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Quantifying the Market Demand for In-Vehicle Telematics Internet Services

Three consultants give their views on in-vehicle telematics Internet services. They explain the approach for creating a suitable business case, in particular the way to look at customer needs and the playing field of the service provider. Service pricing and market size are estimated and the business case issue is concluded with a description on how to structure in-vehicle telematics Internet service development projects, using the Web-enabled Enterprise Framework. There follows a description of the technology required and what is available today. Specifically global system for mobile communications (GSM) operators are mentioned as they clearly are moving towards services beyond speech. The article concludes with a business example of a company using in-vehicle telematics.

Business Case

When looking at the business case for in-vehicle telematics Internet services one must focus on the perspective of the occupant. This focus on an actual user of the in-vehicle Internet service is the same as the focus one needs to develop services on the 'fixed' Internet. An individual (rather than a company or government etc.) should be the focal point as an individual will generate the high-volume services demand that can generate revenue.

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The Driver and The Passenger

For a driver who is a potential user of the in-vehicle Internet services, the journey is fundamental: it starts at some moment and place, it ends at some future moment at the destination. In between the driver and the vehicle are en route for some time.

The geographical elements are: the starting point, route and destination. (Note that in this setting the driver and optional passengers are taken as the point of view. Someone will be the owner of the vehicle, possibly the same person as the driver, but owning a vehicle is a completely different setting, only touched upon here.)

For any person in a vehicle, three aspects of the journey will be of interest:

- the duration of the drive,
- the route, and
- the current location and its vicinity (a sphere around the vehicle).

For each aspect of the drive, the driver or passenger will have a different set of desires for in-vehicle telematics Internet services. For example, if the duration of the drive is important because a meeting is scheduled at the destination, the driver will have a keen interest in route information to ensure the journey is completed within the limited time. Another example is when the driver or passenger(s) develops a desire for a snack. Then it is useful to know which shop will be able to provide the desired snack within a radius of, say, 2 km from the current location.

In short, human behaviour during a drive is important in assessing which in-vehicle telematics Internet service will be viable and profitable.

The Service Provider

From the point of view of a service provider contemplating a business case for any in-vehicle telematics Internet service, providing information in volume is important. Information has a broad definition here which will be addressed extensively in the following sections.

Providing information in volume implies that a service provider will make a profit from selling a small amount of information often. Hence, the service provider should focus on high-volume low-cost in-vehicle Internet services.

To ensure that the vehicle is capable of receiving the in-vehicle Internet services, some basic hardware must be available but manufacturers of in-vehicle telematics hardware must realise that real profit will be made in providing the services through the hardware, not by selling the hardware.

Now, the customer for any of these services is only available while present in the vehicle. This may sound limiting, but remember that while the driver and passengers are in the vehicle, they have virtually no opportunity to spend money on anything. However, they do have the time to select and buy, as they would when cruising around in a huge department store. Moreover, as the

trip becomes boring, they will undoubtedly develop the desire to use their time in a more entertaining way. And that is a perfect moment to have them spend some money!

The price of a service—a packet of information—should be low. So low that one readily decides to purchase the service, just like making a local telephone call (who considers the cost of such a call in advance?). Hence the need for low-cost and high-volume in-vehicle Internet services, like the services on the fixed Internet.

There is one evident distinction between a fixed Internet user and a mobile one: being en route at a specific moment in time with specific unique requirements for that specific journey will enable the service provider to price a service based on these unique aspects. Take two drivers, Roger and Gerwin, who both start to drive from A to B—this does not imply they are two identical potential customers. If Roger is on his way to an important meeting, he will readily spend money on route information that will ensure that he arrives in time. If Gerwin is just driving home, like he does every day, route information is not a service he is likely to buy. For Gerwin it would be nice to know whether he will be home in time for dinner, but acquiring this knowledge has little business value. He would settle for a rough estimate like 'between 30 and 45 minutes', taking into account all route-related data that is available from traffic information from the past (historical extrapolation). Roger, on the other hand, will readily spend a Euro or two for exact, on-line, route information that will guide him around any obstacles to get to B in time. Of course, the next day Roger may be the ordinary commuter, driving from A to C, while Gerwin could then be the person pressed for time on the same route.

Thus the profile of the customer is not based solely on who the customer is, but more on the situation the customer is in. The customer's situation will have a huge influence on the pricing of the service, and therefore service diversification on the quality of the information is essential.

The Size of the Market

Simple calculations show the sheer size of the market. In 1995, people in The Netherlands drove 138·1 billion passenger kilometres. Assuming most of these kilometres were on highways, an average of 100 km/h seems a reasonable estimate (it may be less in practice). This implies about 1·381 billion passenger hours were spent driving or waiting as a passenger to get from one place to another, without spending much money. (The only money they could actually spend while driving was by using their mobile telephone.)

If each journey lasts two hours and two people were in each car, then 345 million journeys were made or about one million journeys per day. Every 700 km or so the car needs refuelling, the only contact the driver and passengers have with the sale of goods and services during a drive.

So, in a country with one million journeys every day, about two million potential customers are available for about two hours. Many are on their way to work or to relatives and a few are in a hurry and pressed for time.

Drive-In-The-Life-Of-A-Driver

To understand how someone works or acts, one should observe the person for a day or so. This shop-floor investigation approach, also known as *A-Day-In-The-Life-Of*, is very useful to understand what situations a person gets into, what moods the person is in, and what the person actually does in the time available. Analysing all the events will provide a profile of the person's day.

Let's take three examples of *A-Drive-In-The-Life-Of-A Driver*.

Drive one—short and familiar

The first drive is 10 minutes long, to get from home to the shopping mall. The driver is familiar with the route and there seems very little to consider in order to provide useful in-vehicle telematics Internet services to such a driver. Apart from providing a parking spot and having the essential groceries packed and ready.

Drive two—commuter

The second drive is a commuter trip. The route is not new, but there are a number of different routes if the standard route is really busy. The journey will take between 30–50 minutes. This driver will be interested in receiving:

- timely traffic information about options in the route, but only when traffic is busy; and
- entertainment through news, music or other content.

The traffic information service must be available before the route option has to be chosen. This is obvious, but as the exact moment of departure and the estimates of traffic congestion are dynamic parameters, it will be a challenge to provide the correct traffic information in time. The traffic jams at any given moment are not important, but the estimated traffic congestion when the driver will be at the congestion is. This kind of information requires a huge number of calculations, on top of the availability of historical data, to provide a decision about the optimum route. Moreover, if the internal decision process of a person is added to this, the mood the person is in that particular day will be an influence as well. The 'I wish to keep moving' mood results in a different decision from the 'I don't mind about anything today' mood.

Furthermore, as soon as a trajectory has been chosen from which no further deviance is possible, most of the value of the traffic information has gone. It can only provide improvements to the expected time of arrival.

In short, the traffic information must:

- provide route options decision support;
- help determine the estimated time of arrival; and
- be tuned to a user profile or actual user requirements.

Today, traffic information only tells you where traffic jams are at a specific moment. This is far from the service a driver would like to have.

The entertainment service should not be seen as a broadcast service as provided by radio stations. For instance, you may like to hear the news as you drive off—not exactly on the hour. For journeys less than 60 minutes, you may not be able to catch the news at all if you are dependent on radio broadcasts only. A *News-On-Demand* service within the first five minutes of any journey would be useful. Moreover, the news content can be based on a listener's profile.

For the more recreational entertainment, there are two important areas to consider. Obviously, *Music-On-Demand* would be an interesting feature, as it is practically impossible to take along all the music the driver would possibly like to hear in the vehicle. Music that the driver has a licence for, for instance because it was purchased on a compact disc, should be free of charge when

requested, and new tracks could be bought on the spot.

The other important area is something that resembles a talking book. On request a text is read out loud. This may be an e-mail, a book or perhaps a lesson on some subject the driver is studying. The service, which can best be named *Content-On-Demand*, will keep the driver from getting bored.

Drive three—the Nanny-gator

Now the third drive is more complicated. The journey will take about two hours. The first hour and a half is to get from home to the driver's parents where the children are dropped off for the night. Then a 30 minutes drive is required to get to the theatre to see the Cirque du Soleil at 20:30 hours. It is Friday evening, the schedule it tight and traffic jams are likely.

In this case, the driver is not the only potential customer of a service—the spouse and children are potential customers as well. What would you personally pay for a service to entertain your children in the back seat for two hours? A limited survey came up with an estimate of about five Euro per child per drive†. For this sum you could have a Nanny-gator service, which is the electronic nanny to help a child navigate through the content it may select. This children's version of a personal digital assistant (PDA) is the personal digital Nanny-gator (PDN).

As the schedule is tight and rather complex because of stops and the delays these stops bring about, personalised traffic information is useful to guarantee timely arrival. The first leg in the route, from home to the parents' house, is familiar but as time is critical all route options should be considered to get to the destination in time. The second leg in the route is towards a parking spot as near to the theatre as possible. The route and destination are unfamiliar and the driver will require route information as detailed as to which turn to take. Also, as parking is required, a parking spot that is guaranteed to be available would be important. On top of this, the duration of the second leg of the route is certainly restricted, as the show will start on time.

All in all, for a drive like this, a total of about 15 Euro for in-vehicle telematics services can be considered reasonable, as it will ensure the journey and the event is a success.

Billing of In-Vehicle Telematics Internet Services

As most of the in-vehicle Internet services will be low-cost (because their benefit/value for the driver or passenger is relatively small) billing must be based on small amounts per service delivered. It must be possible to make a profit on billing a 10 cents service.

GSM operators, like fixed-line operators, are able to bill these kinds of services, as short telephone conversations will result in small amounts to be billed (such as 1 cent per second). On the Internet a huge effort is being made to be able to bill low-cost transactions and this is expected to be possible in the very near future.

Billing small amounts for services has a very interesting spin-off—the information acquired about a customer (based on the services requested) has premium rate value on which to actively base customer management. This alone may be a good reason to provide services with virtually no margin, as the analysis of the acquired services is a product in itself that can be sold for profit.

Future Trends For In-Vehicle Telematics Internet Services

If any provider can bring the Internet infrastructure into a vehicle, with a bandwidth comparable to ISDN (or better), a major outlet becomes available for a plethora of services.

The Content-On-Demand service will enable you to listen to your personalised *Half Hour News* where the news items are selected to your specifications on that specific day.

If you get personalised routing information, the system will know where you are. This enables those who you gave access to that information to track you and then your secretary will be able to tell anyone calling your latest estimate of your expected time of arrival.

If you provide the system with the route you are going to follow, in order to get route-specific traffic information, the system could easily provide you with car-pooling candidates waiting along the route. This would introduce a just-in-time car-pooling facility, in which the driver gets paid a fair amount for taking a passenger, while the passenger is able to relax or work.

Develop the hand-held Nanny-gator and you have the ultimate learning and relaxation device for any child.

How To Web-Enable A Car

To get a car on the Internet, to Web-enable a car, is much more than installing the hardware in the car. It takes a whole new look at system design and system development to ensure that a feasible system is developed. This look at in-vehicle telematics Internet services will be very close to the way we look today at designing and developing Web-based solutions (Internet solutions).

Some key features of such solutions are:

- *distribution is an issue*—the system is spread over a number of moving vehicles (clients) and a set of distributed servers (Internet).
- *reliability is not 100%*—the chaotic system architecture on which theInternet is based on will function most of the time, but not all the time.
- *fire-and-forget is a characteristic*—a service request result, for instance a music-on-demand selection, is sent to the customer, but only if the network is able to detect difficulty in delivery will the sender be notified.
- *a dynamic business case is required*—due to the unpredictability of services emerging, evolving and maturing, the business case must cater for quick changes: since competitors can easily jump in at any time, a fixed business case is out of the question.
- *long-term initiatives*—short-term benefits (quick wins) are necessary.

In short, it requires a adapted project approach to be successful. Cap Gemini developed the WEAPON framework for Web-enabled applications for just this situation‡.

† Based on interviews with: Steven van Battum, Petra van Krugten, Cobi Vroman, Lilian and Dagmar Hoogenboom.

‡ COEN, BOB; and HOOGENBOOM, MARK. Web-Enabled Applications Programmed On the Net (WEAPON) Framework, How to become a Web-Enabled Enterprise. McGraw-Hill, 1997, ISBN 0-07-011774-8.

Mobile Internet Will Fuel the Demand For In-Vehicle Internet Telematic Services

More and more customers will choose their service providers based on their offering of personalised, tailored value-added services. Mobile communication and technology will increasingly become commodities. In the battle for customers, vendors are wondering what services should be offered. One way leading to the answer is to look at what services are used by customers today in other, non-mobile situations.

The Internet is services galore

Today services offered on the Internet are being used by millions of users every day. If one is looking for services galore, surely the Internet is it.

First of all e-mail services over the Internet have become a ubiquitous, convenient way to communicate, both for business and private goals. Also 1000 new services are launched every day on the World Wide Web. These range from news, sports, financial and commerce to search-engines and 'portal' services, which help users find their way and drastically influence the way the Web is being used.

Internet technology is used for intranets

Internet technology is being deployed by companies to create their intranets. Corporate intranets offer essential applications and services (e-mail, calendar, business process control and information) to employees. Of course these services are used in company offices, but they can be used from a simple home telephone line.

Taking the Internet mobile

Once the Internet can be used fully mobile situations, potentially all Internet applications will stimulate the demand for in-vehicle telematics services. It can be expected that the person already using Internet services will take the applications and services he/she likes or needs into the mobile situation, for reasons of comfort, efficiency and mobility.

One could formulate the following rule: *People use services when mobile only when they already use them in a fixed situation.*

Mobile Internet enables easy service development and distribution

Upcoming technologies for mobile Internet will have a high impact on the way in which new in-vehicle telematics services (location specific, time-critical, sensor data) will be developed and re-developed in the next three years. This is because in-vehicle telematics services in the next three years can be developed, based purely on Internet technology. Internet technology offers an easy world-wide and open platform for offering any kind of application. The Internet is easy to access. Internet standards (for example for e-mail messaging, Web pages, file transfer and software development (JAVA)) enable the easy development and deployment of these applications.

Permanent mobile Internet connectivity

New mobile Internet technology will be based on a form of connectivity that is (virtually) permanent, comparable to the way people are connected to their computer networks (LANs) in the office. Ultimately, mobile voice services will also be offered over the mobile Internet as voice-over-IP.

Based on the rapid technology developments and the drastic uptake of Internet services, it can be expected that in-vehicle telematics services and other mobile services will be offered to individuals who are permanently connected to the public mobile Internet as well as to their office IT facilities (LAN, documents, services)—all in a mobile manner.

Third-Generation GSM Will Bring Mobile Internet into the Vehicle

GSM technology is rapidly evolving towards its third generation. This generation GSM is based on the universal mobile telecommunication system (UMTS).

Increasing GSM data speeds

UMTS will enable data speeds ranging from 384 kbit/s to 2 Mbit/s ideally, over 200 times the 9·6 kbit/s available today over GSM circuit switched data (CSD). The UMTS data speed will be higher than available over integrated service digital network (ISDN) lines.

Data speeds of up to 2 Mbit/s allow high-quality audio and video communications. Data access, file downloads, webbrowsing etc. all work very smoothly and rapidly at these speeds.

As a stepping stone towards UMTS, the general packet radio system (GPRS) has been defined. GPRS is available today to GSM operators who are implementing it in their networks. GPRS allows for data speeds in the range of 115–384 kbit/s, enabling data communication and audio streaming comparable to using ISDN lines at home.

The mobile Internet protocol (IP) is being defined

UMTS technology is expected to enable IP-based communication and applications. IP is the foundation layer of the Internet today and is constantly updated by the Internet Engineering Task Force (IETF). Under the latest Request for Change (RFC2002), IP is currently being optimised for the specific challenges of mobile communications. Here one can think of the challenges that come with hand-over, roaming etc.

When UMTS is massively adopted by the GSM network operators and when mobile IP standards have been defined, true mobile Internet access will be a reality. Looking at how fast the evolutions are taking place, this will be in three to five years time.

Third-generation handsets

A lot of development is taking place in GSM handsets. Leading manufacturers are currently introducing handsets that are supporting the wireless application protocol (WAP). These WAP-telephones feature a 'micro-browser' that enables the user to view wireless markup language (WML) pages. This simple variant of web browsing allows for such services as flight schedule information, stock information, traffic information, all in a much more attractive and intuitive presentation than seen on current GSM handsets.

One advantage of third-generation handsets is that service applications eventually can be downloaded to the handset dynamically. This allows for updating of services, adding new services or even completely renewing the user interface and menu structure of the handset.

Technologies such as WAP open up the way for the GSM operators to take a role as a service broker, selecting and offering third-party services.

Although currently WAP telephones use the circuit switched data and SMS facilities of GSM, later WAP telephones can be fitted with GPRS or even UMTS capabilities. In this way the high-data-speed advantages of third-generation GSM will be combined with the latest user interface developments. Third-generation

handsets will evolve into powerful, flexible smart terminals.

Bringing Java to the handset

Evolution goes even further. Java is entering into the GSM industry. With its downsized Personal Java version, Java is positioned to challenge WAP in the future. A smart terminal that is fitted with the Java virtual machine will be capable of executing any kind of application.

One can imagine that a GSM handset running Personal Java is capable of micro-payments, web browsing, running audio and video applications, executing spreadsheet programs, e-mail applications, etc.

It is forecasted (by Yankee Group) that no less than 600 million smart terminals will be sold yearly wordwide by 2005. This is over three times as many PCs sold yearly today.

Clearly the future systems for using in-vehicle telematics services can be developed around third-generation GSM (smart) terminals that are fitted in the vehicle or that can be taken out from the vehicle for that matter.

Typical In-Vehicle Telematics Set-Up

Until now three major developments have influenced what in-vehicle telematics will look like soon:

- mobile Internet (mobile IP);
- third-generation GSM; and
- third-generation handsets.

A fourth source of influence can now be identified—the significant evolution of palmtop and handheld computers.

The market is divided between:

- palmtops/handhelds that run Microsoft's downscaled Windows, called Windows CE; and
- hardware based on using EPOC as the operating system, endorsed by the Symbian Consortium.

Palmtop and handheld computers are well positioned to take a role as the device to use for in-vehicle telematics services.

Microsoft has started the development of the *Auto-PC*. A device that can be fitted in any car like a car-radio, running Windows CE, offering the power of a PC to the driver.

With all these developments taking place, the in-vehicle telematics services set up will be very generic, for example consisting of:

- third-generation GSM (UMTS) connection;
- mobile IP protocols for communications;
- Auto-PC fitted in vehicles;
- additional sensor equipment in the vehicle, connected to the Auto-PC through the PC bus interface; and
- third-generation GSM smart terminals, running Personal Java, also for use when out of the vehicle.

Applications will characterise in-vehicle telematics set-up

The generic example hardware setup described in the last paragraph could run a set of applications for the user.

The set of applications that can be expected to be used in 80% of the vehicles in the future consists of:

- a voice-control application;
- a telephone application using voice-over-IP technology;
- a messaging application for e-mail, using text-to-speech technology for reading out messages and speech-to-text for dictation of e-mail messages;
- an Internet browser for accessing information and dynamically downloading new applications and services;
- a set of specific JAVA applications, developed for this particular user (home-grown);
- a set of industry defined and developed JAVA applications for general in-vehicle telematics services;
- personal radio, using IP audio streaming technology (for example, MP3); and
- video services, using IP video streaming technology (for example, RealNetworks' RealAudio)

Mobile E-Mail: An Example of Current Mobile Internet Services

The first step being taken by the GSM industry today is the offering of mobile e-mail. With this service the demand for e-mail services (regardless the user's location) is being fulfilled.

Mobile E-Mail challenges and solutions

With today's GSM standard there are basically two options for offering e-mail:

- CSD is used where the GSM user sets up a data call at 9·6 kbit/s; or
- e-mail messages are delivered as SMS messages to and from the handset.

The first option requires the user to use a PC or laptop to run the e-mail software. The GSM handset is connected to the computer with a GSM modem. Here, the GSM handset is only used for the data connection. And here the drawbacks of dropping connections, slow download speeds and hand-over trouble come in.

The SMS option forms a good alternative to connecting to a PC to the GSM handset. Firstly SMS allows the service provider to notify the GSM user that an e-mail has been received. The user does not need a computer linked to the GSM handset. Rather he/she can read the notification information on the handset's display.

The next step is to enable downloading of the actual e-mail message text to the GSM handset through SMS and then to allow the user to send commands to the e-mail service, by using SMS messages; for example, issue a command such as 'GET MAIL' to download e-mail.

A step further is to also allow sending of e-mails by using SMS messaging.

Example of a Packaged Service, Combining GSM, E-Mail and Internet: The Mobile Internet Service Provider (ISP)

Several GSM operators have already launched mobile Internet and e-mail services—including Europolitan, Bouygues Telecom and Itineris. One reason for providing this is that it makes it harder for users to churn when their e-mail address is tied to the GSM telephone service. With the upcoming of number portability, where users can switch operators and keep their GSM number, mobile e-mail gives operators a new weapon to fight churn.

GSM operators today invest in mobile e-mail and Internet platforms that have been developed by such companies as Comverse and SendIt AB. SendIt offers the comprehensive Internet cellular smart access (ICSA) platform that allow GSM operators to launch mobile Internet services in months.

In general, mobile Internet and e-mail service offerings consist of:

- an e-mail box on the GSM operator's mobile e-mail and Internet platform;
- SMS notification of incoming e-mails, with filtering options so that only notifications are sent for e-mails that meet certain conditions (for example, sender, subject, time of day, etc.);
- SMS e-mail receiving, sending, replying by SMS commands, all on the handset;
- a web interface through which the user can access his/her e-mail box, regardless of how they access the Internet; and
- a web site for self-care, where users can set their preferences.

Some operators package this service with dial-up Internet access. To enable good-quality Internet access when the user connects by using the GSM telephone (using CSD), the operators set up their own GSM access point, or GSM point of presence (GSM PoP).

This gives the operator full control over the quality of the Internet access, because:

- the operator controls the access point and the backbone network behind it; and
- the operator also provides the actual Internet backbone connection through which the users access the Internet.

Also, the operator is in control of the charges to the user for the GSM Internet connection. To stimulate traffic the operator can set this tariff to a very attractive level, comparable with a local call charge.

The GSM operators who offer these services today have created their stepping stone to offering full mobile Internet and mobile IP services in the near future.

Business Example: A Heavy Duty Construction Equipment Division

For a heavy-duty construction equipment division it is essential to identify important information and communication technology (ICT) trends in the short term, aligned to the business service strategy of the organisation's construction equipment operating companies.

Integration Of information

Servicing for the heavy-duty construction equipment organisation is a complex process. It is tightly linked to service level agreements, to the history of the equipment and requests of the customer. The whole value chain, including the supply chain to the division's home locations and other suppliers, need to be integrated. The margin for the division is very dependent on the timeliness of actions—the move is to just-in-time service.

Current trends exist that have an impact:

- Intranets, with supporting applications that fit into the service areas will be a key element. The trend is to have dedicated IT platforms and IP-multimedia databases. An example of this trend is the new Oracle8i Internet server that provides low maintenance cost with high applicability.
- The Internet will become a de-facto standard for business uses. This will provide a common look and feel and promote user-friendliness.
- E-commerce is a trend that has an impact—for a heavy duty construction equipment division it is probably not deployed in the sense of web-based selling, but may be rather in the linking of procurement and authentication of parties in the transaction. In addition, customers can do self-administration directly through web access to define the specific planning of service needs.
- Remote integration of the workforce leads to the question of identification, authentication and authorisation of users. SIM cards will provide a level of security of the sensitive databases and transactions.
- The sharing of knowledge is key to servicing. Knowledge systems allow the field force to have access to relevant information and responses to their questions and queries.
- Another key element is the capability to detect trends and patterns from the information that is received from the field. The trend is to deploy datamining tools such as Omega that can be tailored to fit the purpose to detect patterns of breakdowns or correlation in service elements. These tools allow the sales-force to keep track of trends in sales and parts supplies and allow them to be proactive. It will provide relevant feedback to product development in a shorter cycle.
- Multimedia is a key area, with videoconferencing. GroupWare applications with shared user interfaces will allow group collaboration. Thin-clients will facilitate the task of distributing functionality to the field.

Mobility

The servicing on-location and in the field with tight integration in (near) real time with the back-office, warehouses and schedules implies that there are ways for mobile data communication. Repair process integration is the new way of working aimed to lower the time spent, the travel, and be ahead of events.

Current capabilities exist in GSM modems for file access and e-mail support. But the next few years show that improved datacommunications services will appear.

- The GPRS mobile data communications service will become available, first of all in the Nordic countries, in Q3 1999. The GPRS standard will allow multimedia support up to 115 kbit/s—allowing video-stills and videoconferencing to take place between locations—for review of instruction material to the field force and sharing (static) pictures of the serviced objects with back offices.
- The wireless access protocol (WAP) will provide the mobile user direct access to the Internet and become available before 2001.
- Portable PCs will become available with the direct-to-air interface on GSM standards, improving reliability—a key element for the rough environments that the organisation services.
- GSM air interfaces can be integrated to remote sensing appliances.
- Mobility and direct access to computer systems with vital information means that attention needs to be given to identification, authentication and authorisation. New-generation SIM cards will be able to be programmed such that the user can be securely accepted into corporate systems and initiate transactions. PCs can be linked to mobile handsets for these enhanced datacommunications services.
- The fast advances of datacommunication show a trend of a drop of the cost of transport.

- Where no GSM network is available, the datacommunication can be provided through satellite services such as the Iridium network (though with a cost disadvantage). Standards are being prepared for this access: the global mobile satellite services (GMSS).

Telemetrics

A key element in being pro-active is to have good information on the current status of the equipment. If the service level agreement identifies a maintenance based on hours of use, then the availability of this information is key to just-in-time servicing. Telematics applications can provide this information and provide this over the air to enable planning.

- In-vehicle telematics is a key research topic for Volvo. The information is provided over the air via GSM SMS messages. Also Siemens is developing a wide range of rugged GSM industrial grade transmitters that can be embedded in equipment and fitted with PC interfaces.
- Sensors are being developed for special purposes, such as analysis of wear and tear. Also for analysing acidity of oils, for gauging oil pressures and temperatures. Their information can be stored locally in the vehicles or equipment or transmitted to base stations for analysis.

The use of these new developments will give organisations an edge in attracting new and keeping customers, and the capabilities thus developed will enhance competitiveness in other lines of business.

Biographies

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Patrick Steemers is a technology consultant with Cap Gemini, the Netherlands. During his career in the telecommunications industry he has gained an extensive experience of the developing Internet business. He graduated from Eindhoven Technical University with a masters degree in Electrical Engineering in 1991. He has held several key-positions within Royal Dutch PTT (KPN). Since 1996, with the commercialisation of the Internet, Patrick has performed strategic consulting with international telecommunications companies for setting up Internet services. His projects have covered Europe (Belgium, Spain, Italy, Slovenia) as well as South-East Asia. Patrick is a conference speaker on issues related to the convergence of Internet and mobile communications technology.

Mark Hoogenboom
Senior Technology Consultant with Cap Gemini

Mark Hoogenboom is currently working as a Senior Technology Consultant with Cap Gemini. He was a speaker on several seminars related to web-enablement, Internet, intranet, etc. Since 1997 Mark has been working as a consultant, implementing the iterative application development method with several clients, in Japan, Korea and the Netherlands. He is a co-author of two titles in the area of iterative working: the Iterative Transformation Cycles Guide and the IAD Implementation Guide and he is a co-author of the book 'How To Become A Web-Enabled Enterprise', a book about the use of Internet-like architectures for business.

Albert Kuiper
Business Consultant with Cap Gemini

Albert Kuiper is a Business Consultant with Cap Gemini. In the 1990s he has worked extensively in developing the concepts of customer care and the relationship of telecommunications services and billing. In this role he has made numerous contributions to conferences and has conducted workshops internationally. He has developed organisational process models for operators and redefined the processes around billing for several German operators. He has managed the development of an ATM billing system in the CANCAN research and development project, that formed part of the EC ACTS framework. The work included development of service concepts and charging schemes for ATM that open up a path for commercialisation.