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TELEMATICS NETWORKS FOR HEALTH CARE IN PERIPHERAL REGIONS

A Greek Case Study

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Abstract

This paper focuses on the potential of information and communication networks for regional development. Particular attention will be given to the role of the telematics sector in the policy for peripheral areas. The critical success factors of this high tech sector will be analyzed by means of the so-called Pentagon model and will be illustrated by a Greek case study.

1. Telematics for Health Care in the Periphery

Infrastructure is widely recognized as a facilitator of (regional) economic development. In our era modern types of network infrastructures (e.g., information networks, telematics) have increasingly come to the fore. Some new developments may be signalled here: electronic highways, e-mail, inter-net, teleworking, teleshopping etc.. The potential of such new kinds of infrastructures seems formidable, especially when they are integrated in everyday life, in industrial production and in distribution.

A main question is then: what will be the likely impact of such modem network technologies on regional development, and in particular on regional discrepancies ? It seems plausible that central locations will tend to be the forerunners in adopting such new information based networks, so that a transformation towards an information society may aggravate regional differences. At the same time, it ought to be recognized that the modem information and communication technology (ICT) may offer also unprecedented innovative opportunities for peripheral regions. For example, the position of small and isolated regional groups may be enhanced by offering them access to public services by means of telecommunication, such as distance learning or telematics. This might to some extent prevent a further outmigration from these regions.

In the present paper we will address in particular the potentials and impediments inherent in the use of sophisticated telematics services for medical care in isolated regions. The main aim will be to identify critical success factors in the adoption and use of ICT services in the health care sector, with a particular view on the problems encountered on isolated Greek islands. In so doing, we will follow the scheme in Figure 1 which describes also the structure of this paper.

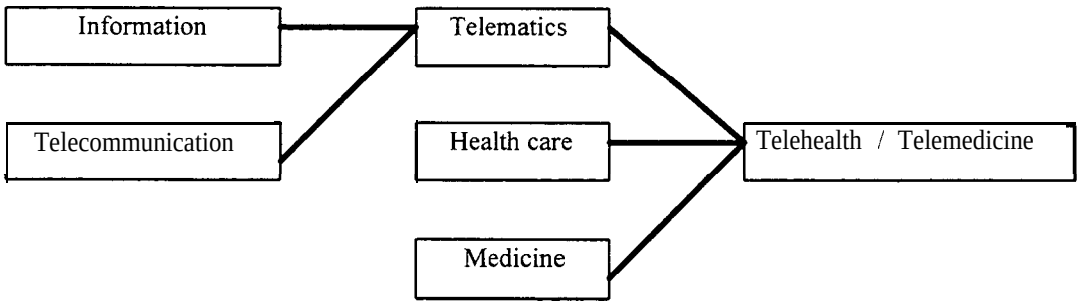

Figure 1. A diagrammatic reprensentation of the organisation of the paper.

2. Innovation, Diffusion and Adoption

The ICT sector is one of the leading sectors in modem innovations. Schumpeter is often called the economic father of innovation theory. He focussed his theory on the technological and organisational factors that induced innovations. Other catalytic forces of the innovation proces are: the growth in capital and population, and changes in consumer preferences. Schumpeter argued that innovation and diffusion create a gale of destruction, a so-called creative destruction, leading to drastic changes in existing production processes and products, which have to be replaced by new structures and products to keep the companies involved competitive. This is often called a cluster of innovations, which is discontinous in time and follows a life cycle pattern (Schumpeter, 1939). This cluster of innovations is also called basic innovations. Freeman (1982) criticized the idea of a succession of basic innovations, although he valued these basic innovations as very important. After the basic innovations a

series of minor important innovatons will normally follow. The organisational inovations were in his eyes also important, but they originate from the technological change and serve only to simplify the implementation of technological innovations.

Some authors (Usher, 1955; Ruttan, 1959; Rosenberg, 1982) support the idea that technological development is a gradual sequence of small changes. Rosenberg (1989) emphasized even that the technological follow-up innovations are more important, because their cumulative effect is bigger than one major cluster of innovations. A circle model is used to show the complementarity between the innovations.

