Chapter III Ripple effects of ITS info-communications systems on society and economy

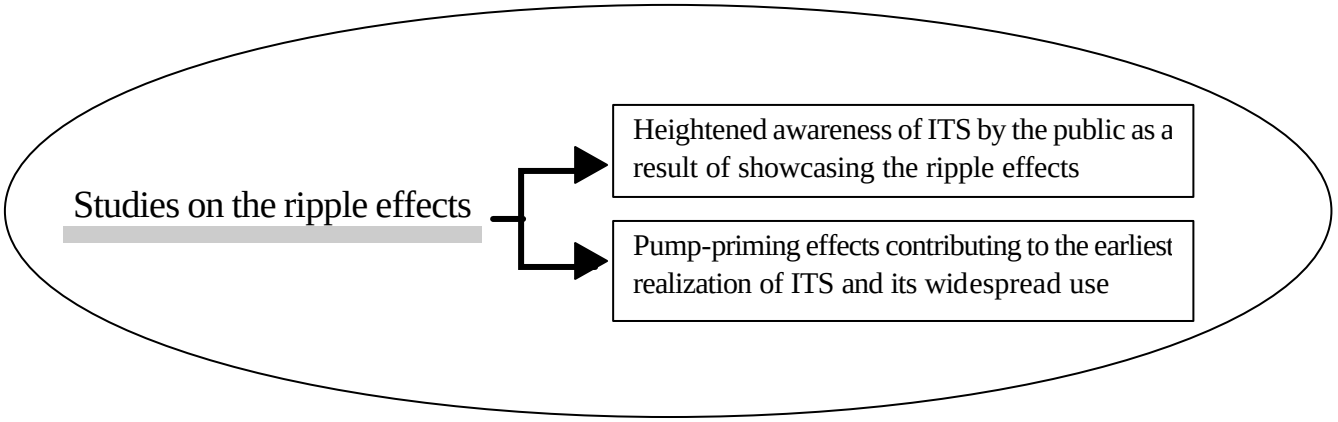
1. Objectives of examinations on the ripple effects of ITS info-communications systems on society and economy

ITS deals with various fields as road, traffic, vehicles and info-communications. It is thus a national project that can be promoted only through tight-knit coordination and collaboration of government, industry and academia. From this perspective, the purposes of examining the ripple effects of ITS info-communications systems on society and economy can be defined as follows.

① When looking at ITS as a national project, awareness of ITS by the Japanese public can be heightened upon illustration of their day-to-day association with ITS info-communications systems in the form of ripple effects that ITS can exert on society and economy. When this is achieved, the perception will be created within the public that ITS holds the answer to various problems faced by Japan today. Therefore, it is vital that the impact of ITS info-communications systems on their daily life be showcased in a very clear manner, for instance, by presenting a variety of application examples.

② Showcasing the social and economic impact of ITS info-communications systems is also expected to exert pump-priming effects that will result in increased investments and further business creation, speeding up ITS implementation and its wide acceptance by the society. Specifically, presentation of the size of future ITS market as well as its impact on the economy and job creation will accelerate new market entries and market revitalization thereon, in addition to providing a yardstick for parties planning R&D activity and investments.

Fig. 3-1 Objectives of examining ripple effects



2. Flowchart of examinations on the ripple effects of ITS info-communications systems on society and economy

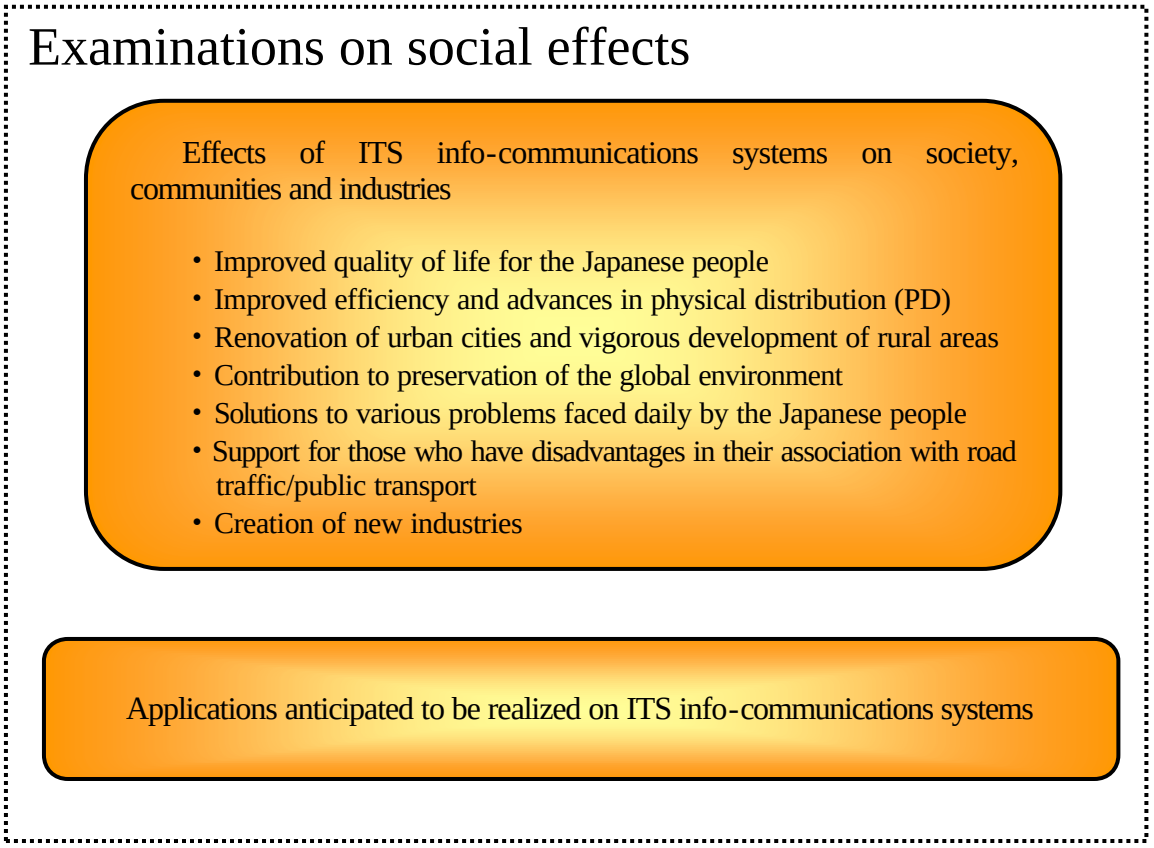
Influence and effects of ITS info-communications systems on the economy, popular life and industry are examined from the perspectives of "social effects" and "economic effects."

(1) Examinations of social effects

"Social effects" of ITS info-communications systems are studied under these two themes: "Effects of ITS info-communications systems on society, communities and industries" and "Applications anticipated to be realized on ITS info-communications systems," as shown in Fig. 3-2.

The former theme is studied from a total of seven focal points including "improved quality of life for the Japanese people," "solutions to various problems faced daily by the Japanese people" and others. The latter involves designation of ITS applications that are closely related to popular life. In this process, target years for the realization of these applications are also discussed.

