School of Management

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An analysis of Factors Influencing the Telecommunication Industry Growth

A case study of China and India

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Abstract

The Telecommunications industry today is a key enabler of productivity across economies and societies. The Telecom industry is not only a significant contributor towards the economic activities of countries, but also towards the growth of other industries. In recent times, developing nations have witnessed significant transformation within this sector due to the impact it has had on their economies. The booming and emerging economies of China and India have been impacted the most by the rapid growth of the Telecom industry in the past decade. The aim of this thesis is to research the most influencing factors affecting the Telecommunication industry growth, by analyzing data for both Chinese and Indian Telecom industries.

In this report, data gathered from questionnaires, interviews, literature reviews and analysts' reports are used to compare and discuss the contribution of different factors influencing the Telecom industry. Data analysis methods such as Weighted Mean Calculations, for analyzing the questionnaire data, and Granger Causality Test, for further co-relating data from the questionnaire with the Telecom industry revenue figures, are used.

Factors such as "Number of Subscribers", "Technology Innovation" and "Government Regulation and Polices" were found to be the most influential and contributing factors towards the growth of the Telecom industry in China and India. Analysis based on historical statistics revealed that, there is no direct impact on the industrial revenue from the "number of Subscribers" factor, unlike the "Technology Innovation" factor. Also, the contribution of "Government Regulation and Polices" as a factor, seems to be more obvious for the Chinese Telecom industry compared to that of India.

Key Words: India, China, Telecommunications, Telecom Industry, Competitiveness, Telecom revenues, Telecom Subscribers, Telecom Industry Policies and Regulations

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Abbreviations

2G	Second Generation (wireless telephone technology)
3G	Third Generation (wireless telephone technology)
AMPU	Average Margin Per User
ARPU	Average Revenue Per User
BRICS	Brazil, Russia, India, China and South Africa
CCI	Communications Commission of India
CNNIC	China Internet Network Information Center
CAGR	Compound Annual Growth Rate
FCC	Federal Communications Commission
FDI	Foreign Direct Investment
FICCI	The Federation of Indian Chamber of Commerce and Industry
GDI	Gross Domestic Income
GDP	Gross Domestic Product
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
ILD	International Long Distance
MII	Ministry of Industry and Information
MNC	Multi National Company
NLD	National Long Distance
R&D	Research and Development
TD-SCDMA	Time Division Synchronous Code Division Multiple Access
TRAI	Telecom Regulatory Authority of India
UAS	Unified Access Service

USCC	U.S.-China Economic and Security Review Commission
USOF	Universal Service Obligation Fund
VAS	Value Added Service
WCDMA	Wideband Code Division Multiple Access
WiMAX	Worldwide Interoperability for Microwave Access
WTO	World Trade Organization

1. Introduction

This thesis investigates the most influential factors contributing towards the growth of the telecommunication Industry in China and India, and analyzes the nature of effect these factors have on their respective industries' growth. The data collected is further used to discuss how these factors could be improved in order to better the existing conditions of the industry today.

1.1. Background of the Problem

China and India are among the largest and fastest growing economies in the world today, which share some key common elements. For example: geographically they share the same continent and are separated by a common border, demographically they are "giants", with populations exceeding one billion, and historically the two countries have a rich and long history, making them world leaders until the 19th Century. Their development is also somewhat similar in economic terms although their economic growth differs in timing, intensity and key characteristics of development processes (Enrico and Marcello, 2011).

The telecom industry is an interesting industry to study, not only due to its volatile nature in terms of technological breakthrough and its policies, but also due to the high growth rate of this industry over the past few decades and the significant contribution of the industry to the economies of these nations. China is now the world's largest telecom market and according to analysts' figures, there are more than 1.25 million cellular subscribers signing up every week (Pyramid, 2003)! Meanwhile, India has become the most competitive and one of the fastest growing telecom markets with an expected growth rate of over 26% and generated employment opportunities for about 10 million people (PTI, 2007).

The number of subscribers were added at a rapid pace as shown in Figure 1, which adds to the growth and importance of the industry. Though it has made the telecom one of the most lucrative sectors today, it has also had a negative effect on the other hand. For instance, India recently witnessed a scandal in the telecom ministry that has changed the nature and environment of foreign investment flowing into the country (Kate and Leila, 2012).

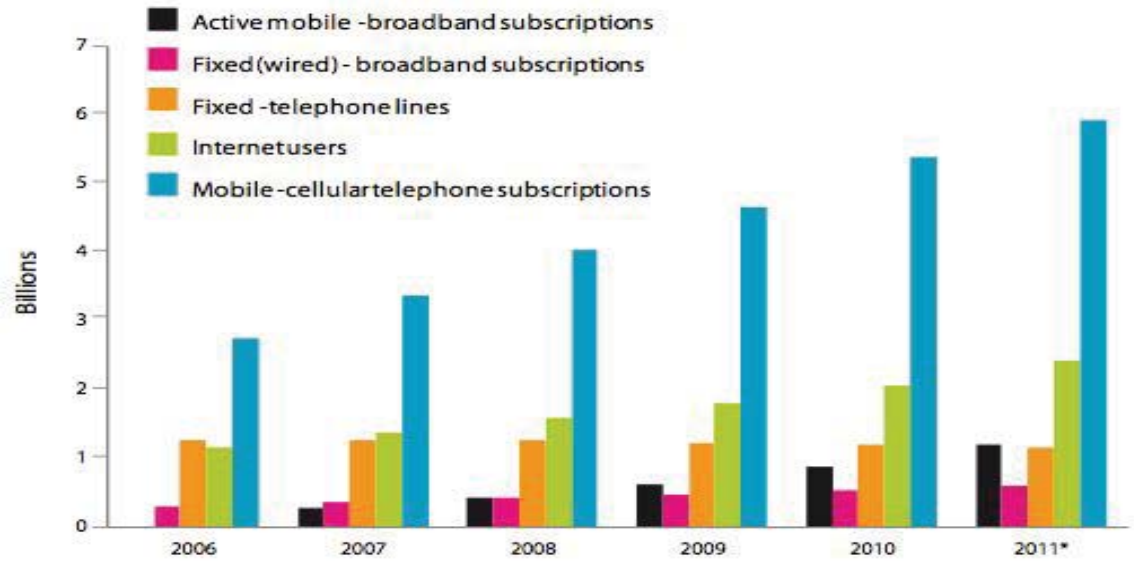

Figure 1 – Growth of Telecom subscribers

Source: ITU World Telecommunications/ICT Indicators database

By using Porter's Five Forces for analyzing industrial competitiveness of the telecommunications industry, this thesis compares the key factors contributing to the telecom industry's revenue for the two economic giants, China and India. The adaptation of this model is because of it robustness and also that it has been tried and tested over the years.

The uniqueness of this thesis lies in the fact that the influential factors' analysis is based on a time series statistics of data collected about the telecom industry's performance within the two countries over the past 11 years. Reason being choosing the telecom industry and nations as China and India is because of the researchers' familiarity with them. In addition, there are various standards existing in this industry and not all are shared between the two countries such as the government policies and regulations related to this industry, which are vital to its growth and expansion.

1.2. Statement of the Problem

Many research papers exist today, which discuss the growth and emergence of China and India in recent times. Most of research was based on the countries' economic performance, political environment, foreign investment, labor issues, etc. (Daniel Park, 2007, ParikshitBasu, 2007). Research works based on the telecom domain are either specific to a

particular technology such as Broadband (Nir and Nikhilesh, 2007) or brief analysis of the financial statement of the telecom industry (TRAI, 2006) in both the nations. There are also papers discussed the impact of communications on a whole towards developing markets.

This thesis intends to fill the gap about understanding and analyzing the key factors that influence the growth of the telecom industry in both the countries by using Porter's Five Forces about industrial competitiveness. Moreover, results were achieved from statistics testing based on data collected from various sources such as questionnaires, state statistics, analysts' reports and interviews.

1.3. Research Objectives

1.3.1. Overall Objective

The overall objective of this case study is to establish the relationship between the revenue of the telecom industry and its identical factors, which attempts to supplement the majority of the previous studies that fulfilling economic needs rather than academic desire.

1.3.2. Specific Objectives

The specific research objectives of this thesis are as mentioned below:

1. To identify the most influencing factors of competitiveness in Chinese and Indian telecom Industries.
2. To analyze the correlation between the selected factors and their contribution to the telecom industry revenue in both countries.
3. To suggest ways to improve these influencing factors to the benefit of future researchers and practitioners, in the telecom industry of both the countries.

1.4. Research Question

What are the competitive factors contributing towards the revenue of the Chinese and Indian telecom industry?

1.5. Significance of the Study

Both China and India are deemed as the fast growing markets, and economists claim that these two countries would continue to contribute more than half of the world's economic growth despite slow down during recent times (The Economic Times, 2012). This thesis, by applying the theoretical framework of Porter in comparing the industrial competitiveness of two nations, aim at developing recommendations for improving competitive strategies for their industrial performances.

This study will elucidate knowledge about the competitiveness of telecom industries in the two countries. On one hand, this knowledge will help in realizing the prevailing business environment in this sector in both China and India, while on the other hand; the study findings will serve as lessons to be shared by other developing countries in shaping their telecom industries. Therefore, the findings of this thesis will be useful for researchers, academicians and practitioners.

1.6. Delimitation of the Study

Due to the time constraints, scope of the study was restricted to focus only on primary telecom companies as representatives of the industry, which could result an overlook on certain industrial element. Language barriers existed during the data collection phase is another since some of the information was only available in local language, in particular in analyzing Chinese telecom industry.

2. Literature Review

This chapter reviews the literature that has been used extensively in forming the thesis report. This chapter has been divided into different sections covering all the important aspects of the research subject.

2.1. Growth of the Telecom Industry

Telecommunication basically is the transmission of signals over a distance for the purpose of communication, though the technology involved in communicating has changed significantly over the years. Like telecommunications itself, the telecommunications industry is broader than it was in the past. Telecommunication has a significant social, cultural and economic impact on the modern society. In 2008, estimates placed the telecommunication industry's revenue at $3.85 trillion or just under 3 percent of the gross world product (Plunkett Research Limited, 2010). The telecom industry is one of the world's fastest growing industries regardless of what the indicators being measured according to Wauschkuhn (2001).