Freeman (1977) has to be given credit for having shown the effect of innovations on employment. During a recovery phase, major new technologies generate on a large scale both new investment and new employment. As a result of the rapid technological change and increasing competitive pressures, relative prices of the new goods will fall and their cost advantages will increase. The main labour market effect in a recovery phase will be a steep increase in employment.

One of the new technologies which has intensively been studied in the past decade is the ICT. It is offering an advanced network infrastructure with a pervasive impact on all regions. The development started with the introduction of the microprocessor in the early seventies. This development made it possible to miniaturize a wide range of goods and to improve the existing goods and services, mainly through adding some "intelligence" to the products. This "intelligence" gave the products a greater functionality and they became easier to use, or alternatively less efforts had to be made to achieve the same end. Cost reduction is also an important part of the ICT. Initially, this development focussed on individual stand alone equipment, e.g. personal computers (PC's), word processors, some consumer goods, etc.. The modem direction of this development is more towards integrating and interconnecting the ICT with telecommunications to set up networks. The networks are built up and connected through telephone, fax, PC's, text and data processing equipment and so on. These connections make it possible to integrate all kinds of production activities with organisational and mangement processes which are also radically changed by the ICT, resulting even in global networks. So, in short, the dominant characteristics of ICT are: miniaturisation, improvement of quality, adding of 'intelligence' to goods, services and processes, rapidly decreasing costs and advantages from the network feature.

Networking consists of at least two dimensions: the set-up of the physical, or technical, network as a medium -or a set of media- for communications of various types, and the user potential which deals with who is using the medium and what functions are being pursued. Managing a network is becoming a crucial skill and it can become an important asset if the organisations involved can mobilise it effectively. It is possible to distinguish two important dynamic relationships which determine the performance of the network configuration: the techno-economic relationship and the technology-human factor relationship. There are several factors which are decisive for the success of an innovative actor. The most important explanatory variables are: the educational levels of the personnel and the management, the degree of systematic planning, the attitude of the management, the market approach, the ability to cooperate and the active use of information networks (Docter, 1987).

Next to innovative behaviour, the diffusion of innovations is a very important issue; information is a critical factor here. The information about innovations has to be diffised through proper communication channels. This information can be spread through various ways in the social system of a country, a region or a company. The information can be supplemented through market or nonmarket channels, formal and informal. The existence of an innovation market is dependent on the legislative structure (e.g., innovations may be protected through patents) (MERIT, 1990).

Finally, adoption concerns the widespread use and general acceptance of the product or service, generating the growth phase in the product life cycle. To reach this stage it is necessary to have a certain critical level of consumers or customers, i.e. a critical mass of adopters (Capello, 1994). If this critical mass is reached, a cumulative self-sustained mechanism is possible. Not only the information about the innovation is important, but also the actual innovation has five main characteristics which are critical (Rogers, 1983): (i) relative advantage, defined as the degree to which an innovation is perceived as better than the idea it supersedes; this has been found to be one of the best predictors of the rate of adoption of an innovation; (ii) compatibility of an innovation, defined as the degree to which an innovation is

perceived as consistent with the existing values, past experiences, and needs of potential adopters; the higer the degree of compatibility the higher the rate of adoption, due to lower switching costs and less uncertainty; (iii) the complexity of an innovation is negatively related to the rate of adoption; the difficulties in understanding and using the innovation are the main barriers; (iv) triability, the degree to which an innovation may be experimented with on a limited basis; and (v) observability, the degree to which the results of an innovation are visible to others.

For the ICT sector there are several types of innovation: substitution, enhancement and transformation. In the substitution phase the improved technology is a substitute for the existing product. The enhancement phase occurs when a new technology leads to substantial performance improvements. Transformation occurs when a whole new type of work practice and organisational structure replaces the old ones.

It goes without saying that the regional potential to flexibly adopt new ICT findings is of critical importance for reaping the fruits of this technology. By no means is the ICT revolution disadvantageous for the competitive position of isolated regions; it may even offer an entirely new potential. In order to infer more substantive and conclusive answers on this question, we will address in our study the foreseeable impacts of telematics in the medical sector on peripheral areas.

