of China Mobile's research Institute, China Mobile has signed agreements with nine international telecom carriers to help deploy 27 TD-LTE trial networks worldwide. Without giving a timetable, the Sprint/Clear-wire and Light Squared have announced they will adopt TD-LTE. Chairman of China Mobile, Wang Jian-zhao, commented during the 2011 Chinese People's Political Consultative Conference, the nation's top advisory body that the Chinese government would draw up development plans for TD-LTE. This would send a clear signal to the market and help domestic and overseas resources to flow into the TD-LTE industry. [35]. The centralized structure of the Chinese government provided open channels for constructive recommendations and suggestions for the development of the country. From the lowest levels upwards there are opportunities to express good ideas. The Chinese People's Political Consultative Conference is one such channel. Members, including men and woman of all ages, come from various levels covering different fields such as workers and business representatives.

In China not everyone had benefited equally from the rapid growth of earlier decades, resulting in growing inequality. The greater reliance on markets had meant that in some dimensions, such as health and education, living standards in some rural areas probably had deteriorated. The rapid growth had also put enormous strains on the environment, and it was clear that such growth was not sustainable over the long run. The path that was being taken was not consistent with a harmonious society, and a new direction was needed.

At the same time, it was necessary to continue rapid growth, if China was to provide jobs for the burgeoning population, and if it was to have the resources required to meet the vast social needs. However other countries have shown that even rapid growth may not lead to an increase in jobs, there can only be job growth if output grows more rapidly than productivity.

Globally, its successes in exporting were not being well received by many elsewhere who saw their jobs being threatened. It was one thing to talk about the virtues of competition and the market, but it was quite another thing for those countries to lose in the market game, and in many quarters, shrill protectionism sentiments began to be heard. [36].

6. Conclusions:

Thirty years ago, China set forth on a new course. Deng Xiao-Pin talked about a policy of "crossing the river by feeling the stones." The policy that underlies this approach is partially responsible for China's enormous success. And the "trial" method is a efficient and effective way for new technology implementation. Now China has gone more than half way across the river, what

is on the other side is clearer. What kind of market economy it chooses will affect what kind of society it will create? Even as China crosses the river by feeling the stones, creating a Market Economy with Chinese Characteristics that is consistent with China's distinct circumstances and values will require a New Economic Model.

Opportunities and challenges to the China telecom industry will rely on the economic globalization. It is now making each country's economic interpenetration and interdependence of national economies with the world economy. This means the indivisibility of the world economy is moving from the era of industrial economy towards globalization, with a knowledge-based economy. Economic globalization to China's telecom Industry raised competitive pressures and challenges. The economic globalization requires well-known international conventions and rules, but also that its development provides rare opportunities and broad market space. [37].

The book "Making Globalization Work" is aimed to show the inequities of the global economy; the mechanisms that the developed countries used to exert an excessive influence over developing nations. Dr. Stiglitz argues that through tariffs, subsidies, an over-complex patent system and pollution, the world is being both economically and politically destabilized. Stiglitz argues that strong, transparent institutions are needed to address these problems. Stiglitz is an exception to the general pro-globalization view of professional economists, according to economist Martin Wolf. Stiglitz argues that economic opportunities are not widely ** available, that financial crises are too costly and too frequent, and that the rich countries have done too little to address these problems.

Towards a Digital Society will enhance the people on earth knowing each other better. The communication availability is a key for the future society. We hope the new technology will help us to build a better world.

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