



Journal of Internet Banking and Commerce

An open access Internet journal (<http://www.arraydev.com/commerce/jibc/>)

Journal of Internet Banking and Commerce, April 2012, vol. 17, no. 1
(<http://www.arraydev.com/commerce/jibc/>)

A COMPARATIVE STUDY OF THE TELEMATICS INDUSTRY IN KOREA AND CHINA

Young-Wook Song

Professor, School of Business, Chungbuk National University, Cheongju, Korea
Postal Address: 52 Naesudong-ro, Heungdeok-gu, Cheongju, Chungbuk 361-763, Korea

Author's Personal/Organizational Website: <http://ib.cbnu.ac.kr>

Email: ywsong@cbnu.ac.kr

Dr. Young-Wook Song is a Professor in the School of Business at the Chungbuk National University, Cheongju, Korea. His current research interests are on Management of Technology and International Marketing. His work has previously been published in International and National Conferences.

Ji Dae Kim

Professor, School of Business, Chungbuk National University, Cheongju, Korea
Postal Address: 52 Naesudong-ro, Heungdeok-gu, Cheongju, Chungbuk 361-763, Korea

Author's Personal/Organizational Website: <http://biz.cbnu.ac.kr>

Email: jdskim@cbnu.ac.kr

Dr. Ji Dae Kim is a Professor in the School of Business at the Chungbuk National University, Cheongju, Korea. His current research interests are on Management of Technology, Operations Management Strategy and Product Service System. His work has previously been published in International and National Conferences.

Liangri Yu

Ph.D. Candidate, School of Business, Chungbuk National University, Cheongju, Korea

Postal Address: 52 Naesudong-ro, Heungdeok-gu, Cheongju, Chungbuk 361-763, Korea

Author's Personal/Organizational Website: <http://ib.cbnu.ac.kr>

Email: 79827@naver.com

His current research interests are on Management of Technology and International

Marketing. His work has previously been published in International and National Conferences.

Hyun Kyung Lee

Ph.D. Student, School of Business, Chungbuk National University, Cheongju, Korea

Postal Address: 52 Naesudong-ro, Heungdeok-gu, Cheongju, Chungbuk 361-763, Korea

Author's Personal/Organizational Website: <http://biz.cbnu.ac.kr>

Email: hklee@cbnu.ac.kr

Her current research interests are on Management of Technology, Operations Management and Product Service System. Her work has previously been published in International and National Conferences.

Hyung Seok Lee

Assistant Professor, School of Business, Chungbuk National University, Cheongju, Korea

Postal Address: 52 Naesudong-ro, Heungdeok-gu, Cheongju, Chungbuk 361-763, Korea

Author's Personal/Organizational Website: <http://biz.cbnu.ac.kr>

Email: hslee0919@yahoo.co.kr; hyunglee@cbnu.ac.kr (corresponding author)

Dr. Hyung Seok Lee is an Assistant Professor in the School of Business at the Chungbuk National University, Cheongju, Korea. His current research interests are on IT Service, Service Operations Management and Quantitative Modeling. His work has previously been published in Electronic Commerce Research and Applications, INFORMATION, International Journal of Business and Management, and Journal of Internet Banking and Commerce.

Abstract

In this era of digital convergence, telematics has been hailed as a field with unlimited market potential. Telematics involves the integrated use of telecommunications and informatics and thus can provide drivers and passengers with high-value services with a number of functions, including location traffic information, internet access, and vehicle testing. This study discusses the regional development trends in and characteristics of the telematics industry from a global perspective and compares Korea's telematics industry (which has developed into a test bed for information technology) with China's telematics industry (which has experienced rapid growth and received considerable attention from global firms). Specifically, the study investigates the development trends in and characteristics of the telematics industry in the two countries; the major industry players; and the differences in the development of the telematics industry between the two countries.

Keywords: Telematics; mobile in vehicle; Korea; China

© Young-Wook Song, Ji Dae Kim, Liangri Yu, Hyun Kyung Lee and Hyung Seok Lee, 2012

INTRODUCTION

Recent years have witnessed an important paradigm shift: the “digital convergence” of industries and technologies fueled by rapid advances in ICT (information and communication technology) and semiconductor technology. This convergence has led to novel and innovative markets because of active mergers not only within new industries such as multi-media services and telecommunications but also within traditional industries such as automobiles, airlines, ship-building, construction, health care, and education. Firms have made substantial efforts to facilitate value added and to secure global competitiveness. These changes have provided firms in traditional industries, whose growth has been slowing down, with new opportunities for increasing firm value through the development of new business models for producing new products and services based on state-of-the-art technologies (Lee, 2011; Kim et al., 2011; Beijing Industrial and Information Administration, 2011; Ministry of Knowledge Economy, 2009).

