

Geographical Factors in the Development of the Mobile Phone Market and Services in Japan

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I Introduction

Mobile phone services have developed rapidly in recent years, and the geographical factors behind this development have attracted considerable attention. Previously, we reported on new location-based services (LBSs), e.g., local information services and security services using mobile phones, mainly based on cases in Japan (Arai 2006, 2007; Arai and Naganuma 2007). This paper focuses on the reasons why many advanced examples in the field of new mobile phone services have been found in Japan.

Nowadays, a mobile phone is not only an oral communication tool but also a multipurpose

information device. A mobile phone handset has various functions such as internet browser, e-mailer, camera, music player, and GPS navigation. An internet connection service provided by NTT Docomo, the "*i-Mode*" service, has encouraged the expansion of the variety of mobile phone uses, and competitors of NTT Docomo now also provide similar services to the "*i-Mode*" service. Although these various services were first developed in Japan, services developed by Japanese companies have not spread outside of Japan, with the exception of a few countries such as Korea. Japanese mobile phone manufacturers, such as Sharp, Panasonic, and Fujitsu, in particular have adapted to

Table 1. Developments of innovative mobile phone services in Japan

1993	Digital (2G) mobile phone (PDC system by NTT Docomo)
1999	Mobile Internet service (" <i>i-Mode</i> " by NTT Docomo)
2000	Camera phone (by Sharp and J-PHONE)
2001	IMT2000 (3G) mobile phone (W-CDMA system by NTT Docomo)
2001	Location based information service (" <i>i-Area</i> " by NTT Docomo)
2001	GPS positioning/security services (by KDDI and SECOM)
2002	Music downloading service (by KDDI)
2003	Navigation services based on GPS positioning (" <i>EZ-Naviwalk</i> " by KDDI)
2004	Mobile payment using RFID chip (" <i>OsaiFu-Keitai</i> " by NTT Docomo)
2004	Browser phone for PC internet websites (by KDDI)
2006	Digital TV receiver (" <i>One-Seg</i> ." by Sanvo and KDDI)

Japanese mobile phone services. However, they have less competitiveness in the current world market.

Why has the development of these various mobile phone services progressed rapidly in Japan? In addition, what factors have hindered the expansion of the various mobile phone uses outside of Japan? In this paper, the geographical factors affecting these issues will be discussed.

II The mobile phone market and services in Japan

Japanese mobile phone companies were the first in the world to develop a number of commercial services (Table 1). For example, NTT Docomo started the first digital mobile phone service (Second Generation: 2G) in 1993. The digitalized networks of mobile phone systems made it possible to develop the "*i-Mode*" service and various services using mobile phones. Third Generation (3G) mobile

phone services started in 2001 and boosted the development of new services that require high-speed data transmission; e.g., online music downloading. Because mobile phones with GPS devices became widely used earlier in Japan, location search services and location-based security services (LBSSs) using GPS positioning technologies were launched. Mobile phone handsets with the addition of a variety of devices have also been developed. Camera phones, mobile phone payment systems using a Radio Frequency Identification (RFID) chip called "*OsaiFu-Keitai*", and digital TV receiver phones called "*One-Seg*" have also recently become very popular.

The use of these services has spread rapidly in Japan. For example, subscribers of 3G mobile phones account for nearly 90% of all mobile phone subscribers (Figure 1). The average revenue per user (ARPU) in Japan is higher than in other advanced countries, and one of the reasons for this is that data transmission