Fig. 3-2 Points of examinations on societal effects



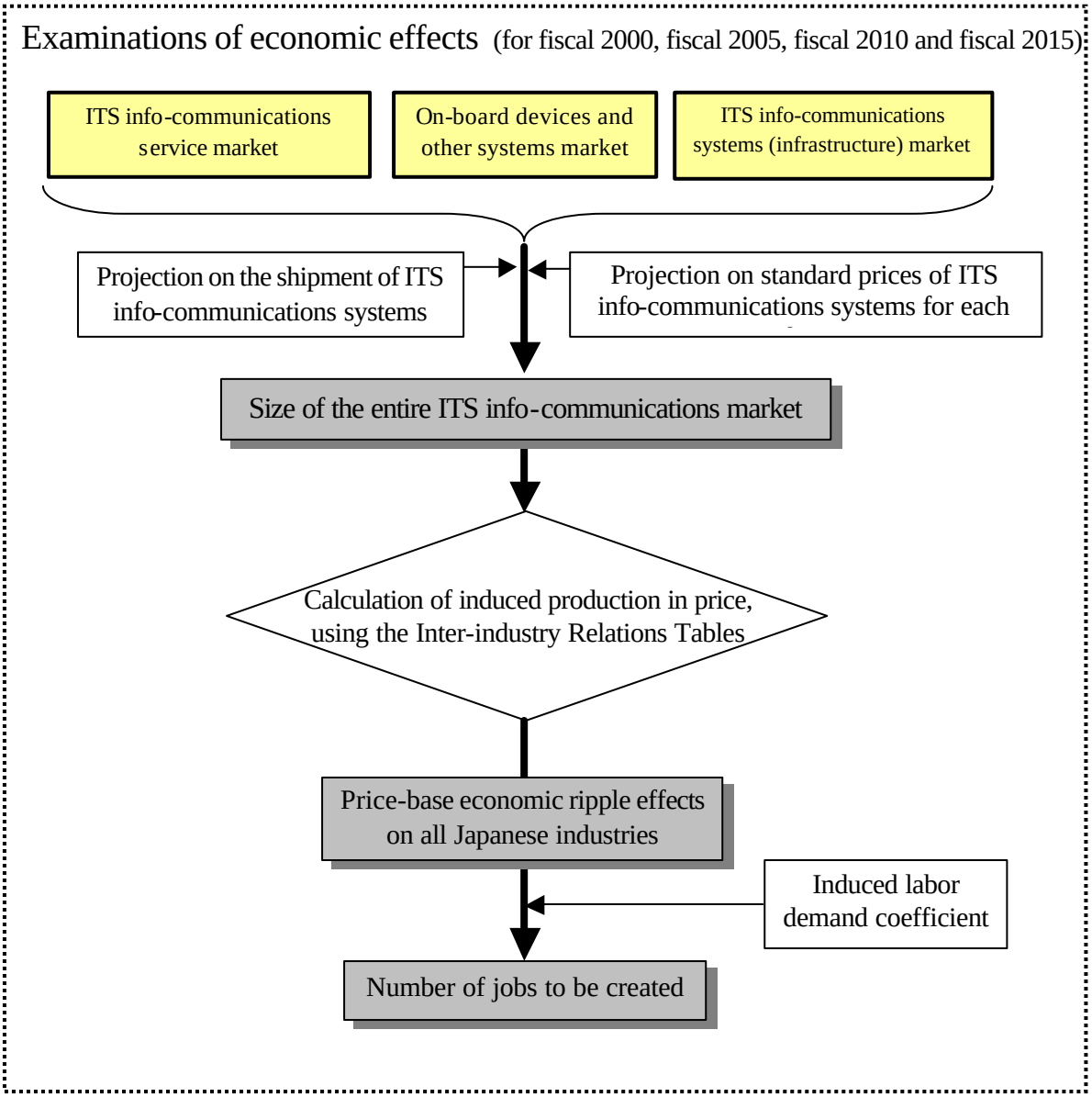
(2) Examinations of economic effects

The examinations from this perspective specifically aim to calculate and estimate the economic effects of the ITS info-communications in figures.

First, the ITS info-communications market is assumed comprising these three submarkets: "ITS info-communications service market," "on-board devices and other systems market" and "ITS info-communications systems (infrastructure) market." Then, sizes of these submarkets in the future are estimated for fiscal 2000, fiscal 2005, fiscal 2010 and fiscal 2015, in accordance with the time span set out for the ITS development and deployment plan of the Comprehensive Plan.

Second, based on these estimates, ripple effects to be exerted by these submarkets on the economy as well as employment in all Japanese industries are calculated using the Inter-industry Relations Tables (by the Management and Coordination Agency). Evaluation of these quantified ripple effects then followed.

Fig. 3-3 Flowchart of examinations of economic effects



3. Effects of ITS info-communications systems on society, communities and industries

(1) Pursuit of a more comfortable driving environment replete with more choices (Improved quality of life for the Japanese people)

Japan is a heavily car-dependent country that holds some 70 million cars within its borders. Therefore, this country's quality of life as it relates to car usage can be improved through pursuit of a more comfortable and luxurious driving environment. ITS info-communications systems are thought to contribute greatly to this goal.

When an advanced info-communications society is created, all citizens will be able to enjoy their own life, meeting new people and participating in various community activities, through use of info-communications networks. Even when traveling in vehicles, which takes up considerable amount of time in their daily life, ITS info-communications systems will ensure people to remain abreast of information available from the outside world. Regardless of time or their locations, people can access a variety of information anytime and make full use of travel time or the car space for work, enjoying entertainment and other purposes. This will allow citizens to have a variegated lifestyle, thereby greatly improving quality of life in Japan.

(Reference)

- VICS -- an already realized, leading example of ITS info-communications systems -- has received favorable comments from the service users, including "VICS helps drivers to keep their composure during driving" and "VICS is crucial to drivers." VICS has helped improve driving comfort.

Fig. 3-4 Positive effects of VICS service

"VICS helps drivers to keep their composure during driving"
"VICS provides drivers with en-route road conditions to destinations"
"VICS is crucial to drivers"
"VICS helps drivers avoid traffic jams"
"VICS helps cut travel time to reach destinations"

(Source: "Report of Survey Results on VICS Users (???)," June 1998, by VICS Center)

(2) Easing of transportation problems such as traffic congestion and accidents (Solutions to various problems faced daily by the Japanese people)

Over the years, transportation system and automobiles thereon have greatly contributed to the nation's economic growth. However, at the same time, heavy reliance on car usage resulted in various transportation problems including traffic congestion, for which the government measures are eagerly awaited. Against this backdrop, the main goal of ITS was set as providing solutions to these traffic problems, with some technologies serving this purpose already adopted in VICS and other systems. The past decade saw a gradual decline in the death toll from traffic accidents; but yet, the number of deaths annually has been hovering around 10,000, after peaking at 11,451 in 1992.

ITS info-communications systems will enable a seamless flow of such information as traffic congestion or road/vehicle conditions in real time. Through realization of advanced navigation systems (e.g., optimal route guidance systems), driving safety support systems and automated driving systems, ITS info-communications systems can further help solve various transportation problems.

(Reference)

- VERTIS has set the national goal for around the year 2025 as "a 50% reduction from today's number of traffic-accident related deaths."

- There is an estimate that introduction of ETC will increase lane capacity at toll gates fourfold. If this comes true, ETC will help alleviate traffic congestion greatly since 35% of all traffic jams on expressways are seen near toll gates.

- For low-power millimeter-wave radar systems that use radiowaves in the 60 or 76-GHz band, technical standards are already set and efforts geared to launch of commercial service are under way. Widespread use of these radar systems, to be mounted on vehicles for driving safety support (for collision avoidance in particular), could reduce the number of victims from traffic accidents.

- Following the opening of the Japanese damage insurance market in July 1998, car insurance firms, for example, were allowed to set varied premiums depending on policyholders' age and residential location. As widespread use of ITS info-communications systems in the future can reduce traffic accidents, and ITS's stolen-car tracking function can also minimize car thefts, insurance firms are anticipated to come up with new policies, which involves use of ITS info-communications systems.

- Since ITS information is very public-oriented, it must be made accessible all the time, whenever needed during socioeconomic activities. Therefore, development of ITS info-communications systems is eagerly awaited, which allow any one to access transportation databases covering broad traffic/transportation issues of today and the past, and share the information thereon smoothly.

- It is estimated that advances in traffic control centers during the fiscal 1992 - fiscal 1996 improved the traffic-accident reduction rate, from 32% to 64%. There are also estimates that the average driving speed increased by 19%, while the average travel time was reduced by 17% and congestion eased by 29% during the period.

(3) Improved efficiency and advances in physical distribution (PD)

The government regards achieving of improved efficiency and advances in the physical distribution (PD) sector as an important policy because such improvements could help renovate the entire industry's structure. The "Comprehensive Program of Logistics," approved by the Cabinet in April 1997, therefore advocates the importance of increasing efficiency in freight operations through use of info-communications technology.

Various systems have been adopted in the PD sector. The most widely adopted is MCA radio, which is used mainly for business contact among distributors. Another example is cellular phones/PDA (personal digital assistant), which are used for managing order/delivery information. Another is navigation systems including VICS, which are used for assisting delivery vehicles operations by providing traffic condition information. Expectations are running high for these systems to realize improved efficiency in delivery, centralized vehicle operations, goods location management, larger truckloads and more frequent use by vehicles. ITS info-communications systems can contribute greatly to advancement of PD system and its efficiency.

It is expected that improved efficiency and advances in PD will be prompted in the near future upon construction of a network that enables seamless distribution of comprehensive PD information, from acceptance to delivery of goods.

(Reference)

■ It is thought that if all parties involved in the PC sector, namely senders (service users), distribution firms, truck drivers and transportation authorities, can share such information as goods locations, types of goods and places of delivery, this will realize improved services, advances in vehicle operation management, in addition to quick responses to emergencies such as crashes and mechanical troubles.

(4) Ensuring mobility of the elderly and hadicapped (care and support for those who have disadvantages in their association with road traffic/public transport)

In recent years, so-called "barrier free" housing and public facilities have increasingly been built, with the aim of helping the elderly and hadicapped with their participation in society. The barrier-free environment should also be prepared in the road traffic/transportation system where those people feel safe, thereby increasing their opportunities to become more independent and active as members of society.

Under the circumstances, efforts geared to achieve this goal are under way in the field of ITS, with some systems already having been put into operation. One is safe route guidance systems for pedestrians (guidance system for the visually hadicapped), which range from walkways equipped with Braille and voice-over traffic signals to IT-applied walking sticks. Another is traffic signals for pedestrian that provide extra time during green light for those crossing the road.