In particular, the telematics industry, which incorporates information technology (IT) into automobiles, has received increasing attention because users (i.e., drivers and passengers) can enjoy songs, TV programs, and movies, among others, and obtain information through the internet and multi-media services. However, there are many issues surrounding the telematics industry that need to be addressed both academically because the industry is still in its initial stages of the production life cycle and there remain substantial development gaps between countries.

On average, the global telematics industry has grown 37.8% per year since 2006, and it is expected to reach USD 119.4 billion. The telematics industry has been providing stakeholders with, new opportunities for developing and strengthening their value chain. In addition, the terminal installation rate of the brand new cars in the global automobile market is about 12%. This implies that the telematics industry is in its initial stages, and thus has, considerable market potential (Eship Consulting, 2011).

In Korea, the demand for telematics has been increasing because of the countries' complex road conditions and frequent traffic jams. This is expected to contribute to the development of the countries' telematics industry, particularly because of the country's robust information and telecommunications infrastructure. Based on Korea's world-class, telecommunications infrastructure and mobile communications technology and the technical competitiveness of the automobile industry, the country's telematics market is expected to become an important part of the global telematics industry. On the other hand, the telematics industry in China, which is experiencing a dramatic transformation from the world's manufacturing plant to one of the world's largest markets, began with the market entry of Honda's G-Book and GM's On-Star in 2009. In October 2010, the Chinese government selected the telematics industry as one of China's three main growth engines and invested more than RMB 10 billion to produce more than 200 million cars with telematics technology by 2020. Since then, many stakeholders, including those in the automobile industry, have regarded the telematics industry as an important symbol of advancement, innovation, and value added and thus, have focused on developing and providing a wide range of telematics products and services. In recent years, Korea and China, taking advantage of their geographical proximity, have engaged in bilateral negotiations and trade to expand their telematics presence.

The objectives of this study are to describe the basic concepts of telematics and the important characteristics of the telematics industry in three of the world's largest markets (the U.S., Europe, and Japan); to examine the development of Korea's telematics industry, the history of its development, and the main participants in Korea's telematics market (which has served as a test bed for IT); to investigate the trends in China's telematics industry, the history of the industry's development, and the main participant in China's telematics market (which has witnessed the rapid development of the telematics industry); to examine the differences in the industry between Korea and China; and to provide implications for the development of the industry.

CONVERGENCE AND TELEMATICS

Technological advances lead to dramatic changes in industries and services. In addition, the integration and collapse of existing industries and services based on consumers' increasingly diverse need for product differentiation can also induce rapid changes in industries and services. Hacklin (2008) suggested the following four stages of convergence: 1) knowledge convergence, 2) technological convergence, 3) applicational convergence, and 4) industrial convergence. Knowledge convergence removes the boundaries of existing industry-specific information through the convergence of knowledge; technological convergence induces technological innovation through knowledge sharing between industries; applicational convergence provides opportunities for value creation through the synergistic effect of technology convergence; industrial convergence refers to the case in which non-rival firms suddenly become competitors by providing identical or similar products. Such phenomena can be found in the telematics industry, which pursues smart cars.

Table 1. Telematics Services

Category	Types	Examples
Drivers	Traffic	Route information, traffic jam, parking
	Security	Anti-theft systems, remote open/close control, vehicle location tracing, stolen vehicle tracking
	Safety	Driving logs, driving surveillance/warning, emergency support systems, remote car accident forwarding, emergency calls
	Personal records	Miscellaneous information, personal information, voice mail/analyses, call records
	Lifestyle	Weather information, events/occasions, local information, points of interest
Unit Installation	Customer relationship management	Diagnostic services, driving records, vehicle maintenance, the auto manufacturer's A/S, auto insurance
Passengers	Entertainment	Music, movies, games, the internet, remote education

Source: Internal document from SK Telecom (2011)

In this study, the word “telematics” refers to the convergence of telecommunications and informatics and the “next-generation service technology that provides automotive information. Telematics services are made possible through the convergence of IT and the automobile industry, which are related through wireless telecommunications, automobiles, terminals, and necessary content (Song, 2007; Jee, 2006). Thus, by using technologies related to mobile communications and positioning systems, telematics can provide drivers with information on vehicle locations/ traffic and vehicle testing/security services and passengers with internet access, games, music, movies and various multi-media services.