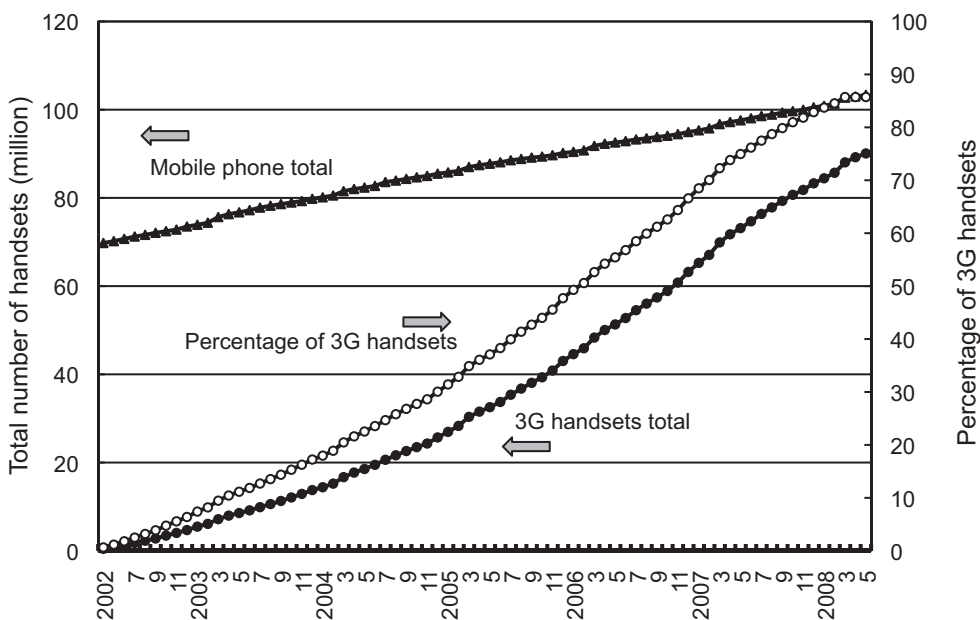


Figure 1. Percentage of 3G mobile phone handsets in Japan
 Source: Telecommunication Carriers Association.

fee is higher than in other countries. This fact suggests that the large volume of data transmissions corresponds to the penetration of various mobile phone services (Table 2, Table 3).

Osaki (2008) pointed out that the recent world market for mobile phones is divided into five segments, as shown in Table 4. The share of the "high-end" segment, which contains mainly 3G handsets, is less than 20% of the world market. The "middle range" is the core segment of the market in advanced countries. However, almost all handsets sold in Japan can be categorized in the "high-end" segment, and these characteristics of the Japanese market relate to the fact that mobile phone handsets

sold in Japan commonly correspond to almost all of the new services provided. On the other hand, the major price zone of handsets sold in Japan corresponds to the "middle-range" or "low-end" segments in the world market (Table 5). In fact, very-low-price handsets are sold in Japanese mobile phone shops, and even campaigns for "free" handsets are frequently found.

Market share by handset manufacturer is also distinctive. Almost all handset manufacturers supplying the Japanese market are Japanese companies, and very few handsets made by foreign manufacturers are sold. On the other hand, the presence of Japanese manufacturers in the world mobile phone market is very limited, although Japanese manufacturers have

Table 2. The average revenue per user (ARPU) in selected countries, 2003

Country	ARPU (US\$)
Japan	940
United State	560
Australia	440
Korea	405
France	370
Germany	360
Italy	330
United Kingdom	320

Source: Ministry of Internal Affairs and Communications.

Table 3. Service composition of Vodafone's ARPU in selected countries, 2005 (%)

Country	Voice	Message	Data
Japan	70.1	6.6	23.3
United Kingdom	79.3	15.7	5.0
Germany	79.6	15.7	4.7
Spain	85.2	11.9	2.9
Italy	82.6	14.9	2.5

Source: Ministry of Internal Affairs and Communications.

Table 4. Segments of mobile phone handset in the world market

Segment	Market share	Price zone	Features
High-end	15 - 17%	over \$300	mainly 3G
Middle-range	38 - 40%	\$100 - 300	2 - 2.5G
Low-end	35 - 37%	\$60 - 100	
Super-low-end	10%	\$30	only voice and SMS

After: Ohsaki (2008).

Table 5. Price zones of mobile phone handset sold in Japan, 2006

Price Zone in Yen	in US\$	Market share
more than 20,000	more than 200	17.6%
10,000 - 20,000	100 - 200	35.6%
5,000 - 10,000	50 - 100	34.1%
1,000 - 5,000	10 - 50	9.2%
less than 1,000	less than 10	3.5%

Source: Communications and Information Network Association of Japan.

Table 6. Market share by mobile phone handset manufacturer, 2007

World market				Japanese market			
Rank	Manufacturer	Number of handsets (million)	Share (%)	Rank	Manufacturer	Number of handsets (thousand)	Share (%)
1	Nokia	437	38.2	1	Sharp	127,334	24.3
2	Samsung	161	14.1	2	Panasonic	6,484	12.4
3	Motorola	159	13.9	3	Fujitsu	5,811	11.1
4	Sony-Ericsson	103	9.0	4	Toshiba	5,193	9.9
5	LG	80	7.0	5	NEC	3,940	9.4
Others		204	17.8	Others		17,180	32.8
Total		1,144	100.0	Total		52,342	100.0

Source: IDC, Gartner Japan.

