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Telematics 2000: Market Structure and Technical Directions[1]

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1 Introduction

Telematics is a term that not everyone may be familiar with. Within the Swiss PTT, it is commonly used to designate telecommunication services other than telephony or, more precisely, other than voice transmission services. In this article, the term does not refer to the entire range of non-voice services, but only those which can be considered *networking* or *data communications* services.

Historically, telematics customers have been viewed as having identical requirements and needs, especially by the public service operators such as the PTTs. Service offerings for telephony and telex were based on the assumption that customers for a particular service had the same needs and requirements and would be satisified with the same flavor of product.

Technological advances in telematics have permitted a multitude of products and services to be developed. These products have applications which depend on the characteristics of their users; as a result, different telematic market segments are emerging.

2 Market Structure

Four market segments can be differentiated. They are the *Domestic Services*, the *Public Business Services*, the *Enterprise Networking Services* and the *Community Networking Services*. The top three sections of *Figure 1* illustrate what these segments are and identify customer and consumer characteristics. A telematics user may belong to one or more of the segments.

21 Domestic Services

Domestic services are addressed to private households. They are used (or rather consumed) by all members of a family and are, therefore, characterized by their simplicity of usage and their low price. They are easily integrable with commonplace household electronic equipment. Computer literacy on the part of the user is not required.

The characteristics of domestic services are:

- they provide entertainment or are associated with leisure activity;
- they provide access to information;
- they decrease the time needed to perform routine tasks.

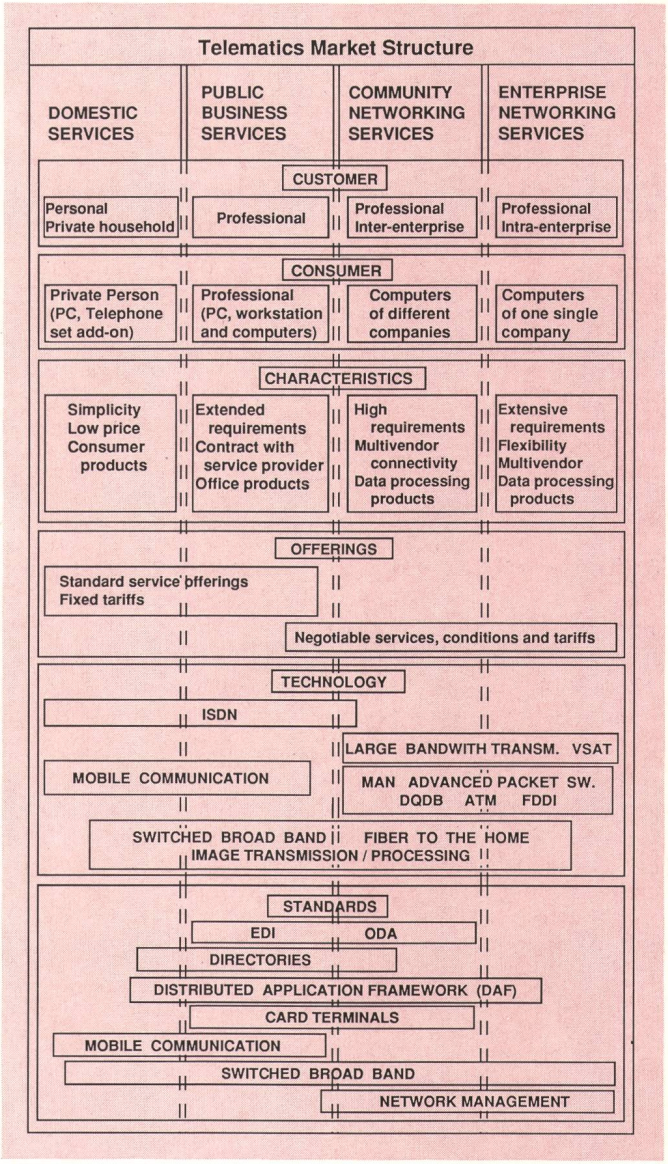

Fig. 1 Telematics Market Structure

[1] This article has been developed from a speech given at the Swiss PTT International Meeting at Villars-sur-Ollon in 1990.

Two functions associated with domestic services are:

- information retrieval (primarily for access to information, e.g. the telephone directory, bus time tables, travel information, etc.)
- electronic personal services (services requiring greater amounts of information processing activity and that permit routine tasks to be done remotely, such as electronic ordering, telebanking, educational programs, etc.)

22 Public Business Services

Public Business Services are used by professionals either at home or in their offices. The applications are similar to those for Domestic Services, but are distinguished from them by the fact that the services are used for business purposes. Higher quality and higher availability of these services are required as well as the ability to differentiate costs. The user usually possesses PC skills. Many small businesses (offices and small enterprises with on average less than 10 people, i.e. lawyers, doctors, artisans, farmers and consultants, among others) are typical customers of Public Business Services. Usually, these services are attractive to them because they cannot afford private investment in a large computing infrastructure.

