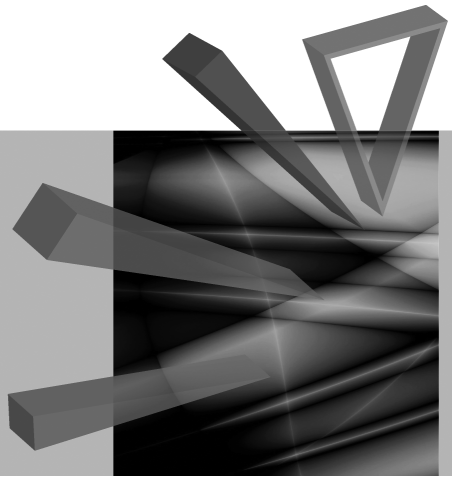
Faces of Competitiveness in Asia Pacific



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COMPETITIVENESS OF CHINESE SUPPLIERS OF TELECOMMUNICATION TECHNOLOGY ON INTERNATIONAL MARKETS

Summary: In recent years one could observe the increasing importance of suppliers from China on the telecommunications equipment and technology market. The perception of Chinese products has also changed, which, along with their competitive prices, strengthens their technological competitiveness. This study examines the political changes in China that led to this situation, as well as the factors of competitiveness of Chinese telecom technology suppliers.

Keywords: China, telecommunication, technology, competitiveness.

1. Introduction

China's strategy was changed after Mao's death, when Deng Xiaoping won the subsequent power struggle. Thanks to his marked-oriented reforms that were started in 1979, called the "Open Door Policy", China began opening to international trade and started to import science and technology from the West. The reform that had the most significant impact on the ICT industry was the "Decision on the reform of the science and technology management system" announced in 1985. Thanks to this, science and technology officially became the engine of growth. Research systems began being competitive, not based on the government's central planning. R&D centers were opened up for commercial research.

The "Open Door" strategy was aimed at strengthening co-operation with the West, primarily the U.S. In 1979 China had started signing bilateral agreements on co-operation in the field of science and technology with Western countries (the first one was signed with the U.S.). The main objective of these contracts was to exchange science and technology, attract advanced technologies and know-how. An important element of these reforms was the introduction of Special Economic Zones (SEZ). The experiment introduced investment zones that have been successful in attracting foreign investment. In the second half of the nineties China was continuing reforms of technical and scientific structure to adapt to the emerging market economy. In 1995 a new policy was adopted in order to speed up scientific and technological development. The main objectives of this policy are:

- assigning 1.5% of the country's GDP to finance R&D institutions,
- international co-operation,
- updating the level of education,
- improving the National Innovation System.

The aim of this paper is to identify and assess the factors affecting the competitiveness of Chinese enterprises in the telecommunications equipment manufacturers industry on the world market. This study consists of three main parts. First of all, the political and institutional background for the development of the Chinese ICT sector will be highlighted. The study will focus on subsidiary government programs that were the trigger point for the establishing the most important telecom supplier corporations. The next part examines industry equipment manufacturers, along with the vendor and services provider environment in China, with an emphasis on internal competitiveness. The indicators that show the development of the Chinese domestic market will also be presented. Thanks to the largest telecommunication market in the world the suppliers from that region created a competitiveness toolbox that will be the subject of the study described in the last part of this publication.

2. Institutional conditions for the development of ICT sector in China

Factors that stimulate the development of the ICT industry in China can be divided into internal and external factors (see Table 1). This chapter focuses on the most important factors that created a framework for ICT development in China.

Table 1. Internal and external factors of ICT industry growth

Internal		External	
Stimulants	Examples	Stimulants	Examples
Opening of the telecommunications market	The end of monopoly, beginning of market based on free-market competition	Absorption of foreign technology	NERC – National Engineering Research Centers
Government programs	"863" programs – National High Tech R&D Program		National Key Laboratories
	National Key Technologies R&D Program		China Academy of Sciences
	"Torch" program		China Academy of Engineering
China's entering into WTO	Trade agreements	FDI inflows	Foreign Expert
Export promotion	Export-duty refunds		Venture Capital
	Financial-support packages for exporter		Licensing
Financial-support packages	SME credit-guarantee system		
	SME stock exchanges		
	Increase of SMA High-Tech enterprises		

Source: author's own work.