3.From Information to Telematics in Health Care

The integration of telecommunication and information is usually called telematics. Telematics services are making use of combinations of data and/or information in transporting and/or processing. One of the major attractive features of telematics is the possibility of integrating and adjusting the internal and external production processes. Telematics is not the most important part of successful integration, but in successful integration, telematics is always present. Further integration makes it possible that some of the production processes can be arranged in a different way, e.g. JIT (Just In Time). New arranged production processes can shift market powers and change the traditional relationships between supplier and customer, and between company and customer (Grijpink, 1992).

Furthermore, there is a trend to use all kinds of electronic equipment to simplify the use of products or to support decision making. In road transport various types of telematics are introduced, from the automated vehicle location by satellite to the use of mobile phones. It is remarkable however, that many transport companies stick to the 'traditional' communication possibilities, the main arguments for not using the more advanced equipment being: the high costs of investments, lack of need by the clients and waiting for new developments (Nijkamp, 1996). Scepticism and no urgent need for change seem to be major barriers to adopting the new technologies on a wide scale.

One of the fields however, where telematics has gained an enormous importance is the area of medicine and health care. We will first give a brief general introduction, followed by a more precise treatment of telemedicine and telehealth.

The main advantage of telematics in health care is improved access. The physician and the patient do not have to be in the same geographical location. This makes it possible to give high quality health care to underserved areas. The benefits of not having to travel lies in the distance-reducing or time-saving benefit. Because instant information is available, people may intend to consult earlier their doctor, and if an illness is detected, the patient can be treated in an earlier stage of the illness.

Generally speaking, remote areas do not have a sufficient critical mass of medical service provision. With telematics in health care, the barrier caused by lack of information will drop, and when connected to a telematics in health care network the barrier is vanishing. This means that advice or consultation can take place instantly, and without travelling.

If all health care actors are integrated into one network, the possibility may arise that a complete personal health care record can be established. Traditionally, a fair amount of time is needed for patient records to be dictated, transcribed, and sent to referring physicians. This is a time consuming process with a great chance of incompleteness and non-accessibility. With the system of integrated medical records this problem of the past will be over. The advantages are: less duplication of records and easy access, while the time-saving components will improve the efficiency of the health care sector. This has resulted in new developments, usually called telemedicine and telehealth (McDonald, 1990).

Telemedicine is 'the investigation, monitoring and management of patients, and education of patients and staff using systems which allow ready access to expert advice, no matter where the patient is located' (Van Goor,1992). Examples of various nature can be found in Moore (1995). Currently the major effort in telemedicine is in diagnosis and in monitoring physiological dysfunctions that are easy to analyse with equipment. In medicine itself however, there has been a renewed interest in holism with the realisation that physiology is only one part of what makes people ill, leading to refocusing on health promotion as opposed to illnes care. In the sphere of telematics, this allows for a holistic rather than a reductionist view of health which includes telemedicine (Gott, 1995). Because health is more than medicine, another concept is needed, to express the more holistic concept, viz. telehealth.

Telehealth is 'the provision of telematic services and related goods which can provide health care services and assist in raising the conciousness and increasing the involvement of both the individual and the community towards the total health environment... aiming to improve well-being and wellness' (Veneris, 1992). Telehealth is more focussed on prevention or on monitoring the people before they actually become ill. Telehealth comes from the primary health care and is characterized by the integration of medical care with social, educational and other pro-active health services, and draws on a social model of health. Primary medical services are characterized by responsive, personal, and preventive treatment and care activities, drawing on a medical model of health. In Europe the spending on primary health care varies markedly as opposed to hospital care. It is around 10% in the U.K., as opposed to 40% in Finland. There has lately been increased recognition in all the E.U. countries that to provide effective and efficient health care for the European citizen, a greater percentage of the health budget needs to be re-allocated to primary health care (Gott, 1995). Several new innitiatives have been developed in various countries which show the importance of telehealth for regional health care.