Hopes also run high for the realization and diffusion of advanced route guidance systems for the visually impaired, which combine functionality of cellular phone, GPS, navigation systems and others. ITS info-communications systems are expected to continue supporting people with disadvantages in their efforts to remain active in the society, by ensuring their mobility (their ability to travel/walk on their own, smoothly and quickly).

(Reference)

- Recent years have seen the successive launching of services providing such visual information as texts, short messages and images via cellular phone or PHS. These services are widely used by people with hearing difficulties as an important communication tool. This is drawing attention as a good example of applying info-communications systems for the support of the hadicapped.

- "Information barrier-free" is a concept aimed at supporting the participation of the elderly and hadicapped in society. With info-communications technology being advanced and needs for nursing-case services diversifying, this concept specifically aims to ensure equal opportunity of all citizens, including the elderly and hadicapped, for their participation in society, through use of state-of-the-art info-communications systems.

(5) Renovation of urban cities and vigorous development of rural areas

The road traffic/transportation system is a key factor in carrying out urban and rural development. Adoption of ITS info-communications systems can improve the entire process of such development plans. Countries in North America and Europe have taken this concept seriously and applied it accordingly in their efforts for the development and implementation of ITS info-communications systems. In Japan as well, the development of ITS info-communications systems is eagerly awaited, that meet both the needs of urban cities and rural areas -- in urban cities for improved housing conditions and road traffic/transportation system, and in rural areas for provision of ITS info-communications systems as a social infrastructure.

Specifically, the use of ITS info-communications systems in urban cities should alleviate traffic congestion, realize smooth operation of public transport and improve mobility thereon. This situation offers citizens with more "space," both physical and mental, in their daily life and upon engaging in social activities, in addition to expanding commutable areas. All these advances are anticipated to lead to the renovation of urban cities.

On the other hand, in rural areas, locals expect use of ITS info-communications systems to revitalize their community. Some information services that serve this aim have already been put into operation. For instance, car navigation systems are helping tourists unfamiliar with a particular area to enjoy sightseeing by indicating tourist/historic site information on the electronic road map. Another example is systems offering information about tourist sites and local products to visitors from other prefectures.

(Reference)

- Kochi Prefecture, one of designated ITS model districts, has chosen this ITS experimental theme, "ITS proposals from KoCoRo (Kochi Communications Road) area." Aiming to distribute local tourist information all over Japan, the prefecture is conducting extensive ITS promotional measures including the KoCoRo project.

Fig. 3-5 Problems with Kochi's ITS model district experiment plan and anticipated solutions

Fact	→	Problems	→	Solutions
Many tourists visit Kochi every year. Tourism business is the main industry in Kochi Prefecture.		Promotional activities for appealing interesting and attractive local features/spots/products are insufficient		• Distribution of attractive local tourist information to other parts of Japan • Ensuring of improved convenience for visitors from outside the prefecture and provision of road/tourist information to them effectively

(6) Easing of the global environmental problems and energy problems

In recent years, global environmental issues have increasingly been perceived as a problem closely related to the Japanese people's life. Acid rain, depletion of the ozone layer and many other global environmental problems are increasingly drawing wide attention. Of these, global warming is one issue of serious concern. Under the circumstances, expectations run high for Japan, one of major countries consuming a considerable amount of energy, to vigorously implement countermeasures against climate changes caused by global warning.

One prominent feature of info-communications is that this is free from the limit of distance and time (in other words, info-communications enables instantaneous transmission and exchanges of information between two distant locations). This feature enables the replacement of travel by people with transmission of information, contributing to a reduced load on the global environment. In addition, route guidance by car navigation systems, one of ITS info-communications system examples, can avoid driving aimlessly or being stuck in traffic jams. This is also expected to lead to shorter driving distance, less exhaust fumes and less fuel consumption, contributing to the efforts geared to the environmental preservation and lower energy consumption.

Hopes run high for ITS info-communications systems to help reduce burdens on the global environment, thus promoting the creation of an environment-friendly socioeconomic system.

(Reference)

- In December 1997, the 3rd Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 3) was convened in Kyoto, where various global-scale countermeasures against global warming were decided upon. The conference adopted the Kyoto Protocol, which defined quantified reductions in carbon dioxide equivalent emissions of greenhouse gases after the year 2000. The Protocol stipulates that respective developed countries must reduce their greenhouse gas emissions by a minimum of 5% within the year 2008 - 2012 time frame. And Japan is mandated to reduce its emissions by 6%.

- By the year 2025, VERTIS aims "to reduce both gasoline consumption and CO_2 emissions resulting from use of automobiles by around 15%, and to cut NOx emissions in urban cities by around 30%." To achieve this goal, close collaboration of the car industry, distribution companies, administrations and other partied involved is crucial.

- There is an estimate that use of info-communications technology can cut carbon equivalent CO_2 emissions by 4.06 million tons. In calculations, particular info-communication systems that can contribute to reducing CO_2 emissions were selected and quantitative analyses conducted thereon vis-à-vis their impact on the reduction of CO_2 emissions. One of the selected systems, ITS (Effects of optimized VICS, ETC and other traffic management systems), is estimated to reduce CO_2 emissions by 1.10 million tons. (Source: "Addressing Global Environmental Conservation through Info-communications Systems," May 27, 1998, by TTC)

(7) Creation of new industries

In order to revive the Japanese economy as soon as possible, it is important to identify new industries that have high market potentials. Therefore, new policy measures toward the 21st century, which will create new industries, revitalize related industries and produce new jobs, are being called for. Such new industries should play a leading role in production activities and in expanding facility investments, while enabling the deployment of their business on a global scale.

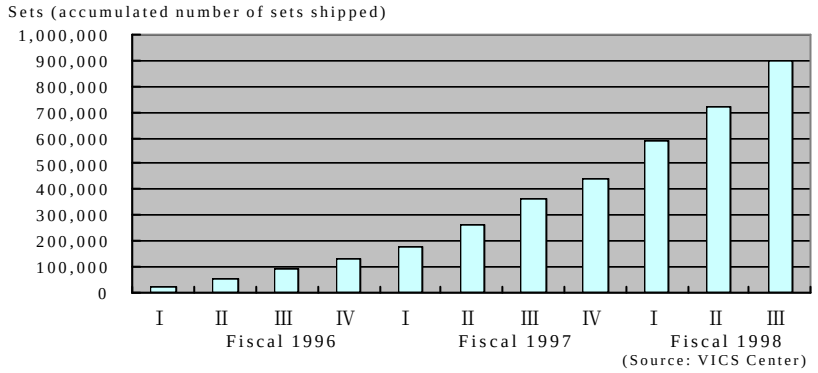
ITS is seen as having a high market potential as well as being capable of exerting a great impact on the economy, since ITS info-communications systems involve the car industry, info-communications device industry, and various other industries.

In fact, companies have increasingly been establishing in-house sections in charge of ITS, in an attempt to handle business related to ITS. In the future, ITS-related markets will be growing further, creating new industries and various ITS services.

(Reference)

■ Car navigation systems are leading examples of ITS info-communications systems; VICS is one form of such car navigation systems. VICS has been sold rapidly, and thus expectations are running high for further VICS market growth as a successful example of ITS. By the end of 1998, some 3.67 million on-board car navigation systems were sold, with VICS-adopted navigation systems accounting for 900,000 sets, thus indicating that the VICS market has been active. A total of 28 navigation system makers have released 151 VICS models in total.

Fig. 3-6 Sales of on-board VICS



■ The Emergency Economic (decided upon on November 16, 1998, at the Ministerial Conference on Economic Measures (???)) sets one of economic relief measures aimed at helping create the society of the 21st century as "ITS shall be fully realized in Japan ahead of any other country. This shall be followed by implementation of ETC on all Japanese expressways within several years, which could be integrated with electronic money technology. In addition, vigorous efforts shall be made to realize world's first Smartway on a model road and to succeed in test driving of Smartcar by the year 2003."

4. Applications anticipated to be realized on ITS info-communications systems

(1) Applications expected for ITS info-communications systems

The "Comprehensive Plan for ITS in Japan" (formulated in July 1996 by five ministries and agencies in charge of ITS) sets 20 user services. Based on these, the five ministries and agencies have newly set 39 applications expected for ITS info-communications systems in five fields that are closely related to the Japanese people's lives. Target years for realizing these applications are also indicated. It is expected that these applications will indicate milestones for turning their ITS-related efforts into real business.