2.1. The end of state monopoly in telecommunication services in China

The main impetus of the development of the ICT industry was the establishment of the Ministry of Information Industry (MII) in 1998, which began restructuring the telecommunications industry. In February 1999 the State Council approved a plan of separating China Telecom into separate entities: China Mobile, China Telecom and China Satellite Corporation, China Netcom, China Railcom Corp.[1] These corporations, along with China Unicom, founded in 1994, are the core telecommunications operators in China. The result was the development of a competitive market instead of a state monopoly, which increased the efficiency and improved the quality of telecommunications services. Furthermore, the government gave the green light for the creation of new players in the telecommunications industry.[2] Those actions created reliable telecommunication equipment needs.

2.2. Government programs

As China develops and becomes more connected to the global economy, its government places greater emphasis on science and technology as an integral part of the socio-economic development of the country. This has led to increased investment and improved the structure and funding of scientific research. In essence, government support takes the form of investment in R&D centers. Table 2 shows the cumulative investment in R&D centers in the years 2001 and 2006 and the annual growth of R&D investments as a percentage of the GDP. From this data one can observe that the investment in R&D, as a percentage of the GDP, raised during the

Table 2. High-technology industry expenditure on R&D and as a percentage of value added in 2006

	R&D expenditure (100 million RMB)	As % of value added
1. Total manufacturing	1551.4	2.14
1.1. High-technology industries	456.4	4.54
1.1.1. Aircraft and spacecraft	33.3	13.82
1.1.2. Computers and office equipments	72.9	3.45
1.1.3. Electronic and telecommunication equipments	276.9	5.41
1.1.4. Medical equipment and meters	20.7	2.67
1.1.5. Pharmaceuticals	52.6	2.91

Source: author's own work based on Ministry of Science and Technology of The People's Republic of China, *China Science and Technology Statistics Data Book*, 2007.

[1] China Netcom was merged with China Unicom on 6 October 2008.

[2] D. Lusi, L. Wen, T. Ji,*Chinese manufacturing informatization*, Web Service Research and Implementation of E-commerce Systems, 2003.

period of 2001-2006 from 0.95% of the GDP to 1.42% of the GDP, and as a result the investments in 2006 were three times higher than in 2001.[3]

It can be concluded from these data that up to 349,800 million RMB[4] (53 billion USD) were spent on research carried out by the ICT industry in 2006. These expenses are covered by government programs the most important of which are described further.

Table 3. Gross domestic expenditure on R&D

	2001	2002	2003	2004	2005	2006
R&D GERD 100 million RMB	1042.5	1287.6	1539.6	1996.3	2450	3003.1
R&D GERD/GDP %	0.95	1.07	1.13	1.23	1.33	1.42

Source: author's own work based on Ministry of Science and Technology of The People's Republic of China, *China Science and Technology Statistics Data Book*, 2007.

Table 4. High-technology industry expenditure on R&D and as a percentage of value added in 2006

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Source: author's own work based on Ministry of Science and Technology of The People's Republic of China, *China Science and Technology Statistics Data Book*, 2007.

"863" programs – National High Tech R&D Program: The National High Tech Research and Development Program (Program 863 in short) was founded in March 1988. Its main objective was to reduce the technological gap between China and the West. The program consisted of a total of about 1100 projects with a total budget of 4,300 million RMB (654 million USD). The computerization program was divided into the following research areas:

- information security technology,

[3] Ministry of Science and Technology of The People's Republic of China, *China Science and Technology Statistics Data Book*, 2007.

[4] [ICT] = [high-technology industries] – [Aircraft and spacecraft] – [Medical equipment and meters] – [Pharmaceuticals].

- computer software and hardware technology,
- communication technology,
- information acquisition and processing technology,
- information security technology.[5]

"Torch" program: The Torch Program was launched by the Ministry of Science and Technology in 1988. Its main objectives were the establishing of Special Economic Zones for the industry with advanced technologies and Technology Incubator Centers, which provide favorable conditions for the development of advanced technologies.[6] Infrastructure was created to provide a link between R&D centers and industrial plants. They consist of high-tech enterprises, research institutes, and universities. The Torch Program resulted in the establishment of such companies such as Lenovo, Founder, Haier, Huawei, and others. FDI played an important role in the rise of technology and competiveness. For developing countries, foreign direct investments are an important source of capital, technology, and foreign trade. However, this factor was omitted in this study.