4. Health Care in the Greek Periphery

Isolation, an insufficient critical mass for the support of various public services and an increased demand for medical services and care due to the demographic structure of the population, are the main factors which inhibit the development of the Greek islands. One of the examples of a peripheral island region is the Aegean archipelago which is located in front of the West coast of Turkey. The archipelago is special in that it comprises many islands, with a wide dispersion of a large number of small communities. Isolation is the main reason inhibiting the development of the islands. The last census showed a trend towards a decrease of the active population in the islands of the Northern Aegean. Nevertheless, a slight increase in the population of the islands of the South Aegean has occurred, in particular the increase in the island of Kos, which witnessed a 33% population increase, due to increased tourist related activities. Population ageing is a particularly severe problem in the North Aegean prefectures, e.g. the island of Samos, where 30% of the population is older than 60 years, which is twice the national average. The percentage of population employed or seeking employment in the Aegean islands is approximately 40%, a figure very low compared to other countries (Darzantas, 1993).

The Greek health care system is headed by the Minister of Health, Welfare and Social Security. The Ministry drafts laws and regulations, plans resource and expenditure policy in each sector, and supervises welfare, health and social security. It is assisted by the Central Council of Health Care and a number of establishments. On a lower level of regional adminstration, the country is subdivided into 54 prefectures, each with its own Department of Welfare and Health Care.

The structure of the health care services in Greece contains three layers of care: primary, secundary and tertiary Health Care Centres (HCC). These services are offered by a variety of providers, both public and private. In rural areas, the public primary health care providers are the HCC and rural doctors in provincial surgeries. According to the most recent inventory of the Ministry, there are 225 HCCs around the country, each of them being responsible for several peripheral medical offices or surgeries (1336 in total)(Sotiriou, 1996).

The primary HCCs were created after the 1983 reform of the national health care system. In the first place, primary HCC were planned in both urban and rural areas, but in practice, the urban HCC were never created. At present 170 HCC in rural areas are in operation, all of which were created after

1985. They are responsible for providing curative, preventive and rehabilitation services for the population in their catchment areas. They were envisaged to operate as gatekeepers to the health care system, reducing the flow of patients to hospitals and accross geographical regions, especially towards Athens.

Greece has always been considered a low spending country on health care expenditures by international comparison. In 1991, the latest year for which OECD data are available, Greece seems to spend 5.3% of GDP on health. Per capita expenditure reached US$ 404 in 1991, a figure only higher than Turkey among the OECD countries. There are however reasons to believe that the Greek health care expenditures are underestimated in the OECD accounts. According to the National Accounts published by the national Statistical Service of Greece, health care expenditures reached 7.8% of GDP in current prices in 199 1.

After this introductory overview of the Greek health care system, we will now move to a concise discussion of the potential of ICT in medical services. The national telecommunication service plays an important role here. The Hellenic Telecommunication Organisation (OTE) was established in 1949, and is an autonomous operating organisation under the legal status of a private company owned by a single shareholder, the state. Under the 1049/49 Law, the state had granted OTE "the exclusive right to administer and exploit all telecommunication media on wire and radio transmission, local trunk, national and international communications". According to this law, the regulatory structure aimed at maintaining OTE's monopoly and through this, the provision of telecommunications services. OTE was intended to run as an autonomous enterprise under state supervision, but actually this is not the case. OTE is often used as a cash cow, the profits were used, by successive governments, to subsidise the debt burdening Hellenic Post Office, leaving OTE with insufficient financial means to invest in a new telecommunication network. To fulfil the tasks of universal service provision, OTE used the cross-subsidization principle. OTEs tariff level for international phone calls is considered to be the highest in Europe, but the tariffs for local calls are comparatively low. The revenues created are used to subsidize non-lucrative telecommunication services in high cost peripheral regions.

Poor services and high prices were the main causes of the pressures to liberalize the Greek telecommunication market. Large companies were emphazising that value added services, mobile and satellite services were essential for communicating with their customers and partners worldwide. In recent years, the E.U. has exerted significant pressures on Greece in order to ensure the establishment of the necessary regulations according to the relevant directives.