Fig. 3-7 Application examples

Field	Application
Road traffic/transportation information	- On-demand type car navigation system - Road, geographic information auto-renewal system - Optimal route-guidance system - Destination point weather forecast information system - Parking-lot vacancy information, reservation system - Traffic congestion, estimated driving time information system - Driving route information exchanging system between vehicles - Pedestrian route guidance, leading system
ETC, DSRC	- ETC system - Parking-lot control system - Gas station charging settlement system - Automated gateway, vehicle control system - Automated check-in system for a car ferry - Drive-through shopping system for convenience stores - Cargo-tag physical distribution (PD) management system for a distribution center - Multi-purpose wireless IC card settlement system
Car multimedia systems	- Provision of destination-related information (travel, sightseeing, recreation) - A variety of booking systems (public transportation, hotel, amusement facilities) - Car-mounted on-line shopping system - Car-mounted electronic secretary system (information search, electronic settlement system) - Entertainment information provision system - Car-mounted Internet access system - Tandem communications system between vehicles
PD, public transport systems	- Optimal realtime car allocation system - Commercial vehicles location system - Container location, tracing/tracking system - Total delivery system - Integrated PD operation system - Public transportation utilization information system - Public transport operations management system - Shared-use short-distance individual transport system
Assistance for cruising, driving safety	- Danger warning system at an intersection and a turn - Provision of road conditions information - Collision avoidance/driving control radar system - Driver/vehicle condition information notification system - Automated driving system for commercial vehicles - Optimal route guidance and control system - Stolen vehicles tracking system information - Automated emergency/accident notification system

※ ETC: Electronic Toll Collection DSRC: Dedicated Short Range Communication

Fig. 3-8 Target years of full implementation for respective applications

		Target year
Road traffic/transportation information	- On-demand type car navigation system	2000
	- Road, geographic information auto-renewal system	2001
	- Optimal route-guidance system	2002
	- Destination point weather forecast information system	2000
	- Parking-lot vacancy information, reservation system	2002
	- Traffic congestion, estimated driving time information system	2002
	- Driving route information exchanging system between vehicles	2010
	- Pedestrian route guidance, leading system	2000
ETC, DSRC	- ETC system	1999
	- Parking-lot control system	2000
	- Gas station charging settlement system	2000
	- Automated gateway, vehicle control system	2000
	- Automated check-in system for a car ferry	2000
	- Drive-through shopping system for convenience stores	2000
	- Cargo-tag physical distribution (PD) management system for a distribution center	2003
	- Multi-purpose wireless IC card settlement system	2005
Car multimedia systems	- Provision of destination-related information (travel, sightseeing, recreation)	2001
	- A variety of booking systems (public transportation, hotel, amusement facilities)	2001
	- Car-mounted on-line shopping system	2003
	- Car-mounted electronic secretary system (information search, electronic settlement system)	2005
	- Entertainment information provision system	2005
	- Car-mounted Internet access system	2003
	- Tandem communications system between vehicles	2010
PD, public transport systems	- Optimal realtime car allocation system	2003
	- Commercial vehicles location system	2001
	- Container location, tracing/tracking system	2001
	- Total delivery system	2005
	- Integrated PD operation system	2005
	- Public transportation utilization information system	2002
	- Public transport operations management system	2003
	- Shared-use short-distance individual transport system	2005
Assistance for cruising, driving safety	- Danger warning system at an intersection and a turning	2003
	- Provision of road conditions information	2003
	- Collision avoidance/driving control radar system	2005
	- Driver/vehicle condition information notification system	2005
	- Automated driving system for commercial vehicles	2010
	- Optimal route guidance and control system	2007
	- Stolen vehicles tracking system information	2001
	- Automated emergency/accident notification system	2001

* "Target year" indicates the year when full-fledged service for each application is seen being launched.

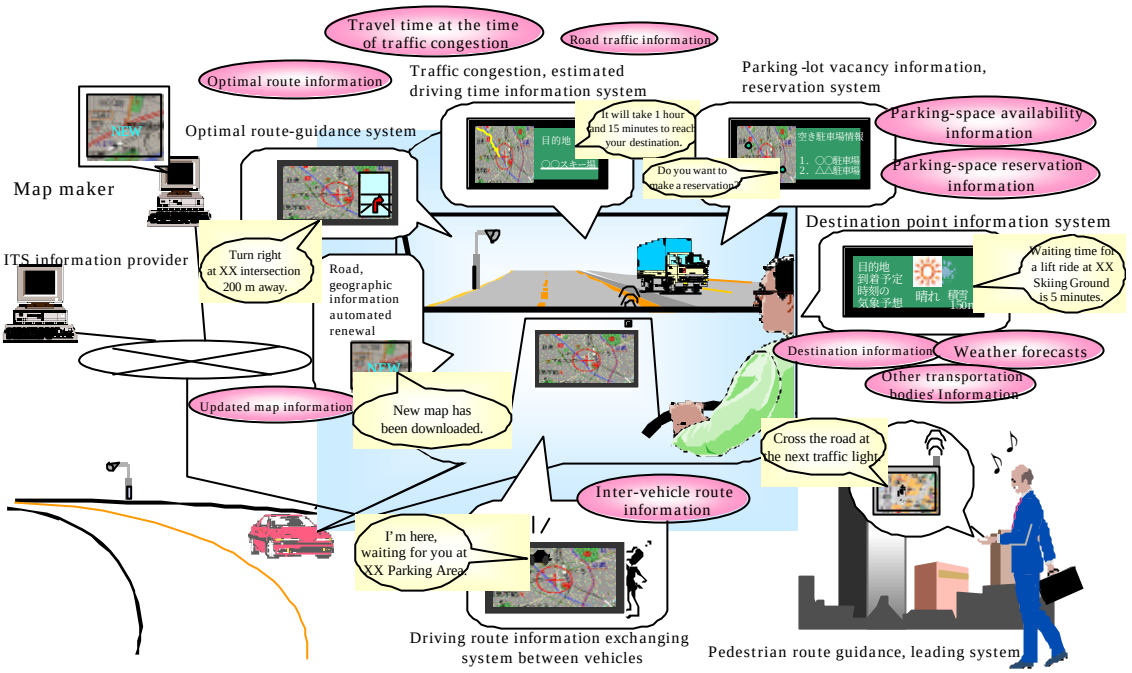
(2) Images of applications expected for ITS info-communications systems

Based on the descriptions in the previous section, future images of the applications expected for ITS info-communications systems are provided on the following pages. These images are no more than examples of situations where the applications are thought usable.

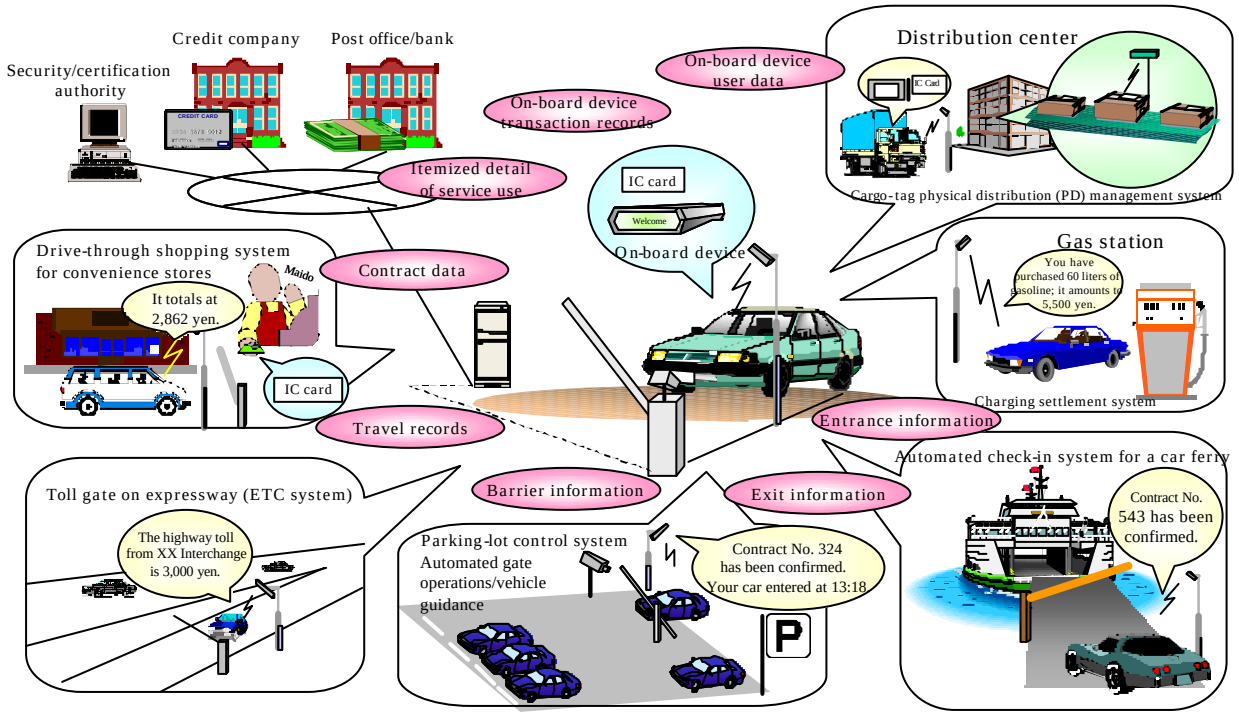
【Five fields for which future images of applications are drawn】