The telecom industry in India and China is relatively new compared to their western counterparts, but they are now growing and evolving at an unimaginable pace. As a result of being a high profit generator, the telecommunications industry has historically been an agent of the government and owned by the state in both the countries. But over the last two decades, there has been a concerted effort to loosen the shackles of governmental control (Deutsche Bank, 2004). On one hand, it has taken the form of privatization of the state owned telecommunications; and on the other hand, it has opened up the domestic market to provide licenses to new entities for bringing in competition to the existing monopoly operators. According to figures from 2006, the Mobile subscribers in India were growing at a CAGR of around 85% since 1999 and over 4 million mobile subscribers were being added every month (TRAI, 2006). On the other hand China registered a growth of 16% in the mobile subscriber base in the year 2005 with monthly addition of 5 million subscribers every month (TRAI, 2006).

2.1.1. Indian Telecom Industry

"*Comment: Politics and economics of Telecom liberalization in India*" by Chowdary T.H. published in the Journal of Telecommunications Policy in 1998, describes the ideological background to more than 40-year monopoly of the Department of Telecommunications over Indian telecommunications. It traces how the monopoly was eased between 1986 and 1991 and the government had to give up its policy of central planning and control (Chowdary, 1998). This was the phase of pre-reforms in Indian telecom sector, which plays a vital role in setting the scene for growth post the 1991 reforms, and the Chinese telecom industry underwent a similar phase before the markets were opened for reforms. The paper also summarized the events that led to India opening its doors to Foreign Direct Investment (FDI).

The analysts' report published by Ernst and Young in collaboration with FICCI titled, "*Enabling the next wave of telecom growth in India – Industry inputs for National Telecom Policy 2011*" is a comprehensive report about the evolution of the telecom sector in India over the past decade. This report tracks the changes in terms of technological advancements, business dynamics and socioeconomic environment over the years. The research program studies in detail all the key segments of the telecom landscape — wireless, wire line, broadband, infrastructure, NLD, ILD, value-added services (VAS), equipment manufacturing, infrastructure and convergence. Moreover, it also identifies and evaluates the critical success factors that are applicable across all telecom segments such as spectrum, USOF, licensing framework, FDI, security, consumer affordability and the role of the regulator (Ernst and Young, FICCI, 2011). Last but not least, it also includes comprehensive interviews conducted with senior executives in the Indian telecom sector, which provides a firsthand perspective about various stakeholders involved in the telecom sector.

Though the state owned telecom company Bharat Sanchar Nigam Limited (BSNL) remains as the pioneer in the telecom market of India, private operators obtained a high market share (Arun, 2011), among which, India's largest mobile operator Bharti leads the pack with over one-fifth of the telecom market, followed by 16.71% from Reliance who is the third largest mobile operator, 16.52% from Vodafone as the fourth largest and 11.16% from the fifth largest mobile transport TATA Group business.

The latest report released by Telecom Regulatory Authority of India (TRAI, 2010) indicated that India has 771.18 Million mobile users, 350 million fixed-line subscribers and nearly 180 million Internet subscribers.

2.1.2. Chinese Telecom Industry

Markus Wauschkuhn (2001) discusses the growth of the Chinese telecommunications sector in "*Telecommunications and Economic Development in China*", in which he argues that the Chinese telecom growth resulted from both the economic and institutional reform policies. He also highlights the role of the regulator, the changing of the framework and the adjustment of the license charges during the growth period. Historical data in graphs and figures are used to compare the growth of subscribers in both India and China over the years and also the growth of telecom services in China.

Lain Mills (2011) in an article titled *"The rise of China's telecommunications industry in less than 20 years*", published by World Politics Review analyzes how China's telecommunications industry has developed from a primitive state monopoly industry into the world's largest mobile phone and Internet communications market today. Through a series of overseas acquisitions and joint ventures with foreign partners, leading companies in China established international business relations. With strong technical capabilities and price advantage, Chinese companies such as Huawei and ZTE, quickly dominated the international market of telecommunications products and services. (Chengchang Wang, Abhinav Kishore, 2009).

By looking at the historical, political and economic perspective, *"The evolution of China's* t*elecommunications equipment market: a contextual, analytical framework*" authored by Brian Low (2005) researches the potential for domestic and international telecom equipment manufacturers to enter the business in China. This case study, by splitting the industry development into different stages, gives a detailed overview about the history of the telecom equipment industry in China. It also discusses the entry of different equipment manufacturers' pre and post reform. Its validity lies in the estimation of Research and Development spending by telecom companies worldwide in comparison to Chinese manufacturers. Though the article is from 2005, it is very informative as it throws light onto

the growth of the Chinese telecom industry, provided that there are so few articles and research papers available in English about the Chinese telecom industry.

2.2. Competitiveness between Multinational Companies and Startups

Should domestic firms in late-industrialized countries develop their innovation capacity during the early stages of catching-up process? Research suggests that innovation capability and self-developed technologies have been the key to lead domestic firms' catching up with multinational corporations (Peilei Fan, 2006).

In emerging markets, established multinationals typically take the early lead in the high-end consumer and high-performance industrial segments, whereas local companies do so in the low-end and low-performance segments. However, as the economy develops, both customers and competitors evolve (Pankaj and Thomas, 2008).Developing countries are pulsating with companies that think of themselves as the next multinationals, pushing outward from their home bases to establish global presence if not dominance (Pankaj and Thomas, 2008).

2.3. Factors Affecting the Growth of the Telecom Industry and Their Current State

Innovation was the key factor for the revenues of the telecom industry in the western countries. Today, however, new wireless applications, low-cost manufacturing innovations, and handset design are some of the areas in which the Asian countries are out-investing the United States and are seen resulting bottom-line impacts to their economies (National Research Council, 2006). In emerging markets, factors such as customer service, regulations and policies are some of the main factors that are shaping the industry.

2.3.1. Performance of Operators

Roma Mitra Debnath and Ravi Shankar (2008) discuss the methodology used to benchmark the performances of service providers in order to create a loyal customer base as well as to retain it, and they claim customer service is one of the factors that influences the revenue growth of the telecom industry.

2.3.2. Market Liberalization

Shilin Zheng and Michael R. Ward (2011) demonstrates the effects of market liberalization and privatization on Chinese Telecommunications, from which, they give an insight into the current state of the Chinese Telecom industry. India has also taken the privatization path in the telecommunications sector and the market is now mainly dominated by private companies with two state-run operators only.

2.3.3. Policy and Regulation Issues

The telecommunications policy in countries like the United States of America is a framework of law directed by government and the regulatory commissions, most notably the Federal Communications Commission (FCC). One of the goals of the FCC is to best utilize this limited resource, in such a way, it brings the "highest and best use" (Wikipedia, 2003).

The Government of India aims to develop the nation as a global telecommunication hub and provides regulatory support to the industry to achieve the goal and to propose 'infrastructure' status to telecom (IBEF, 2011).China's successful reform on the other hand, is now often called another East Asian miracles, has been attributed to policy changes to take advantage of comparative advantages in labor-intensive goods (Lin et al., 1996).

2.4. Future of the Telecommunication Industry

Telecommunications has been and will continue to be an important foundation for innovative new industries that use telecommunications as a primary technological enabler and foundation (National Research Council, 2006). That being said, one should know that "not everything that glitters is gold". For example, the emerging markets face lacking of talented resources and intense competition in order to sustain the growth that has been observed over the past few years (Ken, 2007).

The importance of regulatory and policy changes are stressed upon in order to adapt to the future and maintain the growth rate of the telecom industry in both the countries (Manas, 2011 and USCC, 2011).

3. Methodology

This Chapter discusses the research methodologies adopted and the various data collection methods used for the thesis. The research methods were designed considering the research objectives of this paper. Hence, the strategy employed and the instruments developed were to determine the major factors contributing towards the revenue of Chinese and Indian telecom Industries.

To answer the research question, the factors that have the potential to influence the telecom industry in both Chinese and Indian markets were shortlisted based on Porter's Five Forces model and further developed as key questions in the questionnaire. Results obtained from the questionnaire were used as the primary data. This was then processed along with the secondary data collected from statistical reports, to determine the factors that directly influence the telecom industry revenue.

3.1. Research Approach

The pragmatic approach, which involves using mixed methods that are best suited to the research objectives, was applied for this thesis. It was chosen not only to overcome the limitation of each single method and the limited project time, but also because a combination of research methods improves the quality of research (Kaplan and Duchon, 1988).

Yin (2003), argues that triangulation grants full flexibility to use various methods that complement each other. Depending on the actual need, the research techniques and procedures applied in the thesis were either associated with quantitative or qualitative research. For instance, to obtain respondents' view about the influencing factors of the Chinese and Indian telecom Industries' revenue, the questionnaire consisted of both close-ended questions for quick tabulation, and open-ended questions that allowed respondents to suggest their own factors. To test the null hypothesis about a particular factor's impact on the growth of the Chinese and Indian telecom Industries', a combination of primary data from survey results and secondary data from published financial and industrial statistics were used to improve the validity and creditability of the analysis.

The research structure overview as show in Figure 2employs a three-layer approach aiming at developing an experimental model to study the empirical findings.