Thus, telematics has the following four main characteristics: 1) timeliness (providing users with immediate access to information anytime; 2) mobility (providing services anywhere); 3) individuality (providing services reflecting the user’s geographical location and demand); and 4) convenience (providing useful information and services through the in-car terminal). Table 1 shows the major types of services that can be offered through telematics.

Telematics R&D started in the 1980s in the U.S., Europe, and Japan, which have invested heavily in establishing telematics services. Specifically, automobile manufacturers have played a crucial role in installing and providing telematics equipment and services. In particular, they have employed telematics to manage and retain their customers and to enhance their brand image. GM, Ford, Daimler, and Toyota are representative firms leading the development of the global telematics market.

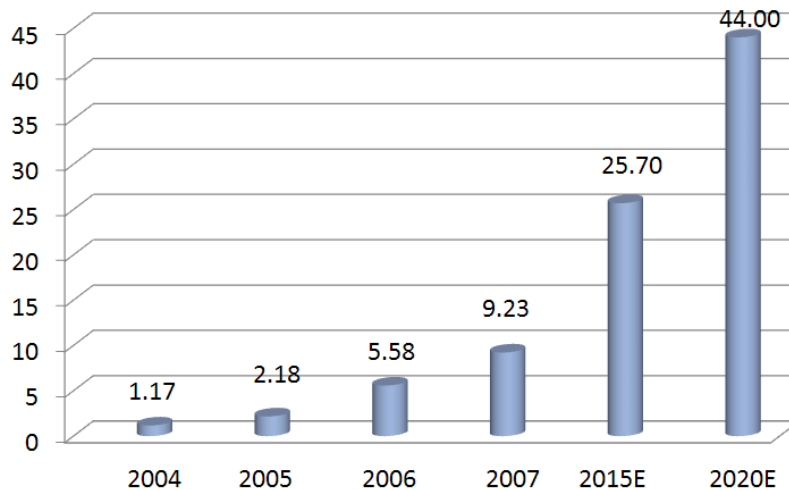
The telematics industry in the U.S., which started with GM's OnStar in 1997, has attracted an increasing number of customers and grown rapidly because of the legislation calling for emergency vehicle safety for the mobile phone firms since the 9/11 terrorist attacks. Noteworthy is that security and safety services have been developed mainly with automobile manufacturers. The U.S. market, which has expansive regions and massive sales networks, requires high standards and demands stringent safety requirements.

In Europe, telematics services are provided mainly in Germany, France, the U.K., and Italy and have been led mainly by the automotive industry, which has generally emphasized safety and information on efficient routes. Europe has 48 countries and more than six languages, and thus, Europe has been slower in offering telematics services than other markets because its telematics systems must accommodate multiple-languages. In addition, the European market has shown low telematics penetration rates because of its difficulty in addressing technical specifications and the standardization of wireless communications, and higher in-car terminal prices and usage fees have limited market growth. However, the market is expected grow sharply in the future because European consumers pay considerable attention to navigation/traffic information systems.

The Japanese market has focused mainly on traffic information and navigation systems because the country has severely congested roads and has too many cars for the total land area. In particular, the government-driven management system for traffic information and the coordinated delivery of road/traffic information have facilitated the growth of Japan’s telematics industry.

KOREA’S TELEMATICS INDUSTRY

Although Korea entered telematics industry after Europe, the U.S. and Japan, its telematics industry has considerable potential because Korea has world-class telecommunications technologies; large numbers of mobile communications users; high-speed communications networks; high internet penetration rates; cutting-edge IT infrastructure (e.g., global positioning systems); an automobile industry with world-class technologies and high automobile penetration rates; and long driving hours (800 hours per year) for average drivers. In addition, the proliferation of smart-phones in Korea indicates the growth potential of the country’s telematics industry. Combining existing telematics services with smart-phone applications, users can receive various services such as vehicle testing, remote control, and entertainment through their smart-phones, realizing the vision of the so-called “car inside the mobile phone.” Figure1 demonstrates the growth potential of Korea's telematics market.