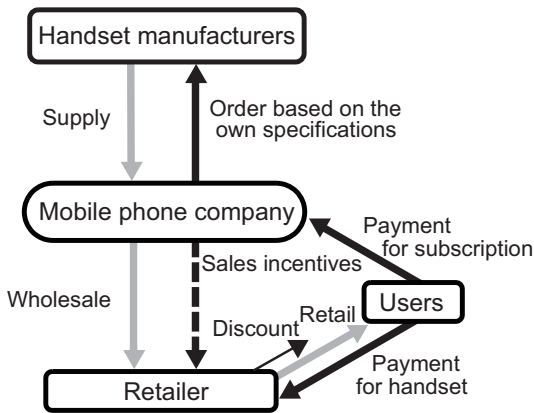


Figure 2. Business model of Japanese mobile phone

exported handsets in large quantities since the beginning of the 1990s (Table 6).

III The business model in the Japanese mobile phone market

These peculiarities of the Japanese mobile phone market relate to the characteristics of the business model found in the market (Ministry of Internal Affairs and Communications 2007a; Taniwaki 2008). The outline of this business model is summarized in Figure 2.

A Japanese mobile phone company procures all handsets for its mobile phone network from the manufacturers on an Original Equipment Manufacturing (OEM) basis and wholesales to handset retailers. The manufacturers are large electronic manufacturers such as Sharp, Panasonic, and Fujitsu. The manufacturers

develop the handsets based on the specifications planned by the mobile phone company and mass-produce the developed handsets. For this reason, a handset developed for one mobile phone company cannot be connected to other mobile phone companies' networks.

A mobile phone company usually offers significant sales incentives to retailers with its handsets. A retailer discounts the final price of handsets utilizing the sales incentives from the mobile phone company. Although the amount of sales incentives differs among mobile phone companies and among handset models, the average amount is estimated at 40,000 yen, or approximately 400 US dollars. If it is assumed that the average actual cost of a "high-end" handset is 60,000 yen and that all sales incentives are used for the discount, the final price can be reduced to 20,000 yen, or 200 US dollars. Because a retailer offers an additional discount for an old model to decrease dead stock, "free" handsets are often sold in shops (Figure 3).

The cost of sales incentives is transferred to the subscription fee paid monthly by subscribers. However, the amount of the additional fee is not linked to the handset price. A subscriber pays the same additional cost for the sales incentives regardless of the price of his/her handset.

In European countries and the United States, discounted handset pricing for long-term

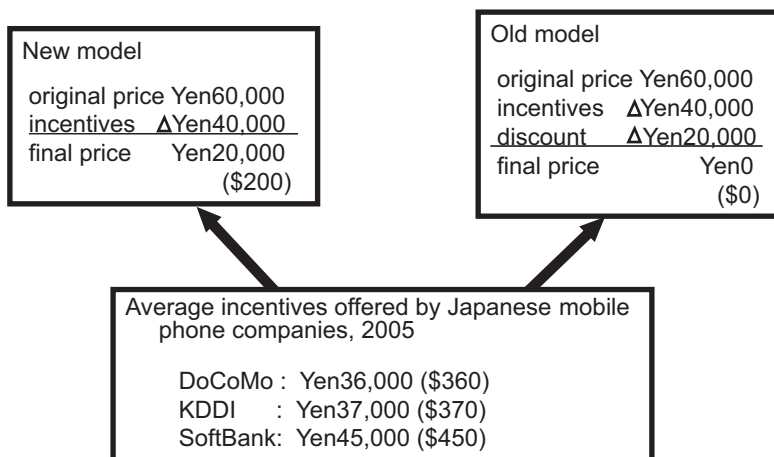


Figure 3. A rough estimation of handset price
 Source: Ministry of Internal Affairs and Communications.

subscribers has become popular in recent years. In Japan, however, discounted handset pricing using sales incentives without restricting the subscription period has been common policy from the early stages of the growth of mobile phone businesses. This distinctive price system encourages the frequent replacement of handsets.

From the above observations, the characteristics of the Japanese mobile phone market can be summarized as follows.

- a. Mobile phone companies procure handsets developed according to their own specifications from Japanese manufacturers. They wholesale the procured handsets to retailers with sales incentives.
- b. The relationship between a mobile phone company and a manufacturer is close.

- c. High sales incentives from mobile phone companies make it possible for handset retailers to keep final prices lower than actual costs.
- d. The segmentation of the market concentrates on "high-end" handsets because of the relatively low retail price.
- e. A mobile phone company can provide new services based on rapid and frequent developments given the close relationships with handset manufacturers.
- f. Relatively high shipment prices of handsets make it possible for handset manufacturers to keep their business profitable in spite of the enormous development costs for handsets.
- g. Severe competition among mobile

phone companies and among handset manufacturers boosts the development of new services.

IV Geographical factors in the development of new mobile phone services in Japan

These characteristics of the Japanese mobile phone market affect the rapid growth of the various mobile phone services. However, our hypothesis is that some geographical factors stimulate the development of new mobile phone services in Japan, and this topic will be examined here from three perspectives: 1. the size of domestic demand for mobile phones, 2. the distinctive relationships historically formed between telecom carriers and manufacturers, and 3. the territorial synergies among the various business fields in the domestic industries and markets.

1. The size of domestic demand for mobile phones

Because written Japanese contains both Kanji (Chinese characters) and Kana (Japan's indigenous alphabet), there are some very specific ways to input and display e-mails and other content for mobile phones. For this reason, handset models sold in Japan must be developed exclusively for the Japanese market. A sufficient volume of domestic demand is therefore necessary for the frequent development of

Table 7. Number of mobile phone subscribers in selected countries, 2005

Country	Subscribers (million)	Subscribers per 100 inhabitants
China	393.4	30.2
United States	213.0	71.9
Russia	120.0	83.8
Japan	96.5	75.5
India	90.1	8.2
Brazil	86.2	46.8
Germany	79.3	96.2
Italy	71.5	122.0
United Kingdom	65.6	109.0
France	48.1	78.9
Korea	38.3	79.3
Spain	42.7	98.4
Sweden	9.1	100.8
Finland	5.3	101.9

Source: WTI.

new handset models corresponding to new services in Japan. If the volume of domestic demand is limited, the frequent development of new models leads to a decrease in business profitability due to the small production volume. Although the penetration rate of Japanese mobile phone subscribers is equal to or slightly lower than that in European countries, the total number of subscriptions, fourth in the world in 2005, is far larger (Table 7). The size of the domestic market must be a prerequisite for the active development of new handset models by Japanese manufacturers corresponding to requests from mobile phone companies.

2. The distinctive relationships historically formed between telecom carriers and manufacturers

From the beginning of Japanese telecommunication services to the middle of the

1980s, the services were substantially operated by the national government. *Denden Kosha* (NTT Public Corp.), which had a monopoly in Japan's domestic telecommunication business from the end of World War II to 1985, provided research and development for the core technologies of telecommunication systems and equipment. However, *Denden Kosha* had no manufacturing department for telecom equipment, and it procured equipment from private manufacturing companies following *Denden Kosha's* specifications. All telephone handsets produced by the manufacturer were bought by *Denden Kosha* and leased to telephone users. Because the customers of telecom equipment manufacturers were mainly limited to *Denden Kosha*, close relationships between *Denden Kosha* and the manufacturers were built up under the strong initiative of *Denden Kosha*. In spite of the privatization of *Denden Kosha* as NTT and the permission for new companies to enter telecom businesses in 1985, the close relationships between telecom companies and manufacturers have been maintained.

At the time when commercial mobile phone services started up in the 1980s, *Denden Kosha* was the sole operator of these services. After the separation of the mobile phone division of NTT into NTT Docomo in 1992, these relationships were maintained. Docomo built a business model in which the manufacturers

mass-produced handsets of Docomo's brand according to Docomo specifications and Docomo wholesaled the handsets to retailers. New companies entering the mobile phone business, which had no capabilities for core-technology development like Docomo, adopted very similar business models.

Despite the entry of new mobile phone companies, NTT Docomo has consistently maintained more than 50% share of the domestic mobile phone market. This competitive strength ensures the strong position in its relationships with manufacturers.

NTT Docomo adopted the Personal Digital Cellular (PDC) system, which was developed by Docomo itself to digitalize its mobile phone network. This decision caused the Japanese mobile phone market to become quite distinctive compared with other advanced countries. The PDC system has no compatibility with the GSM system developed in Europe or the "cdmaOne system" developed in the United States and was introduced only in Japan. Consequently, in the telecom and handset markets, Japanese mobile phones have become isolated from the global market and have only been developed domestically. Japanese journalists refer to this as the "Galapagos phenomenon".

3. Territorial synergies among manifold business fields in the domestic industries and markets

For the start-up of a new mobile phone

service as a viable business, various supporting businesses as well as hardware manufacturing are needed. Not all necessary businesses can be supplied from within the narrow mobile phone industry, and various technologies and expertise developed in industrial sectors other than in mobile phone businesses should be utilized and applied in the new services. In Japan, there are heavy accumulations of advanced electronic and precision manufacturing. In addition, various businesses in fields other than manufacturing can be utilized for mobile phone services. These characteristics of the economic geography of Japan create the positive conditions for the rapid progress of mobile phone services. Two cases, the developments of 1) the camera phone and 2) LBSs, will be examined in the following subsections.

1) The camera phone: synergies among domestic manufacturing industries

The camera phone, which has become widely used in advanced countries, was first developed by J-PHONE (now SoftBank) and Sharp in 2000. The camera phone was developed based on digital camera technologies, but because these technologies are quite different from telecom technologies, a certain level of expertise in digital camera production was needed for the development of the camera phone.

Fuji Film, a leading photo film manufacturer in Japan, developed the first

commercial digital camera in 1988, and Casio, a leading electronic calculator manufacturer, put the first compact digital camera for personal use on the market in 1995. Because the first digital camera was developed by a Japanese company, Japanese manufacturers have maintained the highest share of world digital camera production. Advanced digital camera technologies are commonly owned by a number of component suppliers as well as the final product manufacturers, and these technologies are very useful in the development processes of camera phones.

2) Location-based services: synergies among various business fields

The possibility of LBSs using geographical positioning data acquired by the mobile phone system was suggested in the literature at the beginning of the 2000s (Adams et al 2003). However, in Japan, some nationwide services using mobile phones in the LBS field were actually launched around 2000 or earlier: a location search service for personal use using the Personal Handy-phone System (PHS) in 1998, location search and security services based on GPS technologies in 2001, and GPS-based pedestrian navigation services in 2003. Because these services cannot be developed solely based on telecommunication and geographical positioning technologies, various supporting businesses are needed to provide these services. Car navigation system manufacturers, map

publishers, and security companies are typical of the supporting businesses required for LBSs in mobile telephony.

Honda developed the first car navigation system in 1981. Although this system did not use GPS-based but gyrocompass-based positioning, Japanese automobile-related companies showed great interest in the future possibilities of car navigation services. An organization, named the IT Navigation System Researchers' Association (*Navi-Ken*), was formed with the aim of developing standards for digital maps to promote the penetration of car navigation services throughout the nation. An experimental GPS-based car navigation system was first developed in 1990, and after a GPS-based car navigation system for general use was put on sale in 1992 by Pioneer, a Japanese electronics manufacturer, car navigation services began to be widely expanded. Almost all major electronics manufacturers in Japan entered the car navigation business. The world share of Japanese manufacturers exceeded 50% in the late 1990s. The technologies related to car navigation systems progressed rapidly in Japan because of the wide diffusion of car navigation equipment and the preparation of digital maps throughout the nation. The technologies of car navigation systems were transferred to LBSs in mobile telephony.

Some Japanese printed map publishers, such as Zenrin and Shobunsha, entered the

digital map business. These companies possess the appropriate skills and maintenance systems for the production of large-scale printed maps covering the whole of Japan. Because map publishers' expertise and mapmaking materials can easily be utilized to build digital map databases, from the early stages of digital map expansion, they have been able to publish detailed, low-price digital maps covering almost all of the country. They supply the digital maps for LBSs to mobile phone companies. Pedestrian navigation services, such as "*Ez Navi-Walk*" by KDDI, were developed using high-resolution town map data and pedestrian network data provided by Zenrin and Shobunsha. They provide also application service provider (ASP) solution services for digital map handling. A content provider for mobile phones can easily develop new content using these services.

As reported in Arai and Naganuma (2007), LBSSs were developed by Japanese security companies and mobile phone companies in the beginning of the 2000s. SECOM, a leading security service company, was the first to build new security services using GPS-based positioning technologies based on KDDI's mobile phone networks. Among LBSSs provided by security companies, emergency dispatch services utilizing the dense networks of emergency depots illustrate one result of the synergy between mobile phone and security service sectors.

The existence of territorial synergies among manifold business fields not only in the manufacturing sector, e.g., car-navigation systems, map publishing and security services, is a significant factor in the rapid progress of mobile phone services in Japan.

V The recent competition-promotion policy of the Japanese government

Japanese mobile phone services have developed rapidly under the geographical conditions discussed above. However, some recent changes are evident in the structure of the Japanese mobile phone market. The most significant issue is a new Japanese governmental policy to promote competition in mobile phone businesses. This policy targets the abolition of sales incentives paid by mobile phone companies to handset retailers. As mentioned above, the cost of sales incentives raises subscription fees and is ultimately transferred to mobile phone subscribers. The Japanese government argues that the details of the transfer from subscription fees to handset prices are quite opaque and that there is the possibility of obstruction of fair competition for mobile phone businesses. In September 2007, the government requested mobile phone companies to introduce the "decoupling" business model. In this business model, sales incentives are abolished to remove the linkage between the final price

of handset and the subscription fee (Ministry of Internal Affairs and Communications 2007b). In accordance with this request, mobile phone companies introduced new price systems from November 2007, under which the final price of a handset increases to about three times the previous price. On the other hand, subscription fees are largely reduced. Based on the result of a Japanese government survey, a newspaper report argued that the average monthly fee in Tokyo in 2008 has been reduced by 30% to date (*Asahi Shinbun*, July 31, 2008).

Although the impact of these new price systems is not yet clear, the large rise in handset prices may cause changes in market structure, such as an increase of "low-end" handset models with fewer functions and a decrease in handset replacement. A recent newspaper reported that the number of handsets sold since the start of the new pricing has decreased around 20% on average (NTT Docomo, 21%; KDDI, 19%; SoftBank, 23%) (*Nippon Keizai Shinbun*, August 6, 2008). Consequently, these structural changes in the market may in fact hinder the previously active development of new services.

VI Conclusion

Japanese mobile phone companies were the first in the world to develop a variety of commercial services. These services have rapidly developed under a distinctive business

model in Japanese mobile phone industries. Under this business model, the price of a mobile phone handset is restrained because of high sales incentives from mobile phone companies to handset retailers. Because the final handset price is kept low relative to actual production costs, the segmentation of the Japanese mobile phone market has concentrated on "high-end" handsets. Mobile phone companies can provide new advanced services resulting from rapid and frequent development under close relationships with handset manufacturers. Severe competition among mobile phone companies and among handset manufacturers encourages the development of new services.

In addition, some geographical factors stimulate the development of new mobile phone services in Japan. First, the size of the domestic market must be a prerequisite for the active development of new handset models by Japanese manufacturers following requests from mobile phone companies. Second, distinctive relationships between telecom carriers and manufacturers, which have been formed within the historical monopolistic structure of Japanese telecom industries, enable the active development of new mobile phone services. Third, the economic geography of Japan creates territorial synergies for the rapid progress of mobile phone services. These synergies can be found in the case of the camera phone, which is an example of synergy among

domestic manufacturing industries, and LBSs, which represent synergy among a variety of business fields.

However, a recent Japanese government policy to abolish sales incentives from mobile phone companies to handset retailers and to promote competition in mobile phone businesses has affected the structure of the Japanese mobile phone market. These structural changes in the market may hinder the previously frequent development of new services.

SoftBank started to sell the "*i-Phone 3G*" developed by Apple in July 2008. Many journalists reported that Apple, which maintains competitive brand power, takes stronger initiatives with mobile phone companies than do Japanese handset manufacturers. The entry of Apple into the Japanese mobile phone market may trigger the transformation of the structure of the Japanese mobile phone market constructed under the strong initiatives of mobile phone companies.

The development and progress of mobile phone services in Japan, influenced by its distinctive geographical conditions and historical industrial institutions, is now at a

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