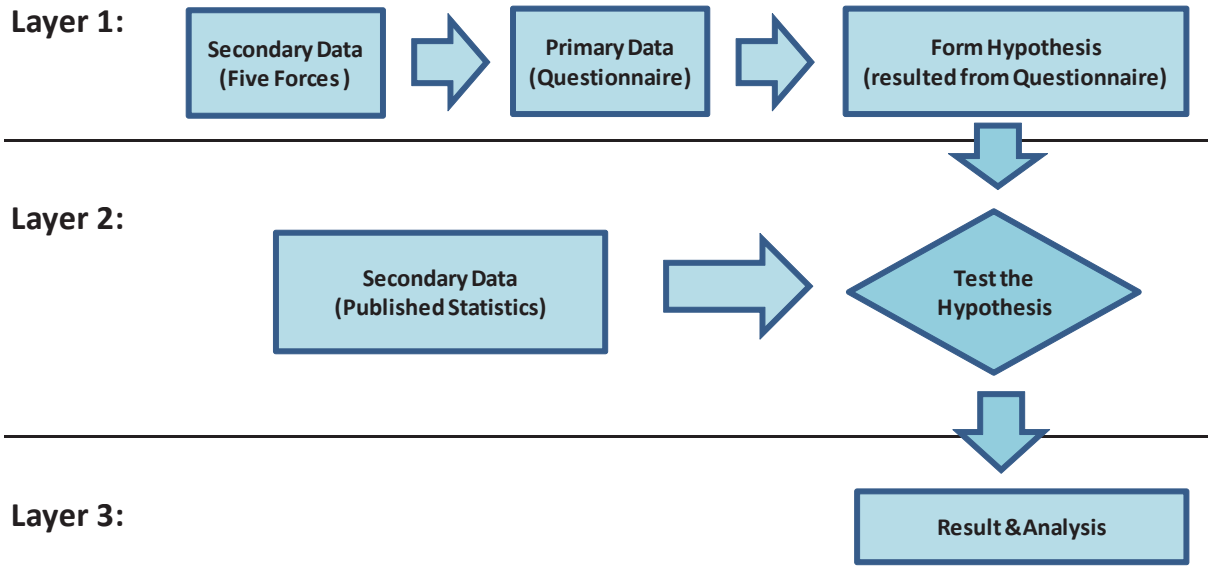

Figure 2- Research Structure Overview

3.2. Questionnaire Design

Porter's Five Forces model systematically accommodates industry analysis (Enright, 2000), making it the best-suited theoretical framework to study the determinant factors of the telecom industry revenue. The Five Forces model refers to competition from both internal threats and external resources (as shown in Figure 3) to determine the industry competitive intensity and the overall industrial profitability of a market (CBS, 2011).Therefore, it was used as the conceptual framework for this thesis to analyze influencing factors of the revenue growth in Chinese and Indian telecom industries.

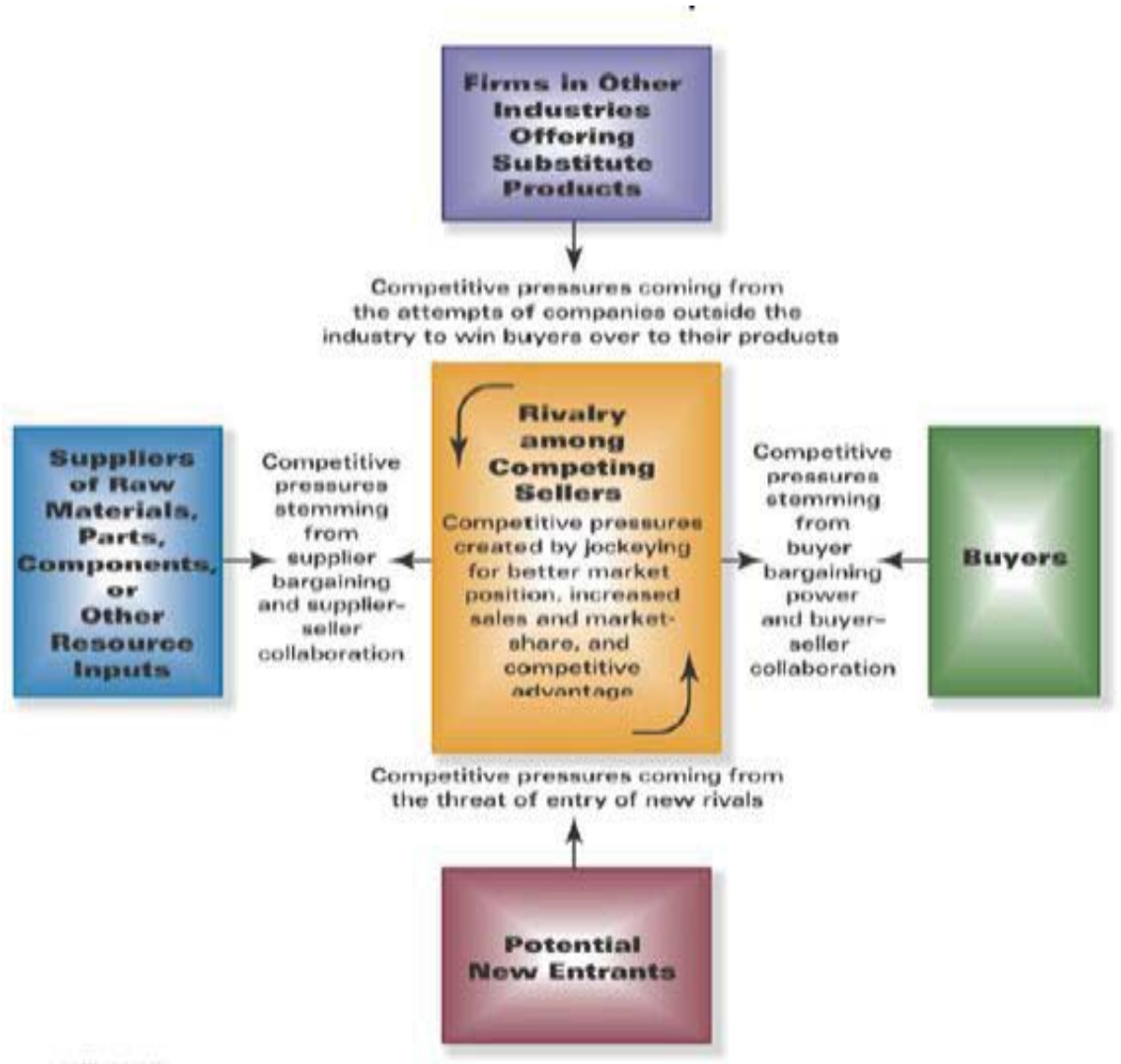

Figure 3 - Define the nature of competitiveness

Source: Sven, 2012

From Porter's Five Forces model and comprehensive literature review of methods on carrying out the industry study, a brainstorm was called for listing out potential factors in influencing the industrial performance. This aimed at obtaining the widest data range possible, and took into account factors from various dimensions such as customers, suppliers and other stakeholders who are relevant to the industry analysis.

To improve data accuracy and objectivity, the questionnaire contains three sections. Section one consists of demographic questions about the respondents. Section two is about the ratings for key factors on influencing the telecom industry revenue, and section three throws an open question to try and cover any factor(s) beyond the defined list. Based on the

questionnaire design that was stated earlier, there were eleven questions chosen. These questions were arranged in scale in order to rate the opinion of users on the key factors influencing the growth of the telecom industry. The questionnaire is included in Appendix A of this report.

3.3. Sample Size and Sampling Techniques

The minimum sampling size was calculated as 30 by using the following formula (Levin Richard I. and Rubin David S, 1998):

$$N = p\% \times (z/e\%)^2$$

Where

N is the minimum sample size required

p% is the proportion belonging to the study

z is the z value corresponding to the level of confidence required

e% is the margin of error required

Random Sampling method was employed for the sample selection. This was to avoid selection bias and create equal opportunity in conducting the survey for the sample population. When conducting this sampling strategy, it defined a list of employees among the research population coded with sequential numbers in front of their names. The lottery sampling was then repeatedly used to finalize the respondents. By doing so, everyone in the research population was given an equal chance to participate in the questionnaire.

3.4. Data Collection

3.4.1. Primary Data Collection

In order to identify the key determinants of industrial revenue in the Chinese and Indian telecom industry, inputs from professionals who work or have worked in the telecom industry in China or India were invited. The respondents were selected from the top three local telecom companies from both countries. The assumption was that these respondents had better understanding of the nature of the industrial competitiveness and thus ensured

that the results obtained fit in their local content. Considering the time and geographic constraints, the questionnaire was forwarded by mail and also asked over telephonic interviews to guarantee minimum sampling size and to speed-up the data collection process. The results from the questionnaire may to a certain extent produce biased response, due to the fact that small and medium size companies' professionals were not in scope of the survey.

3.4.2. Secondary Data Collection

The top three highest rated factors obtained by processing the answers to the questionnaires were - "Number of Subscribers", "Technology Innovation" and "Government Regulations and Polices". These factors were selected to form the null hypothesis of factors in relation to the telecom industry revenue. To test the hypothesis, statistics over the last 11-year period between year 2000 and 2010 was collected on:

1) The annual revenue of the telecom industry in both China and India, and

2) The annual data figures for each of the 3 factors for both countries.

Though it covers a limited data range of 11 years, reliable data sources such as World Bank and published National Statistical Yearbook ensured the validity of the results. Furthermore, the discussion facilitated at the end of the thesis by analyzing peer literature reviews, revealed the empirical findings and their implication to the future growth of the telecom industries in China and India.

3.5. Data Analysis

Since various methods of data collection were employed to investigate the key factors affecting the telecom industry in China and India, it triggered a need for multiple methods to carry out the data analysis as well.

3.5.1. Weighted Mean for Questionnaire Results

The results of close-ended questions were assessed using five-point Likert scale ranging from 1 to 5."Strongly disagree" scores 1, "Disagree" scores 2, "Neutral" scores 3, "Agree" scores 4, and "Strongly agree" equals to a "5" score. To analyze the results obtained from the respondents of the questionnaire, the Weighted Mean Score was calculated. For the

open-ended question, personal interpretation to reasonably score the textual answers specified by the respondents was employed. Evaluative measures consisting of mean scores were then computed for all factors defined and factors ranked at the top 3 were put forwarded for further analysis as explained in the next section.

3.5.2. Granger Causality Test

The Granger Causality method is a statistical hypothesis test based on time series study that can be used to understand the correlation between the dependent variable(s) and the independent variable(s). This model is deemed as a good fit in this thesis to examine the causality between the telecom revenue and the factors - "Number of Subscribers", "Technology Innovation" and "Government Regulations and Polices".

The top 3 factors resulted from mean score calculation were identified as key factors in relation to the revenue of Chinese and Indian telecom industry. Following that, a comprehensive review of analytical techniques using the software EVIEWS for Granger Causality Test, was applied to test the hypothesis if the selected factors directly relate to the revenue growth of national telecom industry.

In order to examine the relationship, the following terms were defined:

- The three factors that resulted from answers to the questionnaire form the independent variables

- The revenue of telecom industry from China and India forms the dependent variable

The hypothesis were either accepted or rejected according to the 5% probability standard. This in turn answered the overall research question - *what are the influencing factors in the Chinese and Indian telecom industries that directly contribute to their revenue?*

3.6. Validity and Reliability

This thesis consists of both primary data and secondary data in addressing the research objectives as well in answering the overall research question and is grounded on a profound theory.

Kirk and Miller (1986) claimed the degree to which a given measurement repeatedly remains the same as reality. The statistics across a period of 11 years was collected from influential and reliable organizations such as International Monetary Fund, World Bank and the respective national administration offices. Besides that, the questionnaire built on the Five Forces model offers a solid theoretical model for industry analysis. The correlation between selected factors and industrial revenue were concluded from the systematic examination by the usage of Granger Causality Model - a well-founded measurement that has won Nobel Prize in Economics.

The key weakness with this thesis lies in the fact that it is very difficult to get deep insights into the industry environment. Also the self-selecting nature of respondents could create some source of bias. The non-compulsory nature of the questionnaire resulted in limited sampling size, which might also lead to a deviation of the analysis result to some extent.

4. Results and Analysis

"Number of Subscribers", "Technology Innovation" and "Government Regulation and Polices" were rated as the top 3 factors in influencing the revenue of the telecom industries resulted from the questionnaire survey. While examining them against the statistics collected for the industrial performance of both China and India from year 2000 to 2010, it was further concluded that:

- There is no causality between "number of subscribers" and "revenue of the telecom industry". Thus "number of subscribers" does not directly contribute to "revenue of the telecom industry".
- There is proven causality between "technology innovation" and "revenue of the telecom industry". Thus "technology innovation" is the one of the key drivers to "revenue of the telecom industry".
- "Revenue of the telecom industry" has direct impact on "government regulation and polices" in China but not in India.

4.1. The Selected Factors

After assessing all 30 filled questionnaires, the resulting top 3 highly rated factors were - "Number of Subscribers", "Technology Innovation" and "Government Regulations and Polices".

In question one, respondents stated as to what extent they viewed each factor contributing to the revenue of the telecom industry, which was rated on a scale from 1 to 5 ranging from "strongly disagree" to "strongly agree". The second question, marked optional, was intended to examine factors other than the ones mentioned in the questions asked previously. There were no suggestions to this question that were received from the respondents and hence, did not account to the analysis.

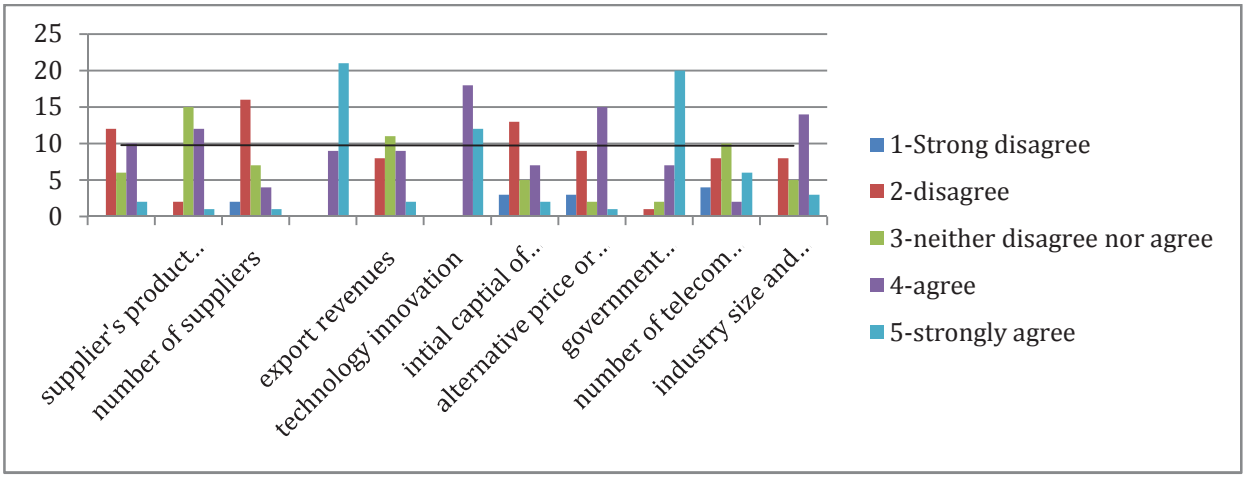

Figure 4 - Questionnaire Result

Figure 4 describes the results of the ratings. Of all respondents, two third of them gave the best rating i.e. "strongly agree" to the factor - "number of buyers/subscribers" and "government regulation and polices". Over half of the respondents answered that either "technology innovation" or "alternative price or quantity" might make a difference to the telecom revenue. 14 respondents rated "agree" for "industry size and trend", while the majority of them answered "number of supplier" or "initial capital of entering into the market" as key factors to the industry's revenue. All in all, "Number of subscribers", "technology innovation" and "government regulation and polices" received the highest mean score among all the other factors, which formed the null hypothesizes to be tested as discussed in the next section.

- There is direct causality between "Number of subscribers" and "Revenue of the telecom industry".
- There is direct causality between "government regulation and polices" and "Revenue of the telecom industry".
- There is direct causality between "technology innovation" and "Revenue of the telecom industry".

4.2. The Result of Granger Causality Test

To test the hypothesis formed on the results obtained from the questionnaire survey, relevant statistics of both China and India between year 2000 and 2010 was obtained to carry out the Granger Causality Test. Data was consolidated from reliable sources such as

World Bank and the National Statistics Yearbook from both Chinese and Indian authorities. As shown in Table 1 and Table 2 below, key data obtained were - the revenue of the telecom industry (REV), telecom subscribers per 100 inhabitants (SUB) as a measure of the number of subscribers, Government Effectiveness (GOV) as an indicator of government regulations and policies, and Fixed Internet coverage per 100 inhabitants (INT) as an indicator for technology innovation.

Table 1 - Statistics of China

China				
Year	REV : Telecom Revenue (USD Billion)	SUB: Total Telecom Subscribers per 100 inhabitants	GOV: Government Effectiveness	INT: Fixed Internet Coverage per 100
2000	227	18.13179465	0.37	0.001794645
2001	263	25.46644022	0.48	0.026440225
2002	305	32.93761403	0.5	0.257614027
2003	355	42.05077072	0.46	0.870770723
2004	403	51.63424281	0.5	1.92424281
2005	459	59.75487896	0.45	2.864878962
2006	529	66.92888819	0.5	3.878888194
2007	632	74.12943819	0.46	5.039438191
2008	766	80.15664796	0.57	6.256647957
2009	785	87.27979134	0.56	7.809791344
2010	932	95.43011059	0.58	9.440110588

Source: World Bank and National Bureau of Statistics of China

Table 2 - Statistics of India

India				
Year	REV : Telecom Revenue (USD Billion)	SUB: Total Telecom Subscribers per 100 inhabitants	GOV: Government Effectiveness	INT: Fixed Internet Coverage per 100
2000	7	3.42	0.42	0.0000000
2001	8	4.214666903	0.45	0.004666903
2002	8	4.997569528	0.39	0.007569528
2003	9	6.86269227	0.44	0.01269227
2004	15	8.780926255	0.46	0.020926255
2005	17	12.42824117	0.45	0.118241168
2006	20	18.06878335	0.47	0.198783353
2007	25	23.50661632	0.45	0.266616324
2008	26	32.75337569	0.36	0.443375685
2009	27.42	47.19133898	0.4	0.641338979
2010	33	65.1874249	0.44	0.897424905

Source: World Bank and National Bureau of Statistics of India

By using the software EVIEWS, statistics were tested under Granger Causality Model and the results are presented in Table 3 below. According to the 5% standard of probability, hypothesis with a P value below 0.05 can be rejected. Therefore, we can only turn down the hypothesis that REV does not Granger Cause GOV for China and INT does not Granger Cause REV for both China and India, which concluded the findings of the research that there is no causality between "number of subscribers" and "revenue of the telecom industry", there is proven causality between "technology innovation" and "revenue of the telecom industry", besides that, "government regulation and polices "has direct impact on "Revenue of the telecom industry" in China but not in India.

Table 3 - Granger Causality Test of hypothesis

Null Hypothesis:	Prob. (China)	Decision (China)	Prob. (India)	Decision (India)
SUB does not Granger Cause REV	0.2248	Accept	0.3805	Accept
REV does not Granger Cause SUB	0.83	Accept	0.417	Accept
GOV does not Granger Cause REV	0.3881	Accept	0.2278	Accept
REV does not Granger Cause GOV	0.0172	Reject	0.854	Accept
REV does not Granger Cause INT	0.0784	Accept	0.5275	Accept
INT does not Granger Cause REV	0.0471	Reject	0.0285	Reject

5. Discussion and Implications

The objective of this chapter is to discuss the results presented in the previous chapter. It elaborates the importance of each factor in relation to the telecom industry and its growth in both China and India. It also explains the causal relationship between the factors and the revenue generated by the telecom industry.

5.1. Factor One: Number of Subscribers

5.1.1. Role of Number of Subscribers in the Telecom Industry

From an industrial point of view, an increased number of subscribers would also stimulate the development of its related industries. An example would be the growing number of mobile phone users, which results directly on the demand for both hardware and software products. According to Porter's Five Forces theory, the growth of subscriber numbers can be related to the strength required to compete with existing competitors.

Another potential benefit that results from the steady growth of number of subscribers in the telecom industry is that, it gathers crucial customer related information. Operators maintain databases with personal information and choice, which is collected during the registration and cancellation processes. Customers are normally obliged to provide personal information as well as personal opinions on the product or service. This information is valuable for the company and the industry to understand better their customer's behaviors, preferences, and segmentations, which provides necessary statistics in order to improve the efficiency in marketing analysis.