① Road traffic/transportation information
② ETC, DSRC
③ Car multimedia systems
④ PD, public transport systems
⑤ Assistance for cruising, driving safety

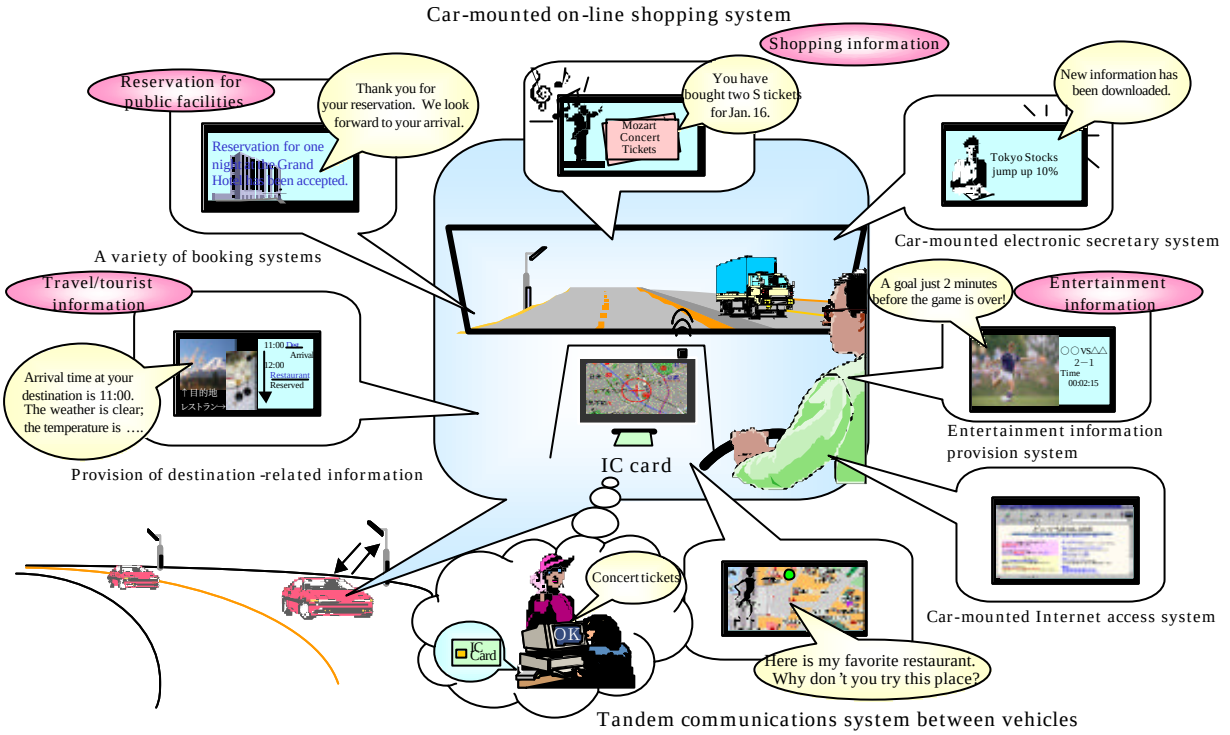
1) “Road traffic/transportation information” applications



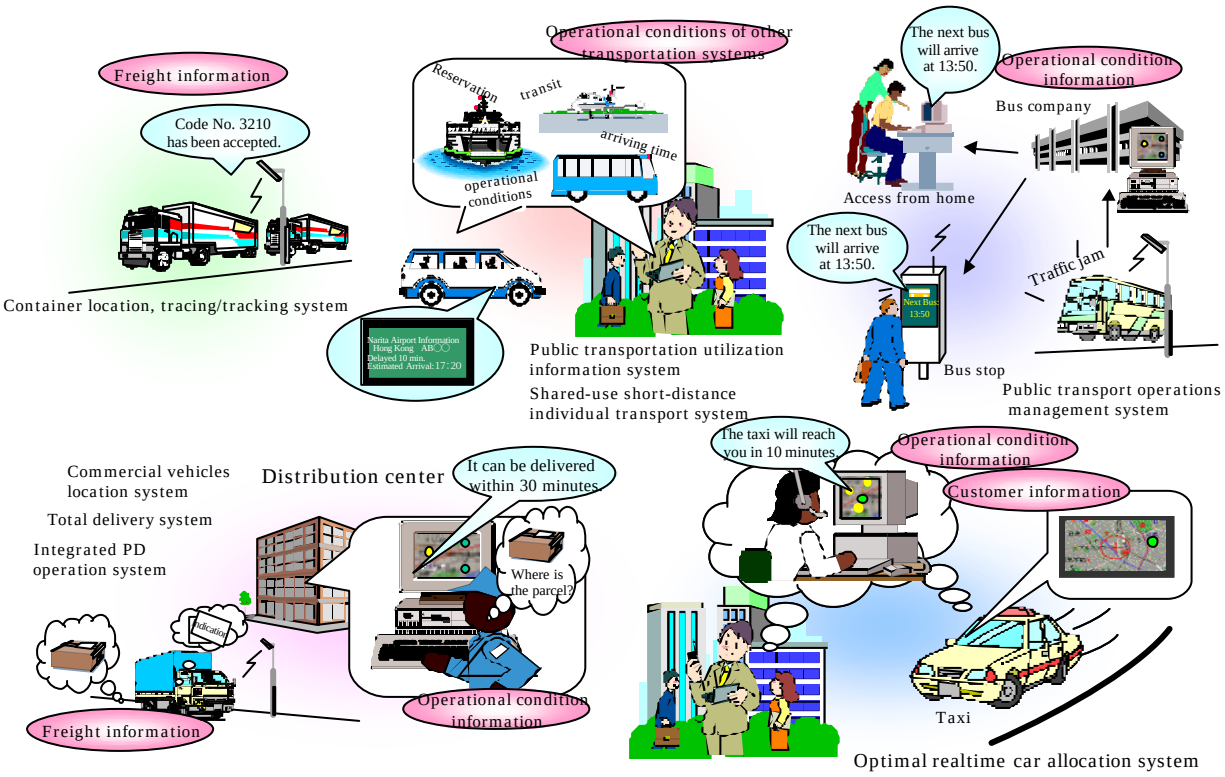
2) “ETC, DSRC” applications



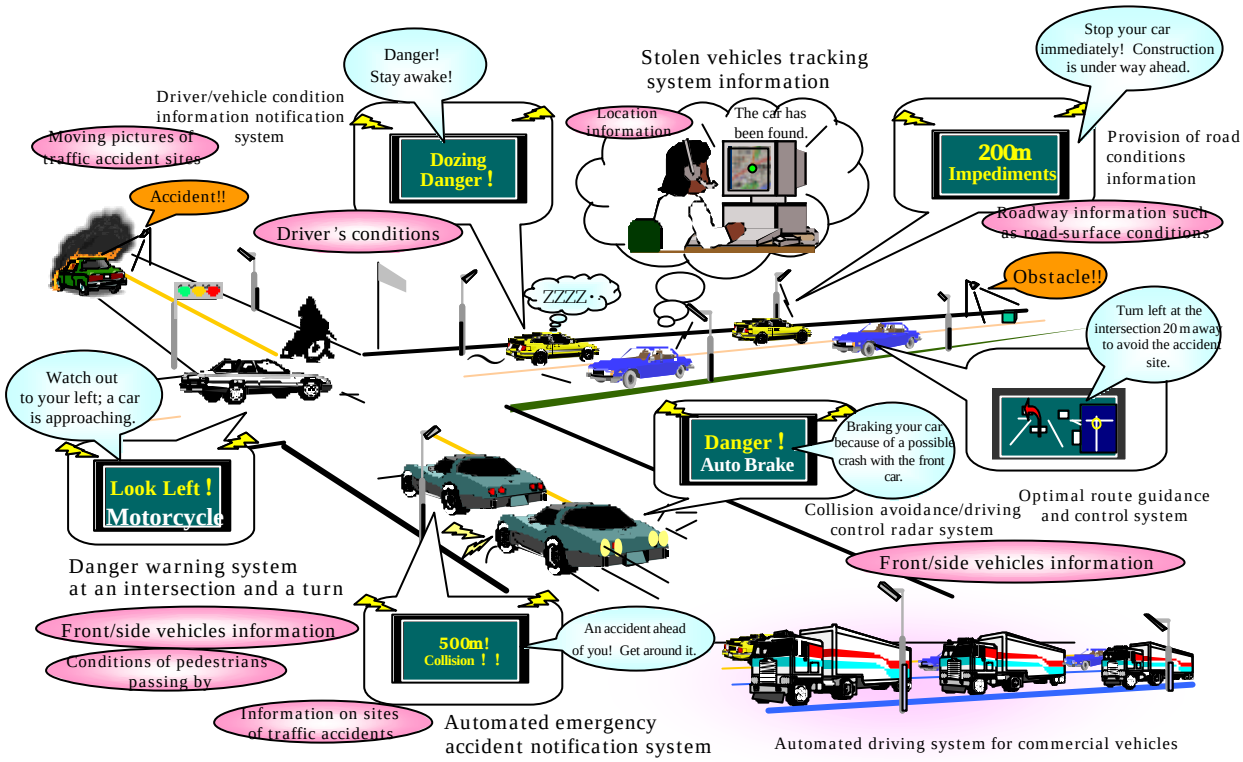
3) “Car multimedia systems” applications



4) “PD, public transport systems” applications



5) “Assistance for cruising, driving safety” applications



5. Outlook for the ITS info-communications market

The economic effects that the realization of ITS can exert on the info-communications sector are calculated quantitatively. The calculation results are shown below.