In April 1990, the government moved to a more liberal regime for the telecommunication market. They allowed new providers of moblile communications (private as well as public) and to set up Value Added Networks (VAN). OTE was excluded to provide these networks and services, but OTE maintained its sole right of voice telephony installation, operation, and development of the public network, while it is obliged to lease circuits and to allow third party access to its network (Skayannis, 1994).

5. Telematics for Health Care in Greek Pheripheral Regions

The first telematics service in health care project was introduced in Greece in 1988. After three years of experimenting it is right now embedded in the Greek national health care system. The Ministry of Health has paid for the installation and consultation. The telematics in health care project is offered by a hospital in Athens to 12 primary health care **centres** scattered all over the country. In this hospital a special Telemedicine centre has been established, which is the central node in the network. From this place, remote areas are connected by leased analogue lines and in some cases the normal packet switched data network.

The objectives of the programme are to provide support to remote physicians and in-job training opportunities for medical workers, i.e. permanent medical education. Advice in cases of consultancy is a possibility, but the emphasis lies on the primary health care, awareness, prevention and education. In this way, one may provide on a regular basis a specialist's opinion on patients with a chronic disease. The patients can be followed prospectively without being obliged to travel and visit the

hospitals' outpatient ward. Teleclinics have been set up in the following fields: lung-, heart- and liver diseases, and dietetic consultation. The network is also used for remote training activities, based a six-point voice conferencing capability. These training activities include distant education of doctors and nurses by specialists, regarding subjects of their own special interest and needs (Chatzipantazi, 1996). These services have resulted in improved medical supply in remote and/or isolated areas and have practically eliminated the scientific isolation of medical workers. The remote population have, as a consequence, more confidence in the health care services offered. Until the mid 1995, more than 1,800 cases, mostly X-rays images and ECGs, were handled with very positive results (Proukakis, 1995).

To investigate the new telematics in health care services and their preconditions, we have to use a systematic analytical evaluation framework in the set-up phase, but when the service is already implemented this scheme can also be useful in the monitoring phase. This framework is based on the Pentagon model (see Nijkamp et al., 1994).

The Pentagon model starts from the centre where the goal to improve the patient care is central (see Figure 2). The service should aim for the improvement of the quality of life. To focus on the patient and to serve them in an optimal way, one needs an organisation, restructure legal aspects, take care of health care budgets, efficiency and quality.

The Pentagon model covers all these aspects combining them into five critical elements:

- Hardware: the tangible (physical) investments.
- Software: the investment in knowledge.
- Orgware: the organisational structure.
- Finware: the financial aspects.
- Ecoware: the effects on the ecology.

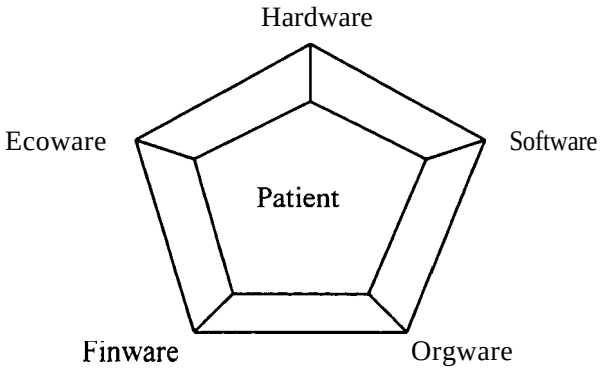

Figure 2. The Pentagonmodel.

The first critical success factor is the hardware. The developments in the computer industry are so fast that the lifespan of the newest equipment is extremely short. This also means that the limits of the computer technology are constantly changing. Because of the rapid developments, prices of computers are structurally falling and this gives the telematics provider more opportunities for the same money, or the same opportunities for less money. Concerning the equipment one should depreciate their cost in a very short time, say 5 years. This short depreciation time gives the opportunity to exploit recent technological developments, and to upgrade the service in time. The hardware part in tele-projects is hardly a problem. The current hardware is in principle able to provide the service to the satisfaction of the users. The installation of a double telephone line is essential, because simultaneous data and voice communication should be possible. The most important thing is that the hardware should be reliable, accurate and flexible enough to meet the varying needs.