2.3. Chinese ICT sector overview

Every year in China, an average of 10 million telephone lines are introduced. In 2008, China had 340 million fixed telephone lines, hereinafter referred to as PSTN (25% of the population) and 641 million people were mobile users (48% of the population).[7] For comparison, China's PSTN lines penetration rate in 1980 was 0.3 per 100 *capita*, while the first transmitter wireless telephony was launched in 1987. The number of users of fixed and mobile telephony in China makes it the world's largest telecommunications market. A similar increase can be noted by observing the increase of Internet users.[8] Over nine years, the number of Internet users grew by 390 million users. In January 2007 there were 4,472,577,939 registered Internet domain names in China.[9] In order to enable domestic vendors to upgrade their technology, the government formulated a four-step strategic policy: import, digestion, absorption, and creation. Using the domestic market to attract foreign technology has since been a preferred strategy for upgrading the technology of domestic vendors, particularly by establishing joint venture arrangements. In addition to joint venture companies, the Chinese government created domestic firms in the late eighties. The largest of these are Huawei, Zhongxing (ZTE), Datang, and Julong. According to the adopted

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[5] http://www.most.gov.cn.

[6] S. Shi, T.Y. Li, *Torch Program – Birthed in Texas, Grown Up in China, Returning to Texas/Mexico: An Entrepreneurship Creation Program for the Success of Chinese High Tech Industry*, Texas Lyceum, 2006.

[7] National Bureau of Statistics of China, *China Statistics Yearbook 2009*, 2009.

[8] ITU, CINIC.

[9] China Internet Network Information Center, *19th Statistical Survey Report on Internet Development in China*, 2007.

strategy, local Chinese corporations were to invest in R&D centers. In years 2000--2009 these investments reached an average of 3% of annual sales, while larger producers (Datang, Zhongxing, Huawei) reached 10%. For these reasons domestic Chinese corporations become a preferred choice. For instance the Chinese vendors has 50%[10] of the market share in field of Ethernet switches and routers, and 40%[11] in the field of xDSL technology.[12]

3. China's competitive advantage in the ICT sector

The most important criteria for the choice of a supplier of telecom equipment include:

- technology, understood as innovative solutions, the stability of solutions, quality, and durability;
- price understood as both a CAPEX (e.g.: the price of equipment, installation price, integration) and OPEX (e.g. power consumption, service price);
- other factors such as financing, preferential payment terms, short delivery times, a long warranty period, long after-warranty assistance, speed of response to problems, an extensive support network.

We will now examine the factors determining the competitiveness of Chinese suppliers of telecom equipment on the European market.

3.1. Technology and innovative solutions

One of the key factors of competitiveness is innovation. Through innovative technologies, solutions and products, telecom equipment suppliers from China are able to compete with their rivals from the UE, Japan, and the USA. When examining this topic, it should be stressed that the promotion of innovation in China began relatively late in 1985. WIPO statistics[13] clearly state that the first patents in China occurred in 1985 (there were 8558 then, while there were 115,235 and 299,851 patents from the U.S. and Japan respectively at that time). After 25 years of dynamic growth China achieved the third position today in terms of the number of patents (in 2008, China reported 289,838 patents; the U.S. and Japan reported 456,321 and 391,002 patents respectively). Assuming a similar rate of growth, it can be forecasted that China will soon reach the first position in terms of patent applications. An important factor essential to the analysis of competitiveness is not only China's share in the amount of patent applications, but also the share of patents directly connected to the

[10] T. Harris, J. Mazur, *Global Historical Quarterly Revenues of Switching and Routing Vendors*, OVUM, 2009.The data included items like: Core IP/MPLS, Edge IP/MPLS, IP/Ethernet, ATM/MPLS.

[11] T. Harris, K. Ganguly, *FTTx, DSLAM, and CMTS Subscribers/Ports, Revenue, and Market Share by Region and on a Rolling 4Q Basis*, OVUM, 2009.

[12] Including SHDSL, ADSL, and VDSL.

[13] WIPO Statistics Database, June 2010.

ICT. The share of electronic engineering patents applications in China is 31%. We can also say that China has a similar distribution of the number of patent applications in the electronic engineering industry as Japan and the U.S. (respectively 37% and 34%). Table 5 shows the number of patents filed by various corporations, including suppliers from China. On the basis of the data presented in Table 5, one can observe the continuing high position of Huawei, which occupied the first place in 2008 (the second and fourth place in 2009 and 2010 respectively). It is interesting that a Chinese company, Huawei, surpassed such market leaders as Ericsson and other telecom equipment suppliers The fact that ZTE recently jumped into second place (it occupied the twenty-second position in 2009, and the thirty-fourth in 2008) is also noteworthy. Both ZTE's rapid rise in the number of filed patents, as well as Huawei's high position, particularly in relation to such companies as Ericsson and Alcatel Lucent may be explained by these companies' investing in R&D centers.[14] Basing on this data, it appears that ZTE has increased investment in R&D as much as 44% in 2009 (first place in terms of increased investment in about a year). Huawei has increased investments by 22%. The increase in corporate investment in China is accompanied by a sharp fall in competitive businesses outside of China (Nokia: –1%, Ericsson: –1.6%, Alcatel Lucent: –11.6%, Motorola: –22.5%).

Large investments in R&D centers also lead to a strong position in standardization organizations. For example, Huawei is actively participating in 123 international standardization organizations, including the most important ones, such as ITU, 3GPP, 3GPP2, OMA, ETSI, IEEE, IETF, ATIS, TM Forum, WWRF, DSL Forum, DLNA, DVB, MEF, OIF. Representatives of Huawei now hold key positions in the aforementioned organizations, including Vice ITU-T SG11, the Chairman of 3GPP SA5, Vice Chairman RAN2/CT3, Vice Chairman 3GPP2 TSG-C WG2/WG3, TSG-WG2 Vice-President, Chairman of the ITU-R WP8F Technical Group, Vice-President of GS OMA/DM/MCC/Olympic Committee, board member of the IEEE CAG, etc. The end of 2009 brought a total of 18.000[15] contributions. IEEE Standards Association awarded Huawei its "2009 Corporate Award" in recognition of its contributions in this field.

3.2. Price

Prices are a secondary criterion for choosing a technology provider in the telecommunications sector. Moreover, unlike everyday products, prices are not commonly known. Even if we make a number of assumptions in relation to the technology (let us consider SDH technology, which seems to be the oldest of telecommunications technologies used to date[16]) new features are added each year

[14] WIPO, based on company filings at the US Securities and Exchange Commission or annual reports.

[15] Huawei Technologies Co. Ltd, Annual Report 2009.

[16] ITU-T Recommendation G.707/Y.1322 published in 2001.

Table 5. Business sector top PCT applicants

Rank	APPLICANT'S NAME	COUNTRY OF ORIGIN	2010 PCT APPLICATIONS	APPLICANT'S NAME	COUNTRY OF ORIGIN	2009 PCT APPLICATIONS	APPLICANT'S NAME	COUNTRY OF ORIGIN	2008 PCT APPLICATIONS
1	PANASONIC CORPORATION	JP	2,154	PANASONIC CORPORATION	JP	1,891	HUAWEI TECH.	CN	1,737
2	ZTE CORPORATION	CN	1,863	HUAWEI TECHNOLOGIES CO., LTD.	CN	1,847	PANASONIC	JP	1,729
3	QUALCOMM INCORPORATED	US	1,677	ROBERT BOSCH GMBH	DE	1,587	PHILIPS	NL	1,551
4	HUAWEI TECHNOLOGIES CO. LTD.	CN	1,528	KONINKLIJKE PHILIPS ELECTRONICS N.V.	NL	1,295	TOYOTA	JP	1,364
5	KONINKLIJKE PHILIPS ELECTRONICS N.V.	NL	1,435	QUALCOMM INCORPORATED	US	1,280	ROBERT BOSCH	DE	1,273
6	ROBERT BOSCH GMBH	DE	1,301	TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)	SE	1,240	SIEMENS	DE	1,089
7	LG ELECTRONICS INC.	KR	1,298	LG ELECTRONICS INC.	KR	1,090	NOKIA	FI	1,005
8	SHARP KABUSHIKI KAISHA	JP	1,286	NEC CORPORATION	JP	1,069	LG ELECTRONICS INC.	KR	992
9	TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)	SE	1,149	TOYOTA JIDOSHA KABUSHIKI KAISHA	JP	1,068	ERICSSON	SE	984
10	NEC CORPORATION	JP	1,106	SHARP KABUSHIKI KAISHA	JP	997	FUJITSU	JP	983

Source: author's own study based on WIPO Statistics Database January 2011, WIPO Statistics Database, June 2010, WIPO Statistics Database January 2009.

to the basic standards that affect the final price of the offered solution. General characteristics of the prices of telecommunication solutions can be found below:

- determined individually in each case (for each tender and each buyer),
- largely negotiable,
- have strong economies of scale both in the case of an individual contract (the amount of equipment ordered by the operator) as well as in the case of time available technology on the market.

The important difference is the minimum price that a supplier may offer for its solution. In the case of the Chinese telecom equipment suppliers, we have to deal with well-described phenomenon called "China price".[17] As the main factors behind the low prices of goods from China are:[18]

a) **Low wages:** The average level of annual wages in engineering research R&D centers in China are around 11 455 USD (in the EU: 65 261USD, the USA: 71 291 USD).[19] This means that wages in China are approximately 82% lower than in Europe, and 83% lower than in the USA for employees that work on equivalent positions.

b) **Government subsidies (tax profit):** Currently, Chinese companies that are producing and exporting telecommunication products may demand a VAT refund from the government. VAT refunds may be made any taxable services related to the production of exported goods. ZTE may serve as an example, the company included the item "Other revenues and profits", quoting the value of 682 million RMB (85.3 million USD) in the annual report. Most of this amount comes directly from VAT refunds. VAT reimbursements accounted for almost 30% of their 2005 1.5 billion RMB pre-tax profits.[20]

The other factors determining relatively low prices of goods and relatively high quality in China are the following: a high quality resulting from high staff discipline, an increase in employee education (relatively highly educated workers), low social security benefits for workers, minimal enforcement of environmental regulations, an effective form of industrial organization known as the "Cluster Network", a frequent lack of enforcement of intellectual property rights, undervaluing domestic currency, intense competition on the domestic market, as well as trade barriers to protect domestic market. The factors listed earlier give Chinese manufacturers of

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[17] P. Engardio, D. Roberts, B. Bremner, *The China Price*, Business Week, New York 2004; R. Álvarez, S. Claro, *The China Phenomenon: Price, Quality or Variety*?, Working Papers Central Bank of Chile, 2006; A. Harney, *The China Price: The True Cost of Chinese Competitive Advantage*, The Penguin Press, 2008.

[18] P.W. Navarro, *China and Weapons of Mass Production: The "China Price" Is the "Cheating Price"*, FT Press 2010.

[19] U.S. Bureau of Labor Statistics, *National Industry-Specific Occupational Employment and Wage Estimates* May 2009; http://www.jobstats.co.uk; National Bureau of Statistics of China, *China Statistics Yearbook 2009*, 2009.

[20] R. Le Maistre, *Pressure Piles on Huawei, ZTE*, 2006, lightrading.com.

telecommunications equipment a greater capacity to offer their products at lower prices than their counterparts from Europe and the USA.

3.3. Financing

With China's huge foreign exchange reserves, Chinese suppliers of telecommunications equipment have a wide range of funding opportunities for telecommunications providers. It gives them a significant advantage over suppliers coming from outside China. According to the Ovum report in 2009,[21] Chinese banks have granted 65 billion USD for credit lines for Huawei and ZTE to finance their telecommunications investments. An example of such financing can be the granting of a credit line for instance to companies like:

- America Movil granted the amount of 1 billion USD to Huawei through the China Development Bank,[22]
- Reliance granted the amount of 750 million USD to Huawei through the China Development Bank,[23]
- Shyam Sistema granted the amount of 70 million USD to ZTE through the Bank of China.[24]