(1) Calculations conditions

- The ITS info-communications market is assumed to comprise these three submarkets: "ITS info-communications service market," "on-board devices and other systems market" and "ITS info-communications systems (infrastructure) market."
- Calculations are made for fiscal 2000 to fiscal 2015.
- Calculations exclude the facility investments as well as the size of terminal market for these non-ITS-specific systems: IMT-2000, satellite broadcasting systems and the Internet, among others.
- Calculations exclude the price-base economic effects resulted from ITS's impact on the reduction of traffic accidents and distribution costs.

(2) Calculations results

≪Summary≫

◇ Following the development of the infrastructure and widespread use of devices, a gigantic ITS info-communications service market will be born. With various applications becoming available on a constant basis, new business opportunities will be created in the market.

- The cumulative price-base ITS info-communications market in fiscal 2015: approx. 60 trillion yen

  (ITS info-communications market can exert economic ripple effects of approx. 100 trillion yen on all industries in Japan (cumulative number by fiscal 2015))

(Reference)

Info-communications industry (communications, broadcasting, software development and terminal production)	36.9 trillion yen (by fiscal 1997)
Car industry	16.6 trillion yen (by fiscal 1996)
Mobile communications industry (cellular phone, PHS and radio paging)	5.2 trillion yen (by fiscal 1997)

- The ITS info-communications service market will take off around 2003, doubling in size every five years from then on.
- By fiscal 2015, ITS info-communications service market will have grown to account for about 65% of the entire ITS info-communications market.
- The services using DSRC-adopted multifunctional on-board devices will outgrow other services within the ITS info-communications service market. These services include charge settlement/toll collection at gas stations, parking lots and resting facilities on expressways.

◇ Car navigation systems will be integrated into highly-functional ("intelligent") on-board systems with PC connectivity and Internet accessibility. On-board ETC devices for use on toll roads will also be integrated into multi-functional on-board systems.

- In fiscal 2015, the number of on-board car navigation systems will reach 42 million, more than 10 times today's number. This is about the same number with cellular and PHS terminals used today.

(Reference)

The number of car navigation systems sold	3.56 million (as of the end of fiscal 1998)
The number of cars sold	70 million (as of the end of fiscal 1997)
The number of cellular phone/PHS subscribers (the subscribers/Japanese population ratio)	45.60 million (36%) (as of January 31, 1999)

◇ The ITS info-communications sector will grow into one of Japan's leading industries in the 21st century, greatly contributing to the creation of wider employment opportunities.

- New jobs will be created employing some 330,000 people as of fiscal 2005 and some 1.07 million people as of fiscal 2015.

(a) Market size of ITS info-communications sector

The size of the ITS info-communications market is obtained by totaling the sizes of these three submarkets: "ITS info-communications service market," "on-board devices and other systems market" and "ITS info-communications systems (infrastructure) market."

The ITS info-communications market size is estimated at 0.9 trillion yen for fiscal 2000, 2.6 trillion yen for fiscal 2005, 4.7 trillion yen for fiscal 2010, and then for fiscal 2015 it is estimated to reach 7.4 trillion yen. These are figures for each fiscal year; thus, when the cumulative market size is calculated for the fiscal 2000 - fiscal 2015 span, it becomes 50.3 trillion yen as shown in Fig. 3-9.

One of the submarkets, the ITS info-communications service market, is projected to grow rapidly from around 2003, the time when the applications, described in the preceding section, are to be fully implemented. If the same growth rate can be expected for the following years, the service market is estimated to double in size every five years from the year 2005. Moreover by fiscal 2015 the service market is projected to account for 54.8% of the entire ITS info-communications market, outgrowing other submarkets.

However, the service market for fiscal 2000 is still seen as a small market valued at below 100 billion. To turn the rosy estimates above into reality, installation of the infrastructure and wide distribution of terminals/devices at the earliest possible date are crucial.

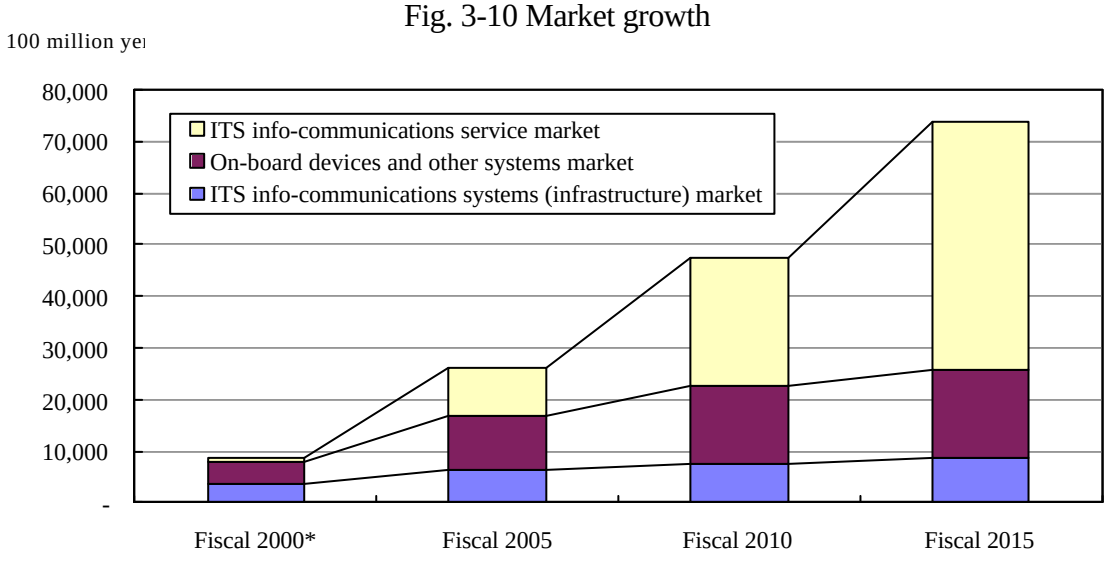
Fig. 3-9 Size of the ITS info-communications market

(100 million yen)

Submarket	Fiscal 2000*	Fiscal 2005	Fiscal 2010	Fiscal 2015	Cumulative figure for FYs 2000 through 2015
ITS info-communications service market	768	9,449	24,950	47,729	309,903
On-board devices and other systems market	4,452	10,182	15,068	17,417	186,705
ITS info-communications systems (infrastructure) market	3,594	6,500	7,470	8,470	106,546
Total	8,814	26,131	47,488	73,616	603,154

* Market size for each fiscal year

Fig. 3-10 Market growth



(b) ITS info-communications service market

For examination purposes, the ITS info-communications service market is assumed to involve several classified service areas.

One of these areas is "road traffic information services." Service examples include distribution of road traffic information toward on-board car navigation systems and automated updating of road maps on these systems. In this service area, some companies have already launched their services. Keeping pace with further diffusion of on-board devices and mobile telephones, this market is anticipated to grow increasingly.

Meanwhile, DSRC (Dedicated Short-Range Communications) services are expected to gain a foothold in the ITS info-communications service market. DSRC systems are ETC-technology-adopted multifunctional systems that can be used for charging settlement at gas stations, parking lots, drive-through facilities and other places. Because of its nature, DSRC has the potential of being adopted in different industries for a variety of purposes. DSRC is thus estimated to account for about 40% of the ITS info-communications service market (cumulative) by fiscal 2015.

Fig. 3-11 Size of ITS info-communications service market by breakdown

(100 million yen)

	Fiscal 2000	Fiscal 2005	Fiscal 2010	Fiscal 2015	Cumulative figure for FYs 2000 through 2015
Road traffic information services + Car multimedia services	251	1,578	3,938	7,330	49,086
Online driving shopping services	0	146	2,516	6,218	30,456
ETC services	436	4,471	7,482	10,786	95,166
DSRC services (charge settlement at gas stations)	31	1,179	4,645	10,635	58,798
DSRC services (charge settlement at parking lots)	0.3	233	1,400	3,806	17,019
DSRC services (charge settlement at drive-through facilities)	0	67	602	1,920	8,447
DSRC services (charge settlement at resting facilities on expressways)	6	719	2,380	4,478	28,235
DSRC services (automated check-in for a car ferry)	5	125	344	439	3,676
Vehicle operation management services (for distribution management)	17	126	403	770	4,851
Route guidance services for pedestrians	22	804	1,239	1,346	14,167
Total	768	9,449	24,950	47,729	309,903

(Because figures used here are rounded off, there may be discrepancies between the sum of figures and the total figure.)