Source: Ryu (2007), The 2020 Vision and Strategy of the Ubiquitous Network Industry, KIET Report.

Figure 1. The size and potential of Korea’s telematics industry (Unit: USD 100 million)

SK Telecom released “NATE Drive,” which is a combined wire-wireless service for VMTs (vehicle mounted terminals) as the first stage of its telematics service in 2002. In 2010, expecting that telematics would move beyond its role as a positioning system and become a key point of contact between the vehicle/driver and external information, SK Telecom introduced “MIV” (mobile in vehicle) services, which combine dissimilar services from diverse industries, including mobile communications, internet content, navigation systems, vehicle management, entertainment, and commerce, among others. MIV services were introduced Shanghai Motor Show in China. MIV services make it possible for users to remotely control their automobiles by using their mobile phones. In addition, MIV services were introduced at the Mobile World Congress (the world’s largest mobile exhibition) in Barcelona, Spain, in 2010. SK Telecom announced that,

together with Renault Samsung, MIV services would offer a wider range of services in Korea.

KT established cooperative relationships with automobile manufacturers (e.g., Daewoo Auto, Ssangyong, and Hyundai-Kia), terminal providers, major SI (system integration) providers, and content providers to effectively manage its telematics business. More importantly, KT emphasized its coordination and cooperation with automotive service providers to provide customers with optimal services by taking into account the life cycle of the vehicle as well as that of the mobile communications network.

LG Telecom, through its service brand "LG U+," forged an alliance with Hyundai-Kia in 2000 to focus on the telematics industry and established the telematics center in 2002 with Hyundai-Kia through the acquisition of shares in Lotis, a provider of real-time traffic information. In addition, LG Telecom and Hyundai-Kia installed telematics terminals in 10 types of cars (including Equus) in 2003 and provided telematics services through those terminals with the brand name "MOZEN." MOZEN, through LG Telecom's networks, provides telematics services such as emergency calls, stolen vehicle tracking, real-time traffic information, navigation systems, wireless internet services (for information on news, weather, and stock prices, among others), and 24-hour customer service. LG Telecom has maintained its cooperative relationships with Hyundai-Kia, extending its services to RVs (recreational vehicles) and commercial vehicles.

In Korea, Daewoo (currently GM Korea) initiated telematics efforts in the automobile industry in November 2001 by introducing the brand "Dreamnet". Daewoo developed Dreamnet in conjunction with KT. Dreamnet provides a wide range of traffic/geographical information based on the GPS as well as mobile communications systems. GM's OnStar was the benchmark for Dreamnet. Dreamnet is a device that installs a terminal and a mobile phone system in the vehicle to automatically identify the location of the vehicle and sends the information to the control center. With this system, customer representatives at the control center provide customers with accident and burglar alarm services, real-time information on routes, and emergency rescue services. OnStar's voice information services focus mainly on drivers' security and safety.

In 1996, Korea's largest automobile maker, Hyundai-Kia, started to focus on telematics by designing systems to trace and record accidents. In 2003, the firm launched its telematics business by introducing MOZEN, which was equipped with a mobile communications terminal and a screen and employed LG Telecom's wireless network. MOZEN services were first offered through three car models: New Grandeur XG, New EF Sonata, and Regal. The services were gradually expanded to RVs and luxury models such as Equus, Opirus, Santa Fe, and Sorento.

Renault Samsung pursued its differentiation strategy by using state-of-the-art technologies, taking advantage of intelligent information/navigation systems such as satellite DMB and applying them to its SM vehicle series. The firm provided its customers with intelligent information/navigation systems as an option. In 2003, it established a joint venture with Samsung Electronics, SK telecom, and TU Media (currently SK Broadband) to secure a firm foothold in the telematics industry. Since the joint venture, the firm has focused on providing all-in-one telematics services (navigation

systems, emergency rescue services, and lifestyle information, among others) through its SM vehicles based on SK Telecom's NATE Drive telecommunications network.

CHINA'S TELEMATICS INDUSTRY

China's telematics industry started with the market entry of G-Book and OnStar in 2009, which motivated Chinese firms to enter the telematics industry. Noteworthy is the role of firms operating China's GPS. These firms were in related business areas for about a decade making contributions to the development of the industry.