5.1.2. Reasons for Increased Number of Subscribers

The dramatic increase in number of subscribers in both Chinese and Indian telecom industries is due to a combination of factors. The most significant factor among these is the technology innovation factor. For example, with the emergence of smart phones and high-speed networks, consumers are more and more attracted towards mobile devices and at the same time moving away from personal computers. Other factors contributing towards the increase in subscribers are - increasing affordability of mobile handsets and services that

has lowered the entry level, and also the changing demographic profile in developing economy, which has diversified the market population.

Technology Innovation - Technology innovation over the last decade has enabled the expansion of telecom infrastructure from metropolis to rural areas where the majority of Chinese and Indian population is located. Hence, telecommunication services become easily accessible and cover large portion of the country's population that eventually resulted in the increase of subscribers.

Owing to the improving network infrastructure, China reported its teledensity had reached 82.9% at end of year 2010 with an increase of 3.4% compared with year 2000 (Ministry of Industry and Information Technology - MIIT, 2010), and India also witnessed tremendous increase over the same period from 63% to 67.6%(TRAI, 2010). Furthermore, launch of the Internet market also drove growth in the telecom subscriber base. According to TRAI (2010), the total wireless subscriber base in the industry crossed the 500-mn-mark and reached 509.03 million by the end of September 2009, which took India to the second position in terms of wireless network in the world, next only to China.

Increasing Affordability - Intense competition has lowered the prices of hardware and services in the telecom industry. This helped in lowering the entry barrier into the market and thus made it affordable to a large percentage of the population. At the same time, competition among multiple operators also reduced tariffs, particularly in the Indian telecom industry, which is characterized by intense competition, has witnessed continuous price wars. The expansion of wireless networks and growth in subscriber base, both in urban and rural areas has led to a boost in the sale of mobile handsets across India (IBEF, 2010).

Demographic Profile Change - The changing demographic profile of China and India has also contributed to the growth of number of subscribers. A large young population, a burgeoning middle class, with growing disposable incomes, and also urbanization, which is increasing literacy levels and higher adaptability to technology, characterizes the changed profile. The urbanization rate in China reached 48.2% in 2010 (National Bureau of Statistics of China, 2012), and the respective number in India was 41%, with an increase of 17.25 million in urban population (Ministry of Statistics of India, 2012).

5.1.3. Volume of Subscribers does not Directly Increase the Industrial Revenue

According to the Economics of Scale, the growth in the number of subscribers is supposed to increase the revenue of telecom industry. Yet, from our analysis based on the statistics between year 2000 and 2010, it does not stand the hypothesis that there is direct causality between the number of subscribers and the telecom revenue for both China and India. The finding is supported due to two aspects: declining tariffs and revenue structure of telecom services.

Declining Tariffs - Liberalization of the telecom industry fuelled intense competition, which eventually resulted in price war to keep market share. Increased competition and the subsequent tariff war have acted as major catalysts for attracting more subscribers. At the same time, companies, confronted with a saturated market, had to also reduce tariffs in order to retain customers.

Couple of years back, China had only two operators whereas India had six major operators, but the number today grow to six in China and over fifteen in India, with more players waiting to enter the market. Despite the high growth of subscribers, the competition firmly has put pressure on the tariff structure. The mobile sector has experienced a sharp decline in the service rates over the years. When cellular phones were introduced, call rates were at 2.8 Yuan per minute in China and Rs. 16 per minute in India, the tariff till end of 2010 had drastically declined to 0.19 Yuan in China and lowered to only Rs. 1 in India (TRAI, 2010). Besides the decreased charge for incoming calls, the introduction of one-way toll waved charges for incoming calls too has led to the sharp decline in Average Revenue Per User (ARPU) and Average Margin Per User (AMPU) and this has had a negative impact on the overall revenue of the industry.

Apart from the market competition, the cost savings achieved from - continuous technology innovations, the lowering of termination charges by the Governments and the fine-tuning of operation costs (The economic times, 2009) was eventually passed on to the consumer to enjoy cheaper rates. But this placed a negative impact on the revenue of telecom industry on the other hand.

Revenue Structures of Telecom Services - In the current service prices, the increased number of subscribers are mainly from those services that generate lower revenues to the industry. In general, the revenue of telecommunication can be broken up into two services, one is the traditional voice based service represented by phone calls where the tariff is declining, and the other is non-voice services such as data service that provides much higher margin.

According to Credit Suisse (2011), data services provide 80% more revenue per unit capacity than that of voice services, at current pricing level with China having 33% and India having less than 18% of its industry revenues coming from non-voice services. MIIT (2010) also claimed the trend for low-end telecommunication customer is still obvious.

In emerging economic like China and India, it exhibits a marked dichotomy in terms of subscriber adoption of new services in urban markets compared to the rural markets. Therefore, not all customers are yet diving into the new higher margin data and content-based services. The rural population is not keen to pay premium charges for data and IP-based services. But in urban areas, there is an approved significant uptake. From revenue perspective, this is arguably an unsustainable position and data revenues have to start picking up to sustain the industrial revenue.

5.1.4. Implications of 'Number of Subscribers' Factor

Regardless of the high growth of subscribers' volume, the challenge for Chinese and Indian telecom sectors to retain positive revenue growth is to handle the market dynamics that are driving down ARPU. This manifests in many forms - first, the policy makers need to increase better economics of scale and develop regulations to foster the industrial development and secondly, operators need to shape their strategy of market segmentation through targeted up-sell or cross-sell. In addition, rollouts of new technology like 3G services as well as increase in Internet penetration across the country is needed to boost the revenues of the industry.

5.2. Factor Two: Government Regulations and Policies

5.2.1. Regulations and Policies as a Factor

All industries, irrespective of the product or service, depend heavily on the support they receive from the government to survive in the market. The role of the government is seen as an essential supporter of the industry, employing a host of policies to contribute directly to the competitive performance of strategic or target industries (Porter, 1990). The telecom industry similarly enjoys the support from the Chinese and the Indian governments in terms of various policies and regulations that help the sector to thrive. This chapter will discuss a few of these regulations and their effects on their respective telecom industries. Due to the limited availability of time and to maintain the scope of the thesis, only a few key policies and regulations that have high impact on the industry will be discussed. This chapter will also discuss and analyze the relationship between these policies and regulations with respect to the growth of the telecom industry according to the results obtained and shown in the previous chapter.

5.2.2. Policy Makers and Their Inputs

Both China and India over the last few decades shifted from a state run monopolistic structure to a market-oriented oligopolistic model, though, the domination of state-run companies in China is still evident. The Ministry of Industry and Information Technology was established in March 2008 under the state agency of China. Among other objectives, some of the key responsibilities of this body was to stipulate laws and regulations, establish technical policies, systems and standards for the communications industry, exercise supervision and control over telecommunications and Information service market, implement licensing for operation as necessary, ensure fair competition and universal service and safeguard in the interest of both the state and users, and to formulate tariff policies for communications and information service (Gov.cn, 2012)

According to the USCC report (2011), the Chinese government treats the telecommunications sector one of the most strategically important and commercially lucrative industries in the country and has expended significant effort and resources to promote and enable new business opportunities in the telecommunications field and their

national-level policies are instrumental in closing the technological gap between China and western nations. Also, the large and growing state-controlled telecommunications sector is a major source of government revenue.

In 1999, the Indian Government established the National Telecom Policy 1999, which played a key role in shaping the sector and later in 2000 introduced the Communications Convergence Bill that setup the autonomous commission called the Communications Commission of India (CCI) that acts as the super/regulatory body to regulate telecommunications, Internet and Broadcasting sectors. The Planning Commission of India in its eleventh five-year plan for the period 2007 till 2012 stated that the approach would be towards achieving faster, broader and inclusive growth, with special attention to enhance the rural connectivity (Planning Commission, 2008). Some of the key objectives set during the Eleventh Plan period are:

- To make India a hub for telecom equipment manufacturing by facilitating establishment of telecom specific SEZs.
- To reach a telecom subscriber base of 600 million.
- To provide 200 million rural telephone connections by 2012, that is to reach a rural teledensity of 25%.
- To provide telephone connection on demand across the country at an affordable price.
- To provide broadband connection on demand across the country by 2012.
- To facilitate introduction of mobile TV.
- To provide broadband connectivity to every secondary school (SS) and health centre on demand in two years.

5.2.3. Key Regulations

The MII in China though encourages domestic operators to purchase telecommunications equipment from Chinese manufacturers, notably from Huawei, ZTE (Zhongxing), Datang and Great Dragon, however, also gives preference to foreign manufacturers in niche markets (where local manufacturers do not yet have the technology) especially those willing to invest in rural areas in Western China, where teledensity or accessibility to fixed line services is still low (Brian Low, 2004).

According to the report released by Ernst and Young, and FICCI (2011), The Telecom Regulatory Authority of India (TRAI) established as an independent statutory regulatory authority is one of the key powers that advise the government in matters related to the development of telecommunication technology and the telecom industry in general. The key feature of India's regulatory regime is "transparency in industry information, an open approach and encouragement of consultation with stakeholders."

Some important regulations affecting the growth of the Chinese and Indian telecom industry are:

Licensing – The Chinese government does not have a uniform licensing system unlike its counterpart in India. The licenses are divided into different classes and are issued by different state authorities. For example - The Telecom Authority of the State Council issues class one licenses whereas class two licenses for service providers operating within a single province/autonomous region/central government-supervised municipality to be issued by the local telecom authority and registered with the State Council's telecom authority (China Telecommunications Regulations, 2000).

The Government of India in 2003 introduced the Unified Access Service (UAS) licensing regulation, which allows the service provider to offer both mobile and/or fixed services within the same license, using any technology. This regulation ensured that licenses were issued without any restriction on the number of entrants in a circle and applications were to be processed within 30 days of submission. Also, allocation of spectrum and grants for wireless licenses was subject to availability and, in case UASL was not allocated spectrum due to non-availability, the licensee had to ensure to rollout services using fixed line technology (Ernst and Young, FICCI, 2011).