【Calculation method】

- Based on the "examples of applications anticipated to be realized on ITS info-communications systems," calculations are conducted, with assumptions being made as regards service content, providers, charges for different types of service, standard charges, diffusion rate, among other issues.
- Calculations exclude the communications charges on cellular phones and/or networks incurred during the use of the service.
- The ITS info-communications service market includes not only newly emerging service areas, but also existing areas being made electronic-settlement compatible through use of ITS info-communications systems (e.g., toll collection by ETC systems and charging settlement by on-board on-line shopping systems).

Fig. 3-12 ITS info-communications service market in brief

Service area	Features
Road traffic information services Car multimedia services	Services for implementing applications that fall into the fields of "Road traffic/transportation information" and "Car multimedia systems" under the category of "Examples of applications anticipated to be realized on ITS info-communications systems"
On-line driving shopping services	Services enabling shopping inside cars through electronic means
ETC services	Automated toll collection services using the systems installed at toll gates on expressways
DSRC services	Services enabling charging settlement inside cars by use of ETC-technology-adopted DSRC systems. The market size of the DSRC services is regarded as being equal to the total amount of charges cleared by the services.
Vehicle operation management services (for distribution management)	Services enabling operation centers to manage location information of commercial vehicles/goods
Route guidance services for pedestrians	Services providing pedestrians with value-added information such as electronic maps and route information

(c) Trends in diffusion of on-board devices and other systems

Prior to estimating the size of "on-board devices and other systems market," trends in diffusion of on-board devices and other systems are projected. The results of the projection follow.

On-board devices and other terminals to be used for ITS services will certainly become more highly functional ("intelligent") and multi-functional along with improvement in the quality of services. One obvious reason behind this is that the space on board cars, where these devices are installed, is limited. Exemplifying such advances in devices/terminals, on-board car navigation systems will be evolving into intelligent on-board systems, which encompass the functionality of the personal computer, the Internet and databases, in addition to the vehicle control mechanism. Meanwhile, on-board ETC devices, which will be operated mostly on a stand-alone basis in the beginning, are then to be integrated into multi-functional on-board systems, as various DSRC services become available in the future.

As the following figures show, sales of ITS service devices (in units) are projected to increase steadily. Of the on-board devices indicated in the figures, car navigation systems (intelligent on-board systems) are most likely to outsell others. Meanwhile, on-board ETC devices, whose service launch is scheduled for fiscal 1999, is also expected to continue selling steadily. Combined with multi-functional on-board (DSRC) systems, whose service is to be launched soon, the number of on-board ETC devices sold will likely surpass 50 million in fiscal 2015.

Fig. 3-13 Diffusion of on-board devices and other systems market*

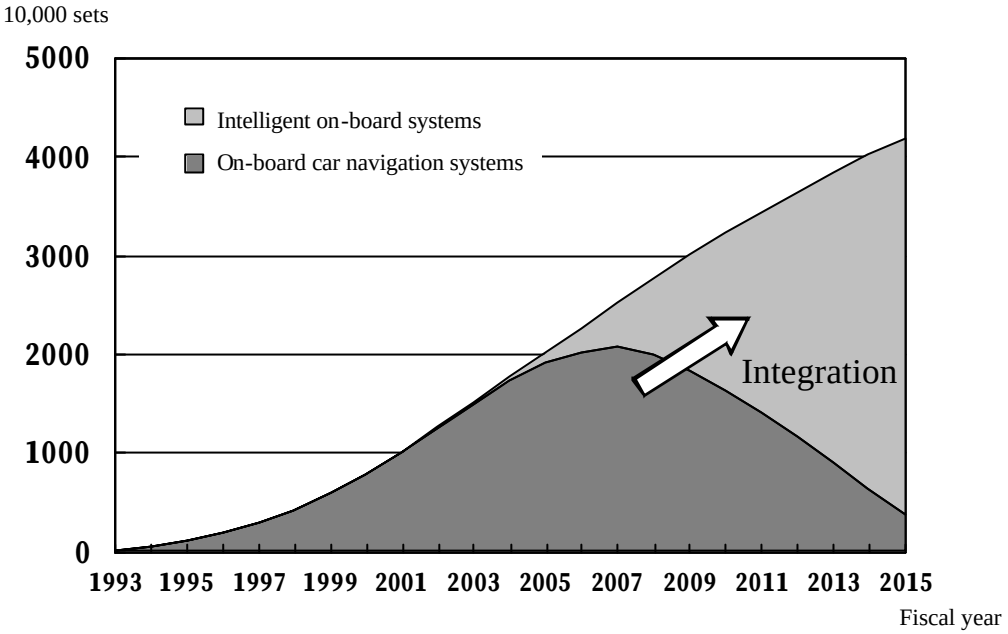
(10,000 sets)

	Fiscal 2000	Fiscal 2005	Fiscal 2010	Fiscal 2015
On-board car navigation systems + intelligent on-board systems	790	2,020	3,228	4,199
On-board ETC devices + multi-functional on-board (DSRC) systems	95	1,207	3,175	5,332
On-board driving safety support systems	35	435	1,500	2,900
On-board proprietary systems for PD/public transport	5	97	341	607
Portable devices for pedestrians	8	319	516	561

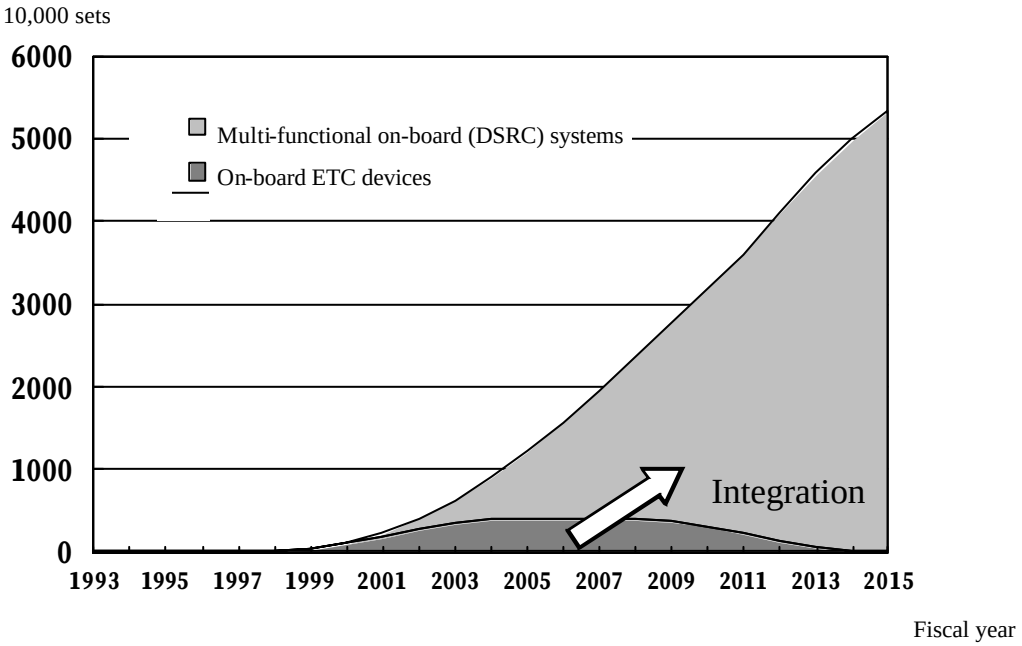
* These projected figures for sets to be sold by the end of each fiscal year also include units to be replaced with the latest models.

Fig. 3-14 Trends in diffusion of devices (projection)

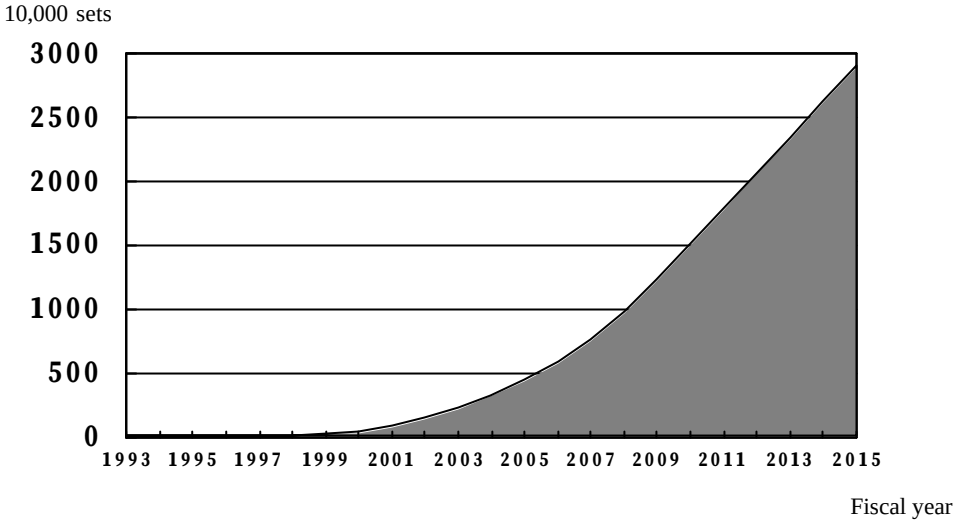
On-board car navigation systems + intelligent on-board systems



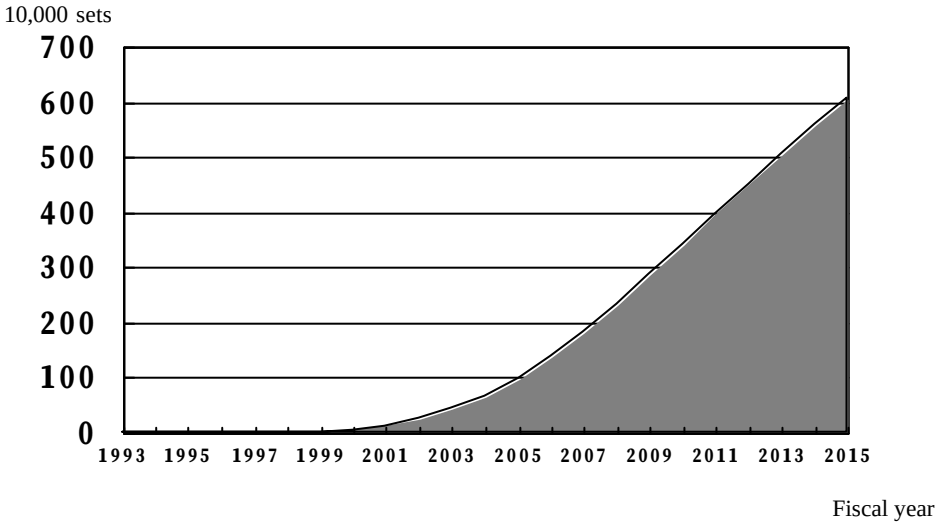
On-board ETC devices + multi-functional on-board (DSRC) systems



On-board driving safety support systems



On-board proprietary systems for PD/public transport



Portable devices for pedestrians

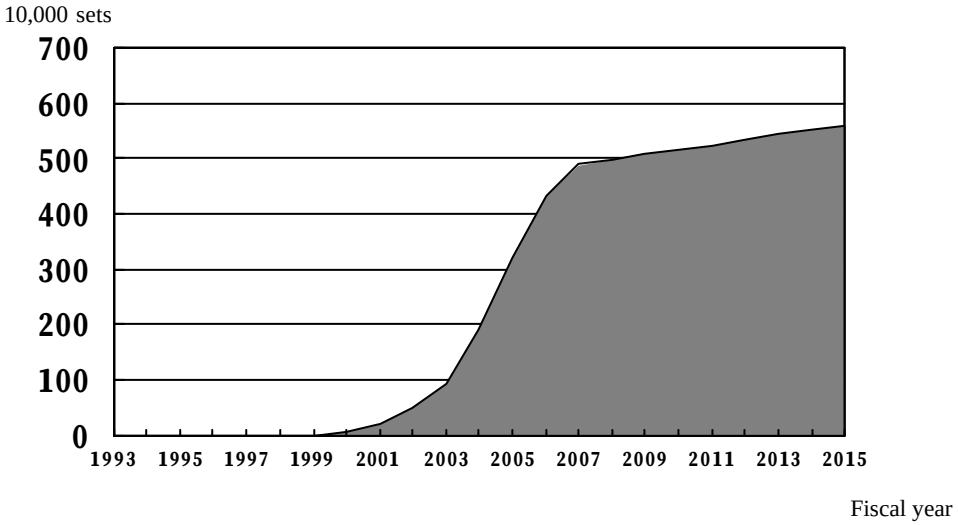


Fig. 3-15 Size of the on-board devices and other systems market by breakdown

(100 million yen)

	Fiscal 2000	Fiscal 2005	Fiscal 2010	Fiscal 2015	Cumulative figure for FYs 2000 through 2015
On-board car navigation systems + intelligent on-board systems	3,620	5.388	6,778	7,258	90,552
On-board ETC devices + multi-functional on-board (DSRC) systems	138	474	474	599	7,265
On-board driving safety support systems	414	2,400	5,700	7,200	61,714
On-board proprietary systems for PD/public transport	200	1,120	1,416	1,600	17,629
Portable devices for pedestrians	20	800	700	760	9,545
Total	4,452	10,182	15,068	17,417	186,705

【Calculation method】

- Projections on the diffusion (the number of sets sold) of each device group being classified as in Fig. 3-15 are conducted, assuming production volume characteristics as well as future price decline characteristics for each of the groups.
- In projecting the diffusion of each device group, their lifespan (replacement with the latest models) was also considered (e.g., the lifespan of on-board car navigation systems was set for 10 years).

The number of sets sold in a particular fiscal year = The number of sets sold in the preceding fiscal year +

The number of sets produced in that particular fiscal year − The number of sets that have surpassed their lifespan figure

- Formula for the calculation of market sizes

Size of the on-board devices and other systems market = Expected future prices × The number of sets produced in the particular fiscal year

(Expected future prices : obtained by assuming price decline characteristics and reflecting them on the current average price)

(The number of sets produced in the particular fiscal year : obtained by taking into consideration the projections on diffusion and the devices' lifespan)

- In calculations, on-board car navigation systems are assumed to be integrated into intelligent on-board systems in the future, and on-board ETC devices also to be integrated into multi-functional on-board (DSRC) systems.

Fig. 3-16 On-board devices and other systems market in brief

Group of devices	Features
On-board car navigation systems	• These systems also include GPS terminal, display panel, road map software, VICS unit and other add-ons. • To be integrated into intelligent on-board systems in the future
Intelligent on-board systems	• Upgraded version of car navigation systems with higher functions • Introduction of PC inside vehicle, with Internet connection available
On-board ETC devices	• On-board devices for ETC service on toll roads • To be integrated into multi-functional on-board (DSRC) systems in the future
Multi-functional on-board (DSRC) systems	• Upgraded version of on-board ETC devices, equipped with a variety of applications
On-board driving safety support systems	• Intra-vehicle LAN network (ITS DATA Bus) devices, various radars, sensors, driving-condition information reception systems, and so on.
On-board proprietary systems for PD/public transport	•Cruise operation management systems to be mounted on bus, truck, taxi and other types of vehicle
Portable devices for pedestrians	• Upgraded version of PDA, expected to combine cellular phone (communications), car navigation system (route guide) and GPS (location detection) • Route guidance and other applications for the elderly and hadicapped

(d) The ITS info-communications systems (infrastructure) market

The ITS info-communications systems (infrastructure) market is assumed to encompass these three info-communications systems: centers, roadside systems and info-communications networks. Construction of these systems involves participation of entities from both public and private sectors.

Fig. 3-17 ITS info-communications systems (infrastructure) market in brief

ITS info-communications systems	Features
Centers	Info-communications systems that conduct centralized processing and distribution of information regarding "road traffic/transportation information," "car multimedia systems," "PD/public transport system" and others [Example: public transport control center, commercial vehicle operation management center, etc.]
Roadside systems	Info-communications systems installed on roadside for gathering and provision of information, such as beacons and information display panels [Example: ETC facilities on toll roads, driving safety support system, sensors for road traffic conditions detection, parking lot management system, automated check-in system for a car ferry, etc.]
Info-communications networks	Transmission cables and data boxes used for connecting control centers with roadside systems

(e) Economic ripple effects of the ITS info-communications market on all industries (price-base)

Based on the estimation that the ITS info-communications market will grow to approximately 60.3 trillion yen in the cumulative figure by fiscal 2015, the economic ripple effects of the ITS info-communications market on all Japanese industries are calculated using the Inter-industry Relations Tables. The result is 107.9 trillion yen.

(f) Job creation

Expected number of new jobs to be created is calculated based on the price-base economic ripple effects of the ITS info-communications market as well as the induced labor demand coefficient. The results are shown in the figure below.

Fig. 3-18 Impact of the ITS info-communications market on employment

	Fiscal 2005	Fiscal 2010	Fiscal 2015
Number of people to be employed	326,432	628,205	1,066,999

(g) Evaluation on economic ripple effects of the ITS info-communications market

- When the infrastructure is fully developed and devices/systems are widely used by the public, a very large ITS info-communications service market will be created. In this market, a wide variety of applications are to be realized and ample opportunities for new business deployment will be created.
- The ITS info-communications sector will grow into one of leading Japanese industries in the 21st century, employing a growing number of people.