The development of telematics in China started with the invention of GPS terminals. Given the global dominance of GM's OnStar, Ford's SYNC, and Honda's G-Book, GPS firms occupied a unique position in China's telematics industry.

This reflects the Chinese government's policies because China lagged behind developed economies in terms of the automobile industry. In addition, because of the industry's slow growth, automobile manufacturers focused mainly on the evolution and production of automotive technologies and, thus paid little attention to the telematics industry. All of the top three telematics brands were owned by automotive firms with considerable advantages. By contrast, China's GPS firms were investors with no existing relationships within the automobile industry, which made it difficult for them to directly enter the BM (before market) and provided them with little negotiating power in terms of telematics. Nevertheless, GPS operators played an important role as TSPs in the development of China's telematics industry.

The major players in China's telematics industry are terminal manufacturers because the development of the industry centered on these manufacturers. In addition, the industry developed around the Hwanam area. This area has a large transient population and thus has serious auto theft problems. Thus, terminals were first developed for theft control. With the Chinese government's increasing emphasis on regulating traffic, logistics firms were mandated to install GPS terminals in their company vehicles. Currently, the major GPS operators in China include Car-GPS (北京奇華), 9TONG (山東九通), Asia Pacific Anxun (亞太安迅), G&G Technology (深圳宇易通), Shenzhen FUTUO (深圳复拓) (which focuses mainly on corporate clients), the Shenzhen Electronics Group (深圳賽格), Beijing Carsmart (北京車網互聯), and E-eye (which targets automobile owners).

These GPS operators are not likely to play a decisive role in the development of China's telematics industry because they are relatively weak in terms of their size/scope, management philosophy, and business model, among others. In addition, automobile manufacturers are not paying much attention to these operators because of their small size and lack of accumulated skills. As a result, these GPS operators are limited as TSPs and are likely to have difficulty entering the BM. This indicates that China's GPS operators may not play a vital role in the value chain of the automobile industry.

A key success factor for GPS terminals is the capability to provide an accurate and specialized navigation system because this is the fundamental function of any GPS terminal. However, China's National Administration of Surveying, Mapping and Geoinformation (國家測繪局) is authorized to issue a license of Certification of Surveying and Mapping (中國導航電子地圖資質證書) to only 10 firms: NAVINFO (四維圖新), AutoNavi (高德), LINTU (靈圖), CHANGXIANG (暢想), RUITU (瑞圖萬方), GEO

(武漢吉奧), CARELAND (凱立德), EMAPGO (易圖通), the National Geomatics Center of China (國家基礎地理信息中心), and Cityexpress (城際通). Currently, however, most navigation systems in China do not have electronic maps from these 10 designated firms.

The telematics business model, which focuses on communications service providers, can provide a wide range of mobile content such as lifestyle information and entertainment and can tap existing telecommunications customers as potential customers. Although China's top three telecommunications firms— CHINA MOBILE (中國移動通信), CHINATELECOM (中國電信), CHINAUNICOM (中國聯通)— have expressed a strong interest in telematics, only CHINA MOBILE has offered some telematics services, and the rest are simply waiting for further developments in the market.

CHINA MOBILE has emphasized the potential of the telematics market since March 2008, offering telematics service on a trial basis through a joint venture with CHELINGTON (北京車靈通). In August 2010, the company was recognized by some automobile manufacturers such as GAC group (廣汽) and DONGFENG (東風). In addition, it had more than 150,000 customers as of 2010. Since then, it acquired CHELINGTON in March 2011 and established the subsidiary Carsmart (車網互聯), aiming to penetrate the market to become China's top TSP.

China's telematics industry must address several issues, including the standardization of the diverse array of complex terminals and regional differences, among others. Currently, Chinese telecommunications firms' core services include only real-time traffic information systems and call centers. Chinese telecommunications firms' limited services are one of the reasons why Chinese customers have shown a lack of interest in telematics products. In addition, there is some uncertainty surrounding the expected ROI (return on investment) concerning the expansion of services, which has prevented Chinese telecommunications firms from making firm decisions. As a result, CHINA TELECOM established joint ventured with firm such as GM (OnStar) to provide wireless communications systems while waiting for further developments in the industry.