In the communication sector much will depend on the speed of deregulation and in what kind of framework this sector will act in the near future. This will influence the services that can be provided throughout the telecommunication network. For the kind of service mentioned above, this is essentially point to point for text, signals and still image transmission.

The software for the computer has to be simple, and easy to learn. The telematics in health care software is very often easy to integrate with the normal computer software, like WINDOWS, OS/2 or UNIX. An advantage to use the existing software is that people who are familiar with computer software know at least one software program, and that speeds up the adoption phase of the new service. The knowledge comes from the use of stand-alone PCs and concerns mainly the use of word processing and data base management. The interconnection with other computers is often not available, but in some hospitals a HIS (Hospital Information System) is already in use, so that there is a base for the use of integrated networks. The HIS is very often used in the administration and financial departments only; this means that the health care provider is not familiar with computer networks, but only some departments of the hospital are. The lack of knowledge about the possibilities and limitations of computer software is a common problem.

The education of the students in medical informatics at the schools and universities is often very poor in Greece. Standards or any curricula are often absent, but the need for such standards is great because the quality of the different courses is very diverse. A post-graduate training is organized by some universities. In Greece an international post-graduate course in health informatics is organised by the Athens University School of Nursing. The quality of the post-graduates is also very diverse. The training of the staff already at work in the hospitals requires a lot of extra training, and the need for teachers with a health informatics background is considerable high. Because of the lack of teachers, computer technicians support the health care worker, but they lack the appropriate skills in the health care part (Hasman, 1995).

This is a very dangerous development because if the people in the hospital cannot deal with the system in a adequate way, the project has an increased risk of failing. In general it is to be said that the education and extra training will face some constraints in the near future, mainly because of the lack of adequate and qualified teachers.

Regarding the orgware, the first step is to look at which departments in the hospital are necessary for consulting the telematics in health service. When a project is set up, it is unlikely that the whole hospital is involved. If the scope of the services offered is widened to include practically every service possible, it is necessary in an early stage that all medical specialities are asked to provide support. The contacts with the providers of all of kind equipment or services have to be taken care of. The hardware, software, maintenance and technical support can be used by companies already under contract by the hospital. There is also a group of purchasers of the service. In Europe, the health departments are still financed by the NHS; so in the end it is probably them who will pay for the service. In many cases a close relationship with a computer or telecommunication company, which will hopefully participate in the cost of at least the equipment and can be appealed to for advice, can be very useful.

The influence of the patient in the organisation is not a necessary step in the organisation of the service, at least not in the early stages. Patient involvement is in a later stage of the project very important to evaluate how the service is experienced (Randall, 1995).

The question of finware, i.e. how to finance the project, is always a problem. The uncertainty in which direction, private and/or public, national and/or international, the services are heading makes it difficult to find financiers, and large funds are hardly available. Creative funding is very often a necessity; in various cases private and public institutions are involved in telemedicine for health care ranging from trusts to telecommunication companies, the E.U., local governments, own hospital funds and funds from the NHS. In the Greek context, the locations on the islands are not to be chosen randomly. The local government has to provide some financial means and the primary HCC should be very cooperative.

The use of telecommunication reduces the factor distance to almost zero, and because patients and medical personnel do not have to travel to a location, there is a time saving component as well. The patients have to travel to the primary HCC, which is normally nearer at hand than the tertiary HCC.

Less travelling time and distance will save travel expenses; this effect is greater if someone is accompanied and, of course, if the travel distance or travel time is large. The service is more beneficial when the distance from a primairy HCC to secondary and tertairy HCC is large.

When there is a fully developed telematics in health care network, it can reduce costs because we do not have to duplicate services, technologies and specialists in remote areas. In other words, with the same amount of money more services can be provided, and generally a better service towards the remote areas. Further cost reductions are possible when health care is provided locally in rural hospitals rather than in special HCCs. Small, rural hospitals often have less overhead costs due to the lack of special equipment, and they have lower personnel costs.