Teledensity – According to the figures from the China Internet Network Information Center (CNNIC), the number of Internet users in rural China rose to 115.1 million users at the end of June 2010, with an annual growth of 26.3% which is lower than the 2008 growth rate. Although consumption-stimulating policies like "home appliances to the countryside" and "Telephones covering all villages" has expedited rural communications network construction and provided rural residents a convenient way to buy computers, the infrastructure for communication in some rural regions is still deficient (CNNIC, 2010) (Chen Xiaohong, 2009)

In India, the Universal Service Obligation Fund (USOF), which came into effect in 2002, was introduced to provide access to telegraph services to people in rural and remote areas of India at affordable prices. The USOF was estimated to hold around $ 3.6 billion at the end of FY10 (IANS, 2010). However, rural teledensity was at 28.4%, whereas urban teledensity was about 137.3%, resulting in a huge digital divide (Ernst and Young, FICCI, 2011). The USOF has a long way to go to improve the rural telephony connectivity.

Consumer Affordability - For any developing nation, the affordability of products and services is a key factor for the growth of the industry. Both Chinese and Indian telecom markets have some of the lowest tariffs in the world, with a large majority of people using low-cost mobile handsets as illustrated in figure 4 below (Ernst and Young, FICCI, 2011).

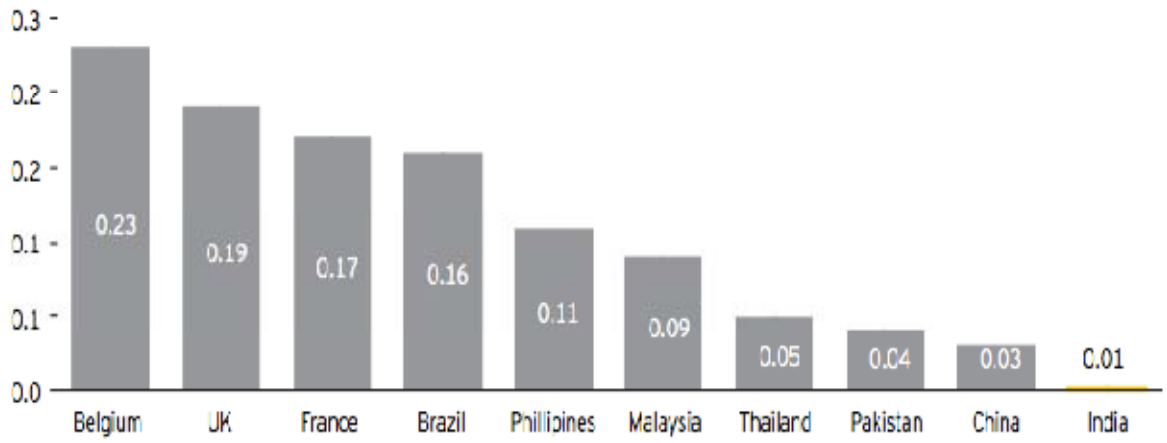

Figure 5 – Mobile tariffs per minute in US$

Source – Department of Telecommunications, India

As explained in the previous section, the telecom industry managed to introduce low costs due to the increase in subscriber base and teledensity. Factors such as transparent regulation, easy market entry, lower tax burden, and low risk enable the creation of policy and a regulatory approach that helps to drive down tariffs (Ernst and Young, FICCI, 2011). In China, with the deepening of telecom tariff reform and marketization domestic telecom tariff dropped markedly and this trend represents the beginning of a new round of competition for domestic telecom market, experts said, "in the near future, telecom operators will have a more drastic move" (C114, 2006). Affordability should not however

compromise on the quality of the service or the product and is driven by policy and regulatory approach and operator strategies.

5.2.4. Implications of Policies and Regulations on the Growth of the Telecom Industry

Every new policy or regulation set by the government and its relevant authority has a direct or indirect effect on the growth of the sector. Be it in supporting new entrants, Foreign Direct Investment, helping the rural and remote areas to be connected or changing the tax structure of the industry and the consumers. All of them have diversified effect on the growth. The political environment in the country plays a vital role in the implementation of these policies and regulations.

The authoritative rule in China has helped the effectiveness of implementing their polices and this has had a positive impact on the growth of their telecom industry, as seen in the results obtained in our previous chapter. As stated in the report from USCC (2011) “A clear model has emerged: Chinese companies leverage their inexpensive and plentiful engineers, designers, contractors, and any others needed to build new networks or to upgrade existing networks in these emerging markets. As western markets become saturated, these emerging markets become the growth areas and enable government-influenced telecommunication companies to find attractive new areas for expansion. Significant investments have been made in the communications sector over the last two decades, with substantial escalation occurring over the last ten years and increasing escalation over the most recent five years”.

Whereas in India, though telecommunications has grown rapidly, it needs to achieve more in terms of teledensity as compared to other countries. For example, in The Tenth Plan of the planning commission had envisaged a teledensity of 9.91% by March 2007, but fell short of about 65.0 million connections (Planning Commission, 2008). Hence, as reflected in our results in the previous chapter, though the policies of the Indian Government are meant to improve the growth of the sector, the effectiveness of the implementation falls short in many aspects. Thus, the co-relation between the Government policies and regulations with respect to the growth of telecom companies is weak.

With plenty of strong potential, the sector requires much more attention and a robust policy framework to address the challenges that exist and help to capture the opportunities that the sector holds for the country. India needs to improve its "Critical Infrastructure Status along with uniform policy and single window clearance". There's also a need to address civic issues such as zoning regulation, single window clearance, preferential treatment for sharing and incentives in a timely manner (Ernst and Young, FICCI, 2011).

5.3. Factor Three: Technological Innovations

5.3.1. Technology as a Growth Factor

Telecommunication basically is the transmission of signals over a distance for the purpose of communication, though the technology involved in communicating has changed significantly over the years. During ancient times smoke signal and drums were used to communicate over long distances. The advent of modern telecommunications took place during the late 18th and early 19th century. Today telecommunications is a highly technical industry, which is constantly evolving, and inventing technologies to improve the cost, coverage and quality of communication. It is one of the most R&D intensive-industries, with leading multinational corporations (MNCs) spending on average between 10 and 20% of their revenues in R&D in 2003 (MIT Technology Review, 2003).

The telecom-equipment market in China and India are growing at a rapid pace and competing globally for market share. The telecom infrastructure in both these countries has seen tremendous advancement in the past few decades. Echoing the market growth, most of the global leading telecom-equipment manufacturing firms have started their operations in China and India. This has facilitated the growth of infrastructure; however, it has a long way to go before the benefits of these technologies can reach every remote place in these countries.

5.3.2. Technology Investments and its Benefits

Telecom-equipment manufacturing can be roughly divided into five sub-sectors: optical transmission systems, switch systems, access systems, data communication systems, and mobile communications. In the 1980s, China relied on 100% of its acquisition of

telecommunication equipment through imports (Zhang, 2000). It has however, progressed from being far behind in every sub-sector in the 1980s, to catching up in the switch market in the middle 1990s, to capturing the access market in the late 1990s, and to becoming competitive in the markets of optical transmission, data communications, and mobile communications in the new millennium (Peilei Fan, 2006). Today Chinese domestic companies compete confidently with global MNCs and the strength in innovation capability and self-developed technology has determined who the leaders are among the domestic firms. Table 3 shows a strong correlation that exists between the innovation capability and the companies' leadership among the Chinese domestic telecom firms.

Table 4 - Major domestic Telecom-equipment manufacturers: leadership and innovation capacity.

Company name	Rank in tele-com-equip-ment industry	Rank in innovation capacity	Rank in R&D input	Rank in R&D output	R&D spending (% of Revenue) 2002	Profit (% of Revenue) 2002	Patent	R&D staff (% of employee) 2001	Employee with bachelor's or higher degree
Posts and Telecommuni-cat-ions Industrial Corp. (PTIC)	1	7	7	7	1.0	4.10	n.a.	n.a.	n.a.
Huawei Technology Corporation	2	1	1	1	18.8	16.4	271	46.50	85
Shenzhen Zhongxin Technology Corporation	4	2	2	2	10.3	7.3	217	46	72
Datang Telecom Technology Co., Ltd	5	3	3	3	12.3	2.9	7	41	93.87
Shanghai Bell Co., Ltd	3	4	6	4	5.3	13.1	19	n.a.	n.a.
Wuhan Telecommunication Science Institute	6	5	5	5	6.5	8.8	4	n.a.	n.a.
Changfei Optical Fiber and Optical Cable Co., Ltd	7	6	4	6	9.7	3.5	2	n.a.	n.a.

Source - Peilei Fan, 2006

Similar to China, liberalization in India started in the mid-1980s and gathered momentum in the 1990s and since then it's been marching towards fully competitive markets enabling India as a major R&D hub. The telecom equipment manufacturing was de–regulated in 1991. Unlike in China, the contribution of domestic equipment manufacturers to the telecom market in terms of technology and market share is relatively low. Despite the growth of a localized manufacturing environment in India, only 40% of the requirement for equipment is met through local sourcing, with the remainder coming from global companies manufacturing in India (Ernst and Young, FICCI, 2011). India is also immensely dependent on import, with the exception of telecom towers and cables. The research in

telecommunications technology in India focuses significantly to improve rural connectivity.

Though Chinese domestic firms such as Huawei were slow to catch up to MNCs with respect to Global System for Mobile Communications (GSM) and the Second Generation (2G) network systems, achieved unexpected success in the value-added part of GSM, such as integrated gateways, mobile intelligent networks, General Packet Radio Service (GPRS), and short message centers (Peilei Fan, 2006). But Chinese firms have caught up with the global players in the race for the Third Generation Wireless Communication (3G) standards and systems. From 1998 to May 2002 Huawei invested RMB 3 billion in WCDMA and its R&D staff totaled 3500, including people from its US, Swedish, and domestic R&D centers and has since operated over 20 WCDMA experimental networks worldwide (China Electronics News, 2003).

The Chinese government also supported its domestic telecom firms such as DTT, which joined Siemens to develop the Chinese 3G standard, TD-SCDMA. Though initially reluctant to support this technology that no other company was interested in, the Chinese government finally made an announcement to support it during 2002. This announcement made all the major domestic telecom-equipment manufacturers to join hands with the state agencies to form the 'TD-SCDMA Industrial Alliance' (People's Posts and Telecommunications, 2002). Hence, by having their own 3G standard, China and its domestic telecom industry has benefited immensely. The domestic firms do not pay royalty anymore for using this technology, thereby increasing their profits.