The business model followed by automobile manufacturers is easy access by customers in BM market as a basic option. However, automobile manufacturers are restricted in terms of terminal costs because they must use only the wireless networks of their partners. As a result, telematics services can be used only through luxury cars on a trial basis. Given the annual sales volume of 18 million cars, China's telematics industry shows substantial growth potential.

Global firms currently operating in China and their brands include the following: GM's OnStar (joint venture between GM and a TSP led by China's OEM), Honda's G-Book, and Nissan's Carwings. On the other hand, local brands include Inkanet by ROEWE (上汽榮威), D-Parter by BESTURN (一汽奔騰), Incal by CHANGAN (長安汽車), and G-netLink by GEELY (吉利). Among global brand, OnStar has grown the fastest, securing more than 200,000 customers. Among local brands, Inkanet, which was introduced at the 2010 Beijing Automobile Exhibition, has been actively promoted, but it has been offered only through the 350 series (i.e., it is not offered through the 750 or 550 series). Thus, even 350 series faces uncertain prospects.

COMPARISON OF THE TELEMATICS INDUSTRY BETWEEN KOREA AND CHINA

Although Korea's telematics industry has a triangular structure involving mobile communications providers, automobile manufacturers, and navigation system providers, the actual telematics industry has developed around only mobile communications providers and automobile manufacturers because of the high cost of establishing and maintaining telematics services. Although Korea's telematics industry was established around the year 2000, the market was not effectively employed in the initial stages because of the inadequate standardization of road, traffic, and geographical information as well as the high cost of terminals. However, with the introduction of low-cost terminals, the industry has witnessed an increasing number of users since 2004.

Korea's telematics market can be divided into Before Market and After Market. Before Market involves automobile manufacturers because these firms install telematics terminals as an option before releasing vehicles, focusing mainly on providing vehicle testing and security-related services. On the other hand, After Market involves mobile communications providers and provides a wide range of telematics services through telematics terminals, which are installed in the vehicle as an option or provided through smart-phones. In Europe or the U.S., OEMs typically establish independent TSPs, whereas in Korea, telecommunications firms and OEMs typically establish cooperative relationships to the AM and BM.

China's telematics industry, which started in 2009, is in its initial stages. Compared with the large market in the U.S. and the dense market in Korea, the telematics market in China shows income gaps across cities, and its internet infrastructure is concentrated in large cities such as Beijing, Shanghai, Guangzhou, and Shenzhen. Thus, there are substantial regional differences in terms of consumers' needs.

The Pearl River Delta, which has large transient populations and auto theft problems, has requires security/safety services, whereas large cities such as Shanghai and Beijing (which face severe traffic jams as a result of high vehicle-population ratios) require traffic information and navigation systems. Although the development of the telematics industry has centered around terminal manufacturers in regional markets, a complex value change structure has been created through the participation of automobile manufacturers and the top three telecommunications firms, which have a monopolistic advantage. In addition, it may be difficult to achieve technical standardization for some telematics services for a certain period of time because it directly related to the technical know-how of automobile and terminal manufacturers. This is likely to influence the cost of components as well as that of installing telematics terminals, which represents another barrier to the development of the market. Based on the characteristics of the market, there may be intense competition between telecommunications firms and automobile manufacturers to achieve TSP leadership.

However, no single player may lead the market in the short term. Hence, telecommunications firms and automobile manufacturers should explore ways to achieve synergies through negotiations and strategic alliances with firms within the value chain, which should allow them to enhance their competitiveness and build structured business strategies and profit models.

Table 2. Comparison of the Telematics Industry between Korea and China

Criteria	Korea	China
Key Leaders	Telecommunications firms	Terminal manufacturers
Popular services	Traffic information, navigation systems	Security/safety, traffic information
Market characteristics	Congested service area	Regional differences, differences in users' requirements
Advantages	World-class wireless infra-structure, early adopters	Substantial growth potential, strong demand for security/safety services, strong government support
Disadvantages	Weak platform standardization, small market	Government red tape, illegal/counterfeit terminals, a lack of efforts to integrate geographical/traffic information, weak platform standardization
Key players	MIV (SKT)	Carsmart (CHINA MOBILE)

DISCUSSION AND CONCLUSIONS

In this study, we examined the development trends in and characteristics of the telematics industry in Korea and China; the major industry players; and the differences in the development of the telematics industry between the two countries. Telematics has attracted considerable attention from researchers and practitioners because it is at the heart of smart lifestyles in the era of ubiquitous technology and has played an increasingly important role in enhancing the value added of firms as an IT growth engine. The telematics industry, which has progressed mainly in the U.S. and Europe, has recently experienced rapid growth in Korea. Korea's telematics industry has witnessed the rapid expansion of target customers, moving closer to reflecting world-class standards. On the other hand, China is currently in the initial stages of forming its business model, and thus, its telematics industry is expected to experience rapid growth through the government's active role and support.