The environment where the services are offered is very important. The people involved in the projects should have positive feelings about the services. A good quality of life is then necessary. If this is satisfactory to all project partners, the next step can be taken. Not only the people directly involved, but also other actors in society will influence the outcome of the project. The projects cannot operate in isolation, if the efficiency and effectivity of the services towards the patients is to be improved. They have to be embedded in the sectoral, national and international legislation and institutions. If this is not possible, organisational, national and international legal and instutitional changes may be needed.

6. Some Caveats in Telematics for Health Care

Some final remarks are still in order. In conventional sectors of the industry, it is a well-known fact that standards increase companies' market opportunities and lower the cost of equipment and services to users. Another characteristic of a standard is that it should not be interpreted as a guideline or measure of performance, but as a well defined, precise, explicit and unambiguous set of rules. This kind of standards, if properly implemented and used, will give proper results.

This is also the case in the health care sector, but right now there are no standards in telematics in health care. The European market is fragmented because of the different standards used, i.e. in technology, organisation and responsibility etc. This makes it difficult to develop, buy or maintain new products, especially if the products have a short life-cycle. One uniform standard will reduce the cost of the health care information systems and open up the market. It is not only the costs of the service that is crucial, but also the possibility to exchange all information between every actor in the market is threatened without such standards. Unfortunately, little progress has been made until now, but the linkage of systems by standard interfaces has now been broadly recognised as a must (e.g., Open System Environment Standards).

Especially in Europe, where information (e.g. administrative patient information) crosses management boundaries and in many cases regional and national boundaries, agreement on structures and information content of messages is necessary (Laske, 1996).

Digital data protection is not in every country adequately taken care of; in Greece there is even no law on digital data protection, which makes it very hard to deal with protection of the patients' records. Most of the data is health related and in view of its sensitive nature special safeguards need to be taken to ensure data protection. In today's reality of multimedia, of integration between several systems, of proliferation of terminals and PCs, data protection is more complex and difficult to enforce. Security is an essential ingredient in the concept of data protection. An interesting problem lies in the intangible nature of electronically generated data; it is essential that the files for transmission are authenticated. e.g. through electronic signature which would subsequently allow for the detection of any alterations. In this way there is evidence of what was actually sent and received which may be vital when trying to establish liability, for example, in cases of diagnosis made from a distance on the basis of transmitted documents (Laske, 1996).The introduction of information technology in the health care sector should not diminish the health care professionel's liability. However, the extent to which a user is liable depends on the extent of the man-machine interaction. The greater the user's share in a process, the greater his/her responsibility in its outcome. With the decrease of the human decision factor, it may come to a shift in the potential liabilities of the user. This means that the developer of information

technology should be aware of the difficulties he faces, and that he faces more responsibility than before in a consultation process. It is thus essential that the legal issues which arise in medical informatics and telematics should be addressed along side with technological development rather than in a retroactive way. Technological advance must be accompanied by appropriate legal considerations, since on the one hand technology must take into account some of the basic legal principles, and on the other hand the law must adapt to the technical realities. In other words, this is a two-way adaption process from both the technical and legal points of view and both players should be encouraged to work together.

7. Strategic Conclusions

Telematics in health care comprises both telemedicine and telehealth. Telemedicine is more technologically driven and aims at the actual counseling and curing of the patient. Telehealth has more primary health care elements; the emphasis is more on education of medical personnel and on prevention, and hence it is less technologically driven. The strong points of telematics in health care are: less travel time of patient and medical personnel; reduced medical isolation; less overhead costs in the primary health care centres; the integration of medical health care records and an availability of that record 'all over the world'.

These new developments may help to overcome the current problems in health care sector in peripheral areas. In addition, the rising costs in health care -in absolute as well as in percentage of Gross National Product- creates a financial problem. Governments have funded in many cases the lack of resources from general tax payments, but with problems of balancing the budget, this cannot go on forever. Telematics in health care may reduce the costs and offer new opportunities for residents in peripheral areas. The Greek situation is a good illustration of such new potentials. It may add to general welfare and well-being in isolated regions, which has the additional advantage that it may stop the structural trend to migrate from such areas to large population centres. In this perspective, the use of telematics in the medical sector forms a convincing argument in favour of the adoption of modem network technologies for regional development.

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