Indian companies in the telecom-equipment manufacturing segment are yet to feature in the global telecom landscape. Though a few Indian mobile operators have a significant presence globally, manufacturers in India face challenges such as high logistics costs, an unreliable power supply, inadequate tax benefits and competition from low-cost Chinese equipment (Ernst and Young, FICCI, 2011). Initially, Indian core telecom equipment companies operated as resellers for foreign companies. Global players, with an intention to enter the fast growing Indian telecom market partnered with local companies such as Fibcom, Anda Telecom, GOIP Global Services, Tirumala Seven Hills, Savitri Telecom, etc.

have all acted as Indian subsidiaries or local partners to these players (Knowledge Faber, 2009).

5.3.3. The Future of Technology and its Contribution to the Growth of the Industry

Technological innovations in 3G mobile technology is capable of delivering broadband content that includes rich multimedia services such as video calling, video on demand, location based services and remote access / VPN applications. Also next generation technologies such as LTE (Long Term Evolution), Mobile WiMAX or 4G networks are expected to drive the wireless services in the future. Applications such as IPTV and Mobile TV will be the beneficiaries of such technological innovations.

For next generation 4G mobile phone networks in China, LTE will be the technology deployed, predicts market analyst In-Stat (Richard Wilson, 2009). Chinese telecom companies such as Huawei are investing considerable resources in the development of LTE technology and have been involved with LTE research and development since 2004 and as of July 2010 had “been awarded 14 LTE commercial contracts and more than 60 LTE trials (USCC, 2010).

Investments in Broadband by the telecom companies are growing rapidly in India. The Department of Telecom in the Indian government has formulated the Broadband Policy 2004, which envisions the creation of a framework through various access technologies such as optical fiber, digital subscriber lines (DSL) on copper loop, cable television networks, satellite media, terrestrial wireless and future technologies(Ernst and Young, FICCI, 2011).

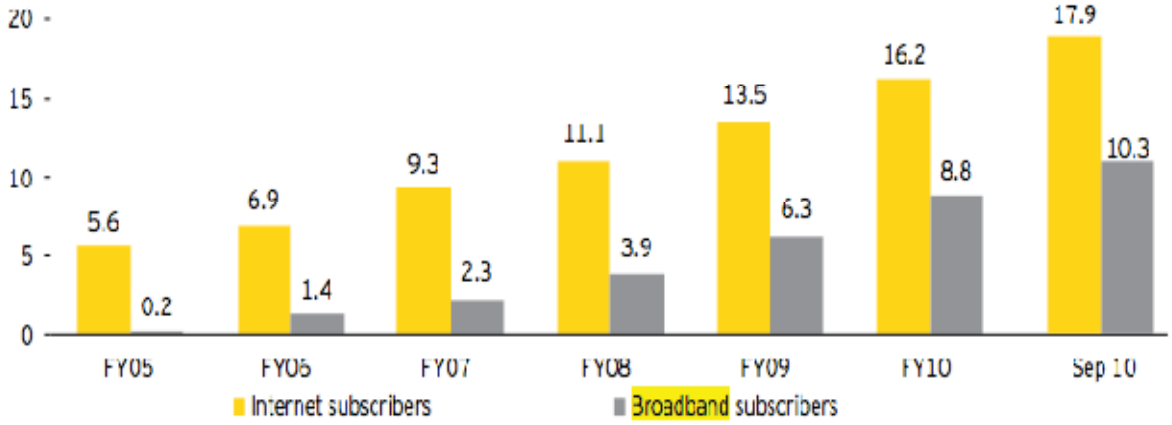

Figure 6 – Internet and broadband subscribers' growth in India

Source: Telecom Regulation Authority of India

According to Booz & Company (2010), it is estimated that a 10% increase in broadband penetration translates to a 1.5% increase in labor productivity in a country. Also, a 10% increase in broadband penetration leads to a 1.3% increase in GDP (INTUG, 2010). This shows that an investment in technology does translate to the growth of the revenues in the telecom industry as shown in the results obtained in the previous chapter. Both China and India, irrespective of their policies and regulations benefit from technological innovations.

6. Conclusion

Today's telecommunications industry is one of the biggest contributors to the growth of the economy, more so in the developing countries. Apart from contributing in terms of revenue, it also influences the growth and progress of many other sectors such as Health, Education, E-Governance, Rural development, etc. Governments of both countries China and India have recognized the influence and the importance of this industry, which is evolving at a rapid pace. Though both countries have been, and are, continuously trying to help the industry by bringing in reforms and adapting their policies and regulations, there is still a long road ahead before the nations benefit to the fullest extent from the telecom industry.

This thesis, while understanding and analyzing the contributing factors towards the growth (revenue) of the telecom industry in both China and India, also compares the competitiveness of these factors in both the nations. Some of the findings such as the contribution of Government policies and regulations to the revenue generated by Indian telecom companies were not only interesting observations but also thought provoking.

In the end, there is no "one best solution" that exists to improve the growth and revenues of telecom industry. Both China and India, in their own terms have different combinations and flavors of influencing their industries. In general, it can be observed that, while the Chinese government is concentrating on developing their domestic telecom firms and helping them expand globally, the Indian government is focusing on the reach of this industry to rural and remote areas within the country to help improve the connectivity and basic infrastructure.

The future of the telecom industry is one filled with excitement and constant evolution. With all the new technologies and their applications that are coming in, "this is just the beginning". Gadgets such as smart phones are today taking over PCs and entering the daily lives of people around the globe. It will be interesting to watch and observe the industry's contribution to developing countries such as China and India.

7. Further Research

The incredibly high level of growth of the Chinese and Indian telecom industries throughout the last decade, benefited from a unique combination of events such as - the national economic boost during the same time period, the huge increase in population base, and the change in the demographic profile of the population.

Reports claim that a one percent increase in the telecom penetration results in a three percent increase in GDP growth (Ernst & Young, 2010). Therefore, further research on how the market strategy should be shaped in order to sustain the industry growth despite the market saturating, particularly in the mobile market, and the implication from industry competitiveness to national competitiveness between the two Asian giants will undoubtedly be beneficial to academic researchers and practitioners. As a consequence, its influence to the national economy growth is more significant than the simple analysis of revenues would suggest.

References

Arora V. and Vamvakidis A., 2011, “China's Economic Growth: International Spillovers. China & World Economy”, 19: 31–46. Doi: 10.1111/j.1749-124X.2011.01257.x

Arun Prabhudesal, 2011, “Top 20 Mobile Operators in World”, [Online] Available from: http://trak.in/tags/business/2011/05/27/top-20-mobile-operators-world-bharti-airtel-5-17/

Booz & Company, 2010, “Bringing Mass Broadband to India: Roles for Government and Industry”

Brian Low, 2005,"The evolution of China's Telecommunications equipment market: a contextual, analytical framework", Journal of Business & Industrial Marketing, Vol. 20 Iss: 2 pp. 99 - 108

C114, 2006, “Marketization of Telecom tariff is accelerating”

Charles Baer and Terry Brown, 2006, “Location Quotients: A Tool for Comparing Regional Industry Compositions,” Advanced Economic and Market Analysis Group, Strategic Research and Development, Indiana Department of Workforce Development.

Chen Xiaohong, 2009, “Domestic Telecom sector keen to tap rural market”, China Economic Net

Chengchang Wang, Abhinav Kishore, 2009, “Compratitive Research on the Marketing Strategies of Telecommunication Industry in China and India”, [Online] Available from: http://www.myacme.org/ACMEProceedings09/p11.pdf

China Electronic News, 2003, Chinese newspaper, ZhongGuo Dian ZiBao

China Telecommunications Regulations, 2000, Technology Research Project

Chowdary T.H., 1998, “Comment: Politics and economics of Telecom liberalization in India”, Telecommunications Policy, Vol. 22, No. 1, pp. 9 22.

CNNIC, 2010, “Statistical Survey Report on Internet Development in China”

Credit Suisse (2011). India Telecom Sector - 23 May 2011. Asia Pacific: Equity Research

D&B, 2011, “Benefits of Telecom Industry”, [Online], Available at: http://www.dnb.co.in/

Daniel Park, 2007, “The Growth Debate – China & India”, a White Paper by B2B International

DBS Group Research, 2010, “Hong Kong / China Industry Focus: China Telecom Sector”, DBS Group Research. Equity

Deutsche Bank, 2004, “Telecoms for Beginners: Technology & Industry Primer”, Global Equity Research, Deutsche Bank AG

Dong-Sung Cho and Hwy-Chang Moon, 2005, “National Competitiveness: Implications for Different Groups and Strategies”, International Journal of Global Business and Competitiveness, Vol. 1 (No. 1) pp. 1-11.

Enrico M. and Marcello S, 2011, “China and India: Openness, Trade and Effects on Economic Growth”, the European Journal of Comparative Economics.

Enright, M. J., 2000, “The Globalization of Competition and the Localization of Competition: Policies Toward Regional Clustering”, in N. Hood and S. Young (eds), The Globalization of Multinational Enterprise Activity and Economic Development (London: Macmillan)

Ernst and Young, FICCI, 2011, “Enable the next wave of Telecom growth”, [Online], Available at: <http://www.ey.com/Publication/vwLUAssets/Enabling_the_next_wave_of_Telecom_growth_inIndia/$FILE/Enabling%20the%20next%20wave%20of%20Telecom%20growth%20in%20India.pdf>

Gov.cn, Chinese Government’s Official Web Portal, “Major Responsibilities of the Ministry of Industry and Information”

Harry Bowen P., Wim Moesen, 2011, "Composite competitiveness indicators with endogenous versus predetermined weights: An application to the World Economic Forum's global competitiveness index", Competitiveness Review: An International Business Journal incorporating Journal of Global Competitiveness, Vol. 21 Iss: 2 pp. 129 – 151

IANS, 2010, “Minister Sachin wants to ‘Pilot’ IT revolution in northeast,” Indo-Asian News Service

IBEF, 2011, “TELECOMMUNICATIONS”, Indian Brand Equity Foundation

INTUG (International Telecommunications Users Group website), 2010, “Broadband Commission Presents Report to United Nations” http://intug.org/2010/10/09/international-insights-%E2%80%93-september/, accessed 10 June 2012

Ken Wieland, 2007, “Asia’s high Telecom growth threatened”, Telecommunications, Telecom Magazine, Horizon House

Johnson E., 1967, “Industrialization And Economic Growth: Problems Of Methodology”. Journal of Economic Issues (Association for Evolutionary Economics) [serial online], 1(3):219-230. Available from: Business Source Premier, Ipswich, MA.