The results of this comparative study indicate differences between Korea and China in terms of development trends and service development environments. The trade between the two countries has increased sharply because of their geographical proximity. In addition, several firms from the two countries have promoted international co-operation and partnerships in diverse areas for their mutual benefit. The results and their implications are summarized as follows:

First, in terms of the Korean market, although it has a triangular structure involving mobile communications providers, automobile manufacturers, and navigation system providers, the actual telematics industry has developed around only mobile communications providers and automobile manufacturers because of the high cost of establishing and maintaining telematics services. The results indicate that although mobile communications firms are likely to dominate the industry because of the country's high mobile phone/internet penetration rates, severe traffic jam, long driving hours per person, and development of various applications to meet customers' diverse needs, fierce competition between mobile communications firms and automobile manufacturers is inevitable.

Second, China's telematics industry started only recently, and thus, it is still in its initial stages. In addition, there are substantial regional differences in terms of customers' characteristics because of large income gaps and the concentration of internet access in large cities such as Beijing, Shanghai, Guangzhou, and Shenzhen. Although the industry is currently driven mainly by terminal manufacturers and GPS operators, intense competition between the top three communications firms and automobile manufacturers is expected as they enter the market. In addition, in terms of mapping, which plays a pivotal role in the generation of profit in the telematics industry, the Chinese government issued licenses to only 10 firms, which may lead to a complicated industry structure.

Third, according to the preliminary analysis, although two major firms currently drive Korea's telematics industry, it is expected to show sustained growth through the leading role of telecommunications firms, mainly because of consumers' diverse needs and the wide range of services under development. In particular, given the leading role played by telecommunications firms, it is expected that the triangular industrial structure, OEMs, terminal manufacturers, and content providers will form an open platform in the future, with each party having a designated role in the provision of hardware, software, or content. By contrast, in terms of the Chinese market, although terminal manufacturers have played a contributing role in the development of the market because of the relatively closed industrial structure, OEMs are expected to play an increasingly salient and leading role in the BM in the future because the regional differences and diverse standards are likely to remain. Thus, China's telematics industry is expected to be integrated, and OEMs are expected to play a pivotal role. In addition, each participant is expected to provide products and services that meet OEM-prescribed standards.

Few studies have examined telematics, particularly through comparative analyses at the international level. Thus, this study contributes to the literature by providing a better understanding of the telematics industry through a comparative analysis of telematics markets in Korea and China. The results are expected to provide a springboard for further research on telematics. Future research should consider international strategies that can help firms to establish business models for achieving success in the telematics industry.

ACKNOWLEDGMENT

This work was supported by the Korea National Research Foundation of Korea Grant funded by the Korean Government (NRF-2011-327-B00196).

REFERENCES

- Beijing Industrial and Information Administration (2011). A Report of 2011-2015 Telematics industry development trend and investment in China.
- eShip Consulting (2011). eShip Consulting Report Available at: <http://wenku.baidu.com>
- Hacklin, F. (2008). Management of convergence in innovation. Physica-Verlag Heidelberg.
- Jee, K. Y. (2006). *Integration of automobile and telecommunications– Telematics*. Jinhan M&B.
- Kim, J. D., Lee, I. G., Kim, S. Y., and Song, Y. W. (2011). A study on the difference of customer needs, development management approaches, and performance by types of new convergence products. *Korean Corporation Management Review*, 16(2), 1-25.
- Korea Ministry of Knowledge Economy (2009). A new growth engine development strategy and technology roadmap.
- Lee, Z. (2011). A study of global telematics industry size and trends. 51 Telematics Website.
- Ryu, H. S. (2007). The 2020 vision and strategy of the ubiquitous network industry. Korea Institute for Industrial Economics and Trade Report, BF2007-47.
- SK Telecom (2011). Internal document on the telematics industry.
- Song, J. H. (2007). *Introduction to telematics*. Hongrung Publishing Company.