The examples of financing toolbox are as follows:

a) **Export Credit Facility (ECA Loans):** A financial facility which is provided for the importer, or importer's bank, by financing a bank from the exporter's country under the coverage of export credit insurance. In practice, the loan does not have to go abroad, the exporter shall receive disbursement directly from the financing bank on site, while the importer repays the loan according to the repayment schedule stipulated within the facility agreement. For example: buyer's credit facility can be signed within the framework of a credit agreement, for the maximum amount of 28 million USD, between Telemar Norte Leste (as a "borrower"), Société Générale (as a "lender"), the China Export & Credit Insurance Corporation, (as a "guarantor"), and Huawei Technologies (as a "supplier") on the 16th of November 2004. This transaction was guaranteed by Sinosure, the Chinese Government Insurance Company for Export Credit financing operations, to finance the telecommunication equipment manufactured by Huawei Technologies and sold to Telemar Norte Leste SA, the biggest Brazilian Telecom Operator. This credit facility has been used to finance up to 85% of the commercial contract signed between Huawei and Telemar for the supply, installation and operation of any kind of system and equipment provided by Huawei.[25]

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[21] I. Lunden, *Vendor Financing: Loan Wars*, 2009, www.totaltele.com.

[22] *America Movil Profits Up on Lower Costs – Secures Chinese Bank Loan*, 2009, www.cellular-news.com.

[23] N. Willing, *Reliance Borrows $750M for Huawei Gear*, 2008, www.lightreading.com.

[24] ET Bureau, *Sistema Shyam TeleServices Limited Signs $70 mn Loan Agreement with Bank of China*, 2009, www.economictimes.indiatimes.com.

[25] Huawei Technologies Co. Ltd, Telemar Norte Leste SA.

b) **Commercial Loan:** Commercial loans are bank loans, which are awarded to different types of businesses. It can be a short-term source of funding for basic operational sources, such as payrolls, or to buy materials for the production of goods manufactured and sold by the company. In other cases, commercial loan can be used to purchase new machines, which are directly related to the operation of the company. The contract between SUNDAY's 3G network provider and Huawei, signed on 18 December 2003 can serve as an example. The financing associated with the Supply Contract is provided under a Facility Agreement covering three separate facilities; 110 million USD 7.5-year Equipment Supply Facility, 2.5-year 110 million USD General Facility, and 3G Performance Bond Facility.

c) **Export credit insurance:** Export credit insurance is a policy-oriented insurance specializing in promoting export by exporting credit insurance coverage against political and credit risks associated with foreign trade and the collection of payments. It is funded by the state's fiscal budget and run on a non-profitability basis. Credit insurance partners are: China Development Bank, Industrial and Commercial Bank of China, Bank of China, Exim Bank (The Export-Import Bank of China)

4. Conclusion

Table 6 gives a full picture of the situation in the telecommunications market in 2010 showing the revenues of telecom equipment suppliers in 2010 and the changes compared to preceding year.

Table 6. Major telecom vendor 2010 annual revenues

All revenues converted to USD	2010 revenues (in USD)	YoY change
Ericsson	31.3 billion	–1.60%
Huawei	28.0 billion	28.40%
Alcatel-Lucent	21.3 billion	1.90%
Nokia Siemens Networks	17.4 billion	0.70%
ZTE	10.7 billion	16.70%

Source: author's own study based on http://www.lightreading.com.

It can be observed that a Chinese company, Huawei, ranked second among the suppliers of equipment (before Alcatel-Lucent, the first place is taken by Ericsson). Huawei's 28.4% increase over the previous year is also worth noting, along with the 16.7% increase YoY in the case of ZTE. These data clearly show that from year to year, Chinese telecom equipment vendors are chosen more and more frequently by buyers from all over the world. Their highly competitive solutions are not only

determined by their price, but by also by their relatively high technology level and innovation.

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KONKURENCYJNOŚĆ CHIŃSKICH DOSTAWCÓW TECHNOLOGII TELEKOMUNIKACYJNYCH NA RYNKACH MIĘDZYNARODOWYCH

Streszczenie: W ostatnich latach na rynku sprzętu telekomunikacyjnego i technologii można zaobserwować rosnące znaczenie dostawców pochodzących z Chin. Zmienia się postrzeganie także produktów, które oprócz wzmocnienia ich konkurencyjności cenowej umacniają swoją konkurencyjność technologiczną. W pracy przeanalizowano zmiany polityczne w Chinach, które doprowadziły do tej sytuacji, oraz czynniki konkurencyjności chińskich dostawców technologii telekomunikacyjnych.