These types of services have two characteristics:

- the information services, while offered to anyone, are often supplied on the basis of a contract negotiated between the user and the service provider;
- the communication services provided must handle the exchange of text and data files as well as personal messages. The text and data files are often prepared on workstations or PCs and can subsequently be processed again on workstations, PCs or mainframes.

23 Enterprise Networking

Enterprise Networking is a term used to describe the partial or complete interconnection of the computing systems within large organizations. It is a prerequisite for the efficient, integrated use of all of the office automation, data processing and communications facilities existing within an organization and is important in organizations or corporations where the facilites are spread over different and, possibly, remote sites. It is a natural enterprise-wide extension of the traditional local area network; therefore, Enterprise Networks are often multinational if not worldwide networks. Such networks must be universal and flexible enough to be easily and quickly adaptable to changing organizational structures, geographic movements and changing needs.

Enterprise Networks are, in most cases, comprised of a variety of different transmission and switching facilities, interfaces and gateway functions, all with efficient means for permanent network supervision and management. An Enterprise Network is an integral part of the enterprise and is under its full control; however, this does not preclude situations where the design, installation, maintenance and management of the Enterprise Network is by contractual agreement entrusted to a third party specialized in communications.

Telematics in this segment means intelligent information transport in a multiapplication and multivendor environment. LAN interconnection plays an important role.

Consumers of Enterprise Network Services are commonly the various EDP departments or sections within an organization. These departments may offer or resell the services of the Enterprise Network to their customers.

24 Community Networking

Community Networking is very similar to Enterprise Networking. The difference is, however, that several autonomous organizations share network usage and facilities. This sharing is driven by the same requirement that drives large organizations into Enterprise Networking: The companies or institutions involved (e.g. regional banks, educational institutions, regional governments) have a certain common interest either related to their businesses or in sharing expensive information processing and/or communications resources.

Community networks may be national or international, and they may be designed to support a single application or to cover a variety of communications needs. They always allow multivendor connectivity.

As in Enterprise Networking, telematics means intelligent information transport, possibly complemented by universal applications support facilities in a multivendor environment.

3 Technical Developments

New developments in telecommunications technology will allow new services to be developed for all market sectors, but in some cases, the new technologies are better suited for particular market sectors. The impact of ISDN (Integrated Services Digital Network), satellite communications, MANs (Metropolitan Area Networks), mobile communications and packet switching is described below. The fifth section of Figure 1 maps these technologies to the market segments on which they will have the greatest impact.

31 ISDN

A significant factor that will influence the evolution of telecommunications during the next decade is the ongoing replacement of traditional analogue switching technologies by digital ones. The increasing availability of ISDN subscriber lines and switches will undoubtedly promote the generation and use of Domestic Telematics Services. The private household will receive an efficient and inexpensive means to access a number of such services. One possible service will be an advanced videotex service that provides access to information data bases and offers games as well as ordering, reservation and

simple computing functions. Telefax is also expected to become a normal means of communication in a number of households. Currently, there is an obvious lack of reasonably designed terminal equipment adapted to household needs and household environments. Any future equipment should be designed so that it can be easily combined with ordinary household electronic equipment.

ISDN will also have its merits in the area of Public Business Services, as it will simplify the connection of the user to the network and, hopefully, reduce costs because of greater data transmission rates and quality. Developments like intelligent network services and their integration into computer-aided telephony will further stimulate Public Business Services.

Enterprise Networks will not gain any particular advantage by the installation of an ISDN network, as they depend heavily on LAN (Local Area Network) interconnection. Additionally, ISDN offers little opportunity for network customization.

It is not yet clear what role ISDN is going to play in the market of Community Networking Services. The required transport services for such applications will probably be provided on dedicated networks in the short term.

32 Transmission

The evolution of terrestrial and satellite transmission facilities to larger bandwidth, including VSAT (Very Small Aperture Terminals), will have a large impact on Enterprise and Community Networking.

Terrestrial communications networks will be enhanced to improve bit error rate performance and response time. This will open the door to transmission of a wider range of voice, data and video applications. Large businesses will be the first to take advantage of these technological advances, as their need to transmit large amounts of data is high.

Private Satellite Networks are showing increasing flexibility and economies of scale over terrestrial networks for point to multipoint communications. Enterprise networks and Community Networks are characterized by computing facilities that are often remote. Consequently, satellite transmission services will be increasingly demanded by these two market segments.

33 MAN

The emerging MAN technologies such as fast packet switching, FDDI (Fibre Distributed Data Interface), DQDB (Distributed Queue Dual Bus) and ATM (Asynchronous Transfer Mode) will allow for efficient LAN interconnection in order to build large networks while insuring privacy and independence within virtual private networks. It is still open which of the technical approaches in the MAN area will survive and which will not. In any case, Community and Enterprise Networking will benefit from this technology.

34 Mobile Communications

Mobile communications capabilities will continue to improve. There will be more equipment installed to process longer range signals. Particularly appealing services for the Public Business market segment will include mobile telematics services such as Fax and Electronic Mailboxes, among others. If service quality is high and prices are low enough, mobile communications will, to a certain extent, penetrate into the Domestic Services.

35 Image Processing

Towards the year 2000, switched broadband services, e.g. Broadband ISDN, and the connection by optical fibers of individual subscribers and, eventually, private households will open the door for image processing and transmission. The Public Business Service customers will most likely benefit from these services before the Domestic Services Customers. The merger of existing TV distribution networks with telecommunications requirements could accelerate the development of image processing services for these two market segments. Until this occurs, image transmission will be primarily restricted to Enterprise and Community Networks using the MAN technologies.

Within businesses, especially large engineering firms, image transmission has become increasingly important. By the late nineties, when Broadband ISDN should be available, there will be enough bandwidth on ISDN networks to facilitate the transmission of complex images, but until that time, 144 kbit/s will not be enough to transmit the kind of images many enterprises need to transmit.

36 Packet Switching

Packet switching technology continues to improve. Technical developments in packet switching technologies, particularly the intelligent access layer network, will have a positive impact on Community Networking and Domestic Services. The intelligent access layer network will be added to existing packet switching during the nineties. It is able to perform protocol conversion for different classes of terminal standards, thus enabling access to different directory services and allowing secure user identification (using PIN codes, smart cards, and eventually fingerprint and voice recognition techniques, among others), thus making service access much simpler for the user. At the same time, this access support simplifies the task for service providers, as it represents a universal feasible platform on which information services can be offered via standardized interfaces to a large population of potential users.

The same technology will also be used to allow EFT-POS terminals (Electronic Fund Transfer at the Point of Sale) to access a variety of different credit and debit card clearing offices.

4 Standards

Availability of international standards for service implementation is an indispensable precondition for Domestic and Public Business Services. Without standards, a multiplicity of services that do not interwork could proliferate. In the Enterprise and Community Network market segments, standards, although not indispensable for service function, can still considerably reduce costs.

Some of the most valuable standards seem to be those for Electronic Data Interchange (EDI) and Open Document Architecture (ODA). The availability of products conforming to these standards is predicted to open a very important market for Public Business Services and Community Networking.

The bottom section of Figure 1 shows the relationship between the various market segments and specific standards.

41 EDI

Electronic Data Interchange (EDI) is the movement of business information, e.g. routine transaction documents, such as purchase orders, invoices, shipping notices, quotes, etc., electronically between a buyer and a seller. The information is structured, i.e., the data is formatted in a prescribed sequence, so that it may easily be exchanged on an intercompany system-to-system basis.

The existence of EDI standards has led to an increase in market demand for this kind of telematic service. EDI services will be particularly appealing to the Public Business Service market segment and the Community Networking Services segment, as both of these market segments have an essential need to communicate with other businesses.

42 ODA

Open Document Architecture (ODA) is another standard that will create market demand for products and services that conform to it. Once ODA products and services begin to be implemented and offered, it can be expected that this will have a profound effect on the Public Business Services and the Community Networking Services. The exchange of business documents will be greatly facilitated. Users in these market segments that were never able to interchange documents with other users because of incompatible electronic formats will demand and utilize communications facilities that support the ODA interchange format.

43 DAF

Some very interesting work has started in CCITT on the standardization of a communications architecture that is intended to be applicable to most types of distributed applications. This work is known as the *Distributed Applications Framework* (DAF). Security and management of distributed applications are major features of this standardization effort. If the international standards organizations succeed in standardizing such an architecture, this will form a very attractive base platform for the implementation of applications for the Community Networking and the Public Business Services segment.

44 Network Management

Management of the networks underlying the application is one of the most important recent developments in telematics. The first set of standards for this was just adopted. Network management standards set the stage for the offering of managed data network services that meet basic requirements of the Community Network market segment. Some of these requirements are that strategic assets be better controlled, multivendor network resources be better managed, reliability be increased, network security be improved, network performance be optimized and the correct operation of the networks be secured. While the Community Networking market segment will be the prime benficiary of developments in this arena, the implementation of these standards in networks will help to reduce costs for the Enterprise Network market segment. Additionally, services offered to the Domestic and the Public Business market segments can be better controlled and thereby offered at less cost.

45 Directory Services

Standards for the operation of a directory service will stimulate market growth in the Public Business and the Domestic Services segments. The availability of information on data communications addresses will make the use of electronic communication means easier and more desirable.

46 Smart Card Terminals

The emerging standards for smart card terminals are of great importance, but primarily for Public Business Services, as they will contribute to the implementation of easy and more secure access control and billing procedures.

5 Marketing Opportunities

The changing regulatory environment in Europe and throughout the world in the field of telecommunications will have a greater impact on telematics than either technical or standards developments. This is true at the very least in the professional sectors, all of which comprise large parts of the Public Business Services, Community and Enterprise Networking market segments.

The liberalization and deregulation that is occurring in the telecommunications environment of Europe will not only give more freedom of choice to telecommunications users, but it will grant new liberties to traditional carriers, i.e. the PTTs. The fourth section of Figure 1 relates some of the areas affected by these developments, i.e. tariffs and service offerings, to the various market segments.

Traditionally, the PTTs were allowed to be run as a monopoly, and this was considered a desirable situation. They were restricted to standard service offerings which were equally available to everyone. The services to be offered were always a matter of public record, and service costs could not be varied between customers. Tariffs were usually set on the basis of a perceived need rather than on the basis of competition. The customers and users of the services had no choice but to take them or leave them. For those who had to design a certain application or network, this situation frequently resulted in nonoptimal solutions from both a technical and economic point of view. The situation has already changed and will continue to change dramatically. PTT customers can now expect technical and operational specifications as well as commerical conditions to be subject to negotiation.

For the Community and Enterprise Networking market segments, this new freedom will allow the growth of opportunities for network optimization and new kinds of service features. Partly, this will be due to the fact that competition is permitted, and consequently, there will exist several suppliers of services, e.g. packet switching or electronic mail services. Partly, it will be because such services will now be tailored to fulfill actual needs and be acquired at negotiated rates and under negotiated terms from PTTs.

It is this second reason that is most important. PTTs are in many respects the best qualified and most established telecommunications specialists. If market forces and market characteristics such as the four market segments identified in this paper are heeded, and plans are made which take these factors into account, then telematics in the year 2000 can be expected to be of a different breed than what it is in 1990. Service providers will be responsive to users, and user demand will determine the types of applications provided.

6 Conclusions

The most outstanding event in telematics in the next ten years will be its transition from a predominantly technology driven pioneer phenomena to a solid, well established, market driven, user adapted everyday tool in both the business and private environment. Technology, deregulation and standards will make this possible. However, success as a service provider will depend on the recognition of and response to the emerging telematics market segments.

Zusammenfassung

Telematik 2000: Marktstruktur und Tendenzen im technischen Bereich

Die Autoren machen auf den Einfluss aufmerksam, den technische Entwicklungen, Normen und die Liberalisierungspolitik im Fernmeldewesen auf den Markt für öffentliche Telematikdienste in den neunziger Jahren ausüben könnten. Diese Dienste werden wesentlich verschieden von jenen der achtziger Jahre sein. Die Marktkräfte werden zunehmend die Angebote und Preise bestimmen. Es sind vier verschiedene Marktsegmente zu erkennen, die von den Anbietern beim Entwickeln und Anbieten künftiger Dienste in Betracht gezogen werden müssen.

Résumé

Télématique 2000: structure du marché et tendances dans le domaine technique

Les auteurs attirent l'attention sur l'influence que pourrait exercer au cours des années 90 le développement technique, la normalisation et la politique de libéralisation dans le domaine des télécommunications, en ce qui concerne le marché des services télématiques publics. Ces services seront essentiellement différents de ceux des années 80. Les partenaires présents sur le marché détermineront de plus en plus les offres et les prix. Il y a lieu de reconnaître quatre segments de marché distincts, qui doivent être pris en considération par les fournisseurs lors du développement et de l'offre de futurs services.

Riassunto

Telematica 2000: struttura del mercato e tendenze nel settore tecnico

Gli autori descrivono l'influsso che lo sviluppo tecnico, le norme e la politica di liberalizzazione nel settore delle telecomunicazioni potrebbero esercitare sul mercato dei servizi pubblici di telematica negli anni novanta. Questi servizi saranno notevolmente diversi da quelli degli anni ottanta. Le forze del mercato determineranno sempre di più le offerte e i prezzi. Si possono riconoscere quattro segmenti di mercato che gli offerenti dovranno prendere in considerazione per lo sviluppo e la commercializzazione dei servizi futuri.

Summary

Telematics 2000: Market Structure and Technical Directions

The purpose of this article is to call attention to the influence of technical developments, standards and telecommunication liberalization policies on the market for public telematics services in the nineties. These services will have a distinctly different character than the services which were offered during the eighties. Market forces will increasingly determine service offerings and their prices. Four distinct market segments can be identified that service providers will need to consider when developing and marketing future offerings.