Kaplan, B., Duchon, D., 1988, “Combining Qualitative and Quantitative Methods in Information Systems Research: A Case Study”, MIS Quarterly, December 1988, pp. 571-586.

Kate Holton and Leila Abboud, 2012, “License scandal rattles India's Telecom nirvana”, Reuters

Ken Wieland, 2007, “Asia’s high Telecom growth threatened”, Telecommunications, Telecom Magazine, Horizon House

Knowledge Faber, 2009, “Indian Telecom Equipment Manufacturing: Current State and Potential Future Opportunities”

Lall S., 2001, “Comparing National Competitive Performance: An Economic Analysis of World Economic Forum’s Competitiveness Index”, Queen Elizabeth House working paper, Oxford University Press, for World Economic Forum.

Levin Richard I. and Rubin David S., 1998, Statistics for Management, Prentice-Hall, Inc., Upper Saddle River, New Jersey, Seventh Edition

Lain Mills, 2011, “The Rise of China's Telecoms: Part I”, World Politics Review [Available Online At] < http://www.worldpoliticsreview.com/articles/8474/the-rise-of-chinas-telecoms-part-i>

Lin J., Cai F., Li, Z., 1996, “The China Miracle: Development strategies and economic reform”, Chinese university press, Hong Kong

Manas Bhattacharya, 2001, “Telecom Sector in India: Vision 2020”, submitted to the Planning Commission of India as a part of the series - Background Papers: Vision 2020

Markus Wauschkuhn, 2001, “Telecommunications and Economic Development in China”, Berichte des Arbeitsbereichs Chinaforschung

Michael Porter E., 1980, “Competitive Strategy: Techniques for Analyzing Industries and Competitors”, The Free Press, First Free Press Edition.

Michael Porter E., 1990, “The Competitive Advantage of Nations”, Harvard Business Review

Michael Porter E., 2008, “The Five Competitive Forces That Shape Strategy”, Harvard Business Review

MIIT, statistics of Telecom subscriptions and analysis, [Online], Available at: http://www.miit.gov.cn/n11293472/n11293832/n11294132/n12858447/index.html

Ministry of Statistics India, 2012,”Statistical Data-Urbanization”, [Online] Available from: http://mospi.nic.in/mospi_new/site/Publications.aspx?status=1&menu_id=22

MIT Technology Review, 2003, “The Corporate R&D Scorecard 2002”

Momaya K, 2011, “Cooperation for competitiveness of emerging countries: learning from a case of’ nanotechnology", Competitiveness Review: An International Business Journal incorporating Journal of Global Competitiveness, Vol. 21 Iss: 2 pp. 152 - 170”

National Bureau of Statistics of China, 2012, Statistical Data-Urbanization, [Online] Available from: http://www.stats.gov.cn/

National Research Council, 2006, "The Importance of Telecommunications and Telecommunications Research", Renewing U.S. Telecommunications Research, Washington, DC: The National Academies Press.

Nir Kshetri and Nikhilesh Dholakia, 2007, “Drivers Of The Broadband Industry In China And India: What Can We Learn?”, PTC 2007 proceedings.

Pankaj Ghemawat and Thomas Hout, 2008, “Tomorrow’s Global Giants? Not the Usual Suspects”, Harvard Business Review, The Magazine.

ParikshitBasu K., 2007, "Critical evaluation of growth strategies: India and China", International Journal of Social Economics, Vol. 34 Iss: 9, pp.664 – 677

Peilei Fan, 2006, “Catching up through developing innovation capability: evidence from China’s Telecom-equipment industry”, Elsevier Ltd, available online at www.sciencedirect.com

People’s Posts and Telecommunications, 2002. Ren Min You Dian (Chinese Newspaper, Renmin Youdian, October 31, 2002)

Planning Commission, Government of India, 2008, “Eleventh Five Year Plan (2007-2012): Agriculture, Rural Development, Industry, Services and Physical Infrastructure”, Volume III, New Delhi, Oxford University Press

Plunkett Research Ltd., 2010, “Telecommunications Industry Overview”, Internet Engineering Task Force

PTI, 2007, “Indian Telecom market to be at Rs 344,921 crore by 2012”, The Economic Times

Pyramid, 2003, “Telecommunications Markets in China”, Pyramid publications

Richard Wilson, 2009, “China goes for 4G LTE in a big way”, [Available Online At] http://www.electronicsweekly.com/Articles/29/07/2009/46620/china-goes-for-4g-lte-in-a-big-way.htm [Accessed on June 10, 2012]

Robert K. Yin, “Case Study Research, Design and Methods”, Sage Publications, Applied Social Research Methods Series, 3rd Ed., Volume 5

Roger Best J., 2010, “Market-Based Management, Strategies for Growing Customer Value and Profitability”, Pearson Education Inc., 5th Edition

Roma Mitra Debnath, Ravi Shankar, 2008, "Benchmarking Telecommunication service in India: An application of data envelopment analysis", Benchmarking: An International Journal, Vol. 15 Iss: 5 pp. 584 - 598

Sanjay Kaul, 2008, “Business Models for Sustainable Telecoms Growth in Developing Economies”, Hoboken, NJ, USA: Wiley, 2008. p 31

ShilinZheng and Michael Ward R., 2011, “The Effects of Market Liberalization and Privatization on Chinese Telecommunications”

Simi Kedia, 2006, “Estimating product market competition: Methodology and application, Journal of Banking and Finance”, Volume 30, Issue 3, Pages 875-894, ISSN 0378-4266, 10.1016/j.jbankfin.2005.04.031.

Sven Junghagen, 2012, “An Introduction to Industry Analysis”, [Lecture] Strategic Management Module, Copenhagen Business School, Library, Room SP103, 18th May.

Telecom Regulatory Authority of India, 2006, “Study Paper on Financial analysis of Telecom Industry of China and India”, Press Release No59/2006

Telecom Tariff Trend, [Online], Available at: http://www.indiaTelecomonline.com/Telecom-tariff-trend/

The Economic Times, 2009, India, “Reason behind India’s lowest tariffs in the world”, [Online]. Oct 2009, Available from: http://articles.economictimes.indiatimes.com/2009-10-25/news/28402469_1_outsourcing-deal-costs-operators

The Economic Times, 2012, India, “China still contribute half of world economic growth”, [Online]. Jan 2012. Available from: http://articles.economictimes.indiatimes.com/2012-01-11/news/30616053_1_global-growth-economic-growth-china-and-india

TRAI, 2010, “Indian Telecom Industry”, [Online], Available from: http://www.dnb.co.in/IndianTelecomIndustry/OverviewTI.asp

Urbanization, [Online], Available at: http://www.stats.gov.cn/

USCC Research Staff, 2011, “The National Security Implications Of Investments And Products From The People’s Republic Of China In The Telecommunications Sector”, U.S.-China Economic and Security Review Commission Staff Report

Wikipedia, 2003, “Telecommunications policy of the United States”, [Available Online At] <http://en.wikipedia.org/wiki/Telecommunications_policy_of_the_United_States>

Wikipedia, 2011, “Communications in India”, [Available Online At]<http://en.wikipedia.org/wiki/Communications_in_India>

Williamson O.E., 1979, “Transaction Costs Economics: The Governance of Contractual Relations”, Journal of Law and Economics

World Bank, 2010, “Unfinished Business: Mobilizing new efforts to achieve the 2015 millennium development goals”, page 17

World Bank, 2012, “Fixed broadband Internet subscribers (per 100 people)”, [Online], Available at: http://data.worldbank.org/indicator/IT.NET.BBND.P2

Yin, R. K, 2003, “Case study research: Design and methods”, (3rd ed.), Thousand Oaks, CA: Sage.

Zhang, Q., 2000, “Made in China”, PuTian Enterprise Group, China Yanshi Publishing Co, Beijing, China (in Chinese)

Appendix A: Questionnaire

Dear Sir or Madam,

We are currently working on an academic research project to evaluate the factors that directly contribute to the growth of Chinese and Indian Telecom industries'. As a process of collecting data, we would like to ask your opinions about the key influential factors in your country. Your reply by end of May is highly appreciated.

In the space provided below, we kindly ask your address for possible contact in the future, however, feel free to leave it empty if you wish not to mention it. As this study is solely for academic purpose, there is no "right" or "wrong" answer. It is also not necessary to mention your name anywhere in this sheet. And we promise full and complete confidentiality of this survey.

Thank you very much for your help.

Email Address: _____

In which country do you work? _____

Name of your company _____

Education level

□ Primary/Elementary school □ 2-3 years of college

□ High school □ 4-year university □ Postgraduate or above

Position

□ Engineer □ manager □ senior manager

□Finance staff □ technical staff □other (specify): _____

To what level of agreement do think the following factors contribute to the revenue of Telecom industry in your country? Please answer the question by ticking the appropriate response in each row below.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a) Accessibility to supplier	☐	☐	☐	☐	☐
b) Supplier's product and service quality	☐	☐	☐	☐	☐
c) Number of suppliers	☐	☐	☐	☐	☐
d) Number of buyers/subscribers	☐	☐	☐	☐	☐
e) Export revenues	☐	☐	☐	☐	☐
f) Products and services offered	☐	☐	☐	☐	☐
g) Initial capital for entering the market	☐	☐	☐	☐	☐
h) Alternative price or quality	☐	☐	☐	☐	☐
i) Government regulations and policies	☐	☐	☐	☐	☐
j) Domestic competition	☐	☐	☐	☐	☐
k) Industry size and trends	☐	☐	☐	☐	☐

Any other factors you might think as relevant besides above listed? Why? (Optional)

Thank you very much for your cooperation!

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