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Special Contribution

Research and Development Programmes of The European Union in Health Telematics: A Leverage for Convergence

Health care expenditures account for between 6 and 11% of the Gross Domestic Products of Member States. European citizens have rising expectations regarding quality and access to services, whilst governments are keen to limit the strain on the public purse. Within Member States, investments in information and communication technologies (ICT) are already being made, which offer the potential to control costs and provide better and more accessible services to patients. Over the last twenty years, the European health care sector has purchased systems to ease the handling and acquisition of information. These systems have not always been compatible; research and development at a European and Member State level have increased their usefulness. However, whilst the effective and timely exchange of patient-related information is at the heart of modern health care, less than 2% of the health care budget is spent on ICT -the corresponding figure for the manufacturing sector is 4%, for finance it approaches 10%. Competing claims for health care expenditure, concerns about patient confidentiality and the lack of user- friendly systems have slowed development. There is now a global trend to make the health care sector an application domain of the emerging information society as the Europeans put it, or of the information superhighway as the Americans would have it. In other words, health care should benefit from the opportunities of cyberspace. This means that the workstations and information systems developed over decades should be interconnected to allow free and rapid flow of necessary data and information to authorised persons for whom this information is essential for the decisions they must make. They may be medical professionals, managers or citizens, but at the end of the day, the patient should benefit. The benefits of the information society should also ease the daily lives of the professionals by allowing them to consult their peers, to have easy access to remote databases, libraries of guidelines for "best clinical practice", training facilities, computer-assisted cooperative work, "telepresence" and eventually virtual reality at their fingertips and at their desktop.

It means that we are moving from an age of research and development in health informatics to an age of health telematics. If the change is to be successful we must develop and stick to a strategy that is based on modularity and interoperability. Systems integration and development, and provision of value-added services will become key issues.

AIM and Health Telematics

It is in this changing environment that the European Union has supported research and development in the area of Health Care. A number of programmes have supported the development. ESPRIT and RACE are programmes that have developed information and communication technologies (also for health applications) and the BIOMED programme has in particular supported the customisation of software for biomedical diagnostic and therapeutic equipment. However, a special programme was prepared in the latter half of the 1980s; AIM (Advanced Informatics in Medicine) was the name. In 1988 the Council of Research Ministers decided to launch a two-year feasibility phase. Around 40 projects shared around 20 million ECU in cost-shared projects, each getting 50% of the total cost of the project. The idea was, and still is, that each project was run by a consortium with partners from more than one country; that both industry, research and health care interests should be represented. The programme was sufficiently successful for the European Parliament and the Council of Ministers to launch

another phase of AIM from 1990 to 1994. The justification was provided by experts who prepared a document looking into the future: "Perspectives of Information Processing in Medical Applications" [1]. Not only was the time frame expanded to four years, also the funds were raised to around 110 million ECU. Formally, this became part of a Research and Technological Development (RTD) programme of TELEMATICS, addressing a number of application areas. In retrospect, the significant change was the emphasis on interconnectivity as a result of the advent of networks and services in the programme. However, this phase with another 40 projects and a dozen concerted actions, etc. has, nevertheless, been dominated by informatics.

In the mean time, regional services and telemedicine have become visible. The experimental integration and validation of systems and services, the development of application interfaces to common platforms and the open systems architecture were highlighted when a supplementary second call in 1993 invited on-going projects to take this avenue. A third phase will be launched in the autumn of 1994 to 1998, this time as a very integrated part of a multisectoral Telematics programme with emphasis on generic multimedia aspects and development of application-specific services led by user needs and neither by pure technological nor by pure research approaches.

What has been Achieved by the Programme and by Europe?

1. AIM and Health Telematics

Already during the 1988-90 feasibility phase of AIM, a number of very concrete developments were achieved and certain projects succeeded in reaching the marketplace [2]. The domains ranged from conceptual modelling of systems to medical coding and classification; from systems to cater for chronically ill patients to knowledge-based systems; from medical imaging projects and laboratory reporting systems to data protection and confidentiality. The latter topic had its own publication [3]. However, the best single outcome was perhaps the emergence of a European identity in a forum of researchers, industrialists and health care providers. This platform with a sound core of persons from the European Federation of Medical Informatics (EFMI) extended beyond the Federation itself by involving industrialists, and reached the decision makers. Also, the fostering of standardisation incentives leading to the formation of CEN TC251, the European Standardisation Committee for Medical Informatics was a step in the right direction for Europeans in demand of open systems. This fortunate development has been further strengthened over the years. The programme participants have realised the need for global collaboration both on technical developments and on standardisation, and ties have been established with researchers, developers and industrialists, also from the USA and Japan, and from the WHO and elsewhere. An important event was the meeting in 1992 in Geneva on global standardisation in health informatics [4].

2. Ongoing Investments in Information and Communication Technology

A number of hospitals are in the process of expanding their services to surrounding physicians and other hospitals, using telematic solutions, but this approach is not yet commonplace. With assistance from the European Union, a number of centres of excellence are using sophisticated broadband technology to keep their specialist services at the leading edge. Modelling of planned surgical interventions, exchange of medical images, provision of immediate second opinions are just some of the possibilities that this technology makes possible.

Telemedicine is providing better access to care and treatment in areas of sparse populations, and for chronic patients with restricted access to services. Such services are now offered to patients, particularly in Spain, Greece, Scandinavia, Italy and France.

In France, Minitel supports services that run to five pages in the directory. More than 75% of GPs in The Netherlands and the UK own computers, but in France and Germany this is less than 40%. GPs depend on good links with hospitals and health care administrators, but so far there have been patchy investments in networks for this purpose. Italy, The Netherlands and the UK all have major reform programmes underway and are relying on ICT solutions to make them fully operational. Networks provide automated booking and discharge services, facilitate financial transactions, and avoid duplication of basic administrative information. The UK and Denmark are implementing plans for a national health care network. In Germany, more than 75% of the population now has a chip card, helping them gain access to their health care entitlements. The information transmitted is increasingly structured in various forms of medical records. The use of such medical records is extremely high amongst Dutch general practitioners but the overall zeal to engage independently in this topic is somewhat frightening. There is, however, an abundant number of approaches to this key item with respect to coding and classification nomenclature, syntax and semantics. Very often EDIFACT is at the core of the systems promoted.

What is still to be Achieved?

Although Health Telematics has been successful in creating a European platform, the key challenge now is to get the programme to have an impact in Europe on investment and implementation, by showing feasible solutions to be used on a wider scale. It has been stated in the midterm report on the programme [5] that penetration of the market might not succeed because of the peculiarities of the market. However, it is not just the problem of the European Union Health Telematics programme; it is a challenge common to anyone investing in systems and services within the health sector.

1. A common Infrastructure

A consistent way to address the concept of a Health Care Information Infrastructure (HCII) will be provided by a unifying concept to harmonise the progressive establishment and use of information and communication systems and services in health care.

The concept of a HCII should provide a common perception of objectives and ensure the interoperability of results. It should also allow the generalisation of outcomes to be used in other sectors. In this way, the results of this area will not only contribute to develop systems and services meeting the health care needs, but they will also be valuable inputs to the establishment of a generic European "infostructure" for public services. The HCII should be composed of focused health care telematics applications and common horizontal layers, ensuring their interoperability.

The concept is based on three main poles:

a. The integration of health care information systems, allowing different applications, tailored to specific or local needs, to interact. To achieve this, the future efforts must focus on the development and acceptance of:
   - Health care application integration platforms,
   - The medical record, message contents and other information structures, and
   - Health care added-value telematic services.
b. Development, testing and validation of pilot applications such as:
   - Hospital information systems (HIS),
   - Departmental and ward information systems,
   - General practitioners and community care systems,
   - Home care,
   - Health care management systems, and
   - Metropolitan health care management and trans-European systems.
c. Enabling technologies and systems that are tailored to be properly applied in the health care sector as part of integrated pilot applications meeting clearly defined functional and service needs:
   - Workstations,
   - Cards,
   - Images,
   - Decision-support systems,
   - Virtual reality, and
   - Telemedicine.

2. Geographic Integration

Telematics systems for Public Health and Service Management

These operate at the national and central levels (region, province), intermediate level (districts) and local level (cities) and provide information on the mortality rate of the population, on personal, environmental and occupational risk factors, drug consumption, etc. The objective is to have a clear picture of the health status of the population and to plan and implement the national health care policy and to evaluate the services and resources required. These systems are targeted at governmental institutions, both central and regional, at universities and epidemiological centres. The link between the national systems should be ensured by the trans-European networks.

Telematic systems for the care of the individual patient

These operate on three interconnected levels: home-care, community care, and institutional care (the hospital). The systems and services for health care provision (patient care) are required to assist the patient with home care, primary care (community) and institutional care (hospital).

The hospital functions, therefore, support community care and these together support home care. Thus, these functional levels must be interconnected in such a way that the critical data relative to the patient can be exchanged amongst authorised professionals. The territorial integration will be provided by the Local Community Network.

3. Open Systems

The emergence of Open Systems is essential for the coordination of efforts at the community level. Identification and promotion of standards are crucial in this context. Open Systems support standard interfaces, meaning that they freely interact through the use of communication and messaging protocols accepted by industry. Standard interfaces render the systems portable and interoperable.

Open Systems and a common architecture for the health care telematics systems, integrating from public health systems to institutional, community and home-care systems, will have an accelerating effect on the full exploitation of the possibilities of the local and Transnational European Network and on the related market.

4. How can these challenges be met?

In summary, what has been described can be stated as the requirements for the immediate future:

- Close coordination with regional, national and European programmes and projects to reach critical mass that will convince vendors and service providers.
- Involvement of the researchers and their National and International Societies in practical solutions.
- User involvement.
- Maximising the generic content of the developments.
- Encouraging non-proprietary open systems architecture solutions.
- Establishing test sites, which are ready to host integrated systems and services for validation pilots by having the networking facilities in place.
- Effective dissemination of "best practice" and creation of visibility.
- To this list must be added man-machine interfaces, legal and regulatory issue handling, safety, user acceptance, training, international cooperation, and more flexible ways of obtaining investment support and incentives not least for small and medium sized enterprises.

The White Paper on European Growth, Competitiveness and Employment

The so-called White Paper on European Growth, Competitiveness and Employment implies a network of networks: Member States are investing in networks at a hospital, regional and national level. At the European level, value can be added by ensuring that systems work together and that duplication of investment and development is minimised. If this can be achieved, and both telecommunication operators and the IT industry are ready to invest, the routine transfer of information becomes possible. Universal access to value added services - today only available in a few areas - not only by health care professionals, but also by citizens and patients will become possible. Patients covered in one Member State can become confident of receiving services in a second. Time-critical information about epidemics and other public-health information can become available across boundaries. Matching of donors for transplants across Europe can be speeded up. The results of the latest results from European research into cancer and the other major health scourges can be quickly transferred into improved health for European citizens. This is the basis for the recent suggestion to the Commission by a group of IT and Telecommunications Chief Executives, who had been charged with advising Member States and the Commission on investments that will help to bring about an Information Society in Europe [6].

Conclusion: Health Telematics during 1994-1998

The fourth Framework Programme for RTD in 1994-98 has been adopted by the European Commission. It allows for a specific programme on Telematics in a number of areas, including health care. The content of this programme will now be decided. Overall, it is characterised by a demand to obtain the maximal degree of generic solutions across the areas; a demand that is accompanied by an emphasis on certain horizontal actions. Among the vertical domains of this 840 MECU programme is health telematics with a suggested 135 MECU. The activities of that sub-programme reflect the requirements described above and can be summarised as follows:

1. *Multimedia medical records*
   The aim is to bring existing and emerging electronic health care records and subsets of them to a point where they can be communicated and combined, respecting requirements for confidentiality. It should accommodate multimedia and contribute to making systems interoperable and will facilitate the convergence of national and international efforts.
2. *Increasing Resources and Improving Health Care Management*
   To improve clinical effectiveness, continuity and quality of care and control of costs. The area is concerned with the full range of health professions and health service management.
3. *Telemedicine and new Telematics Services*
   This area takes specific advantage of the increasing capacity and facilities on fixed and mobile communication networks to provide everyone with proper health care, irrespective of location and to permit consultation between different points of care.
4. *Information Services for Citizens and Health Care Workers*
   In accordance with the treaty and the policies of the European Union, the emphasis is on prevention and identification of diseases and protection of the citizens.
5. *Preparatory and Supportive Measures*
   A number of preparatory and supportive measures will be supporting the research deemed necessary in the above fields.
6. *International Collaboration*
   It should be emphasized that the programme presumably will allow partners from a number of countries outside the European Union to participate and share intellectual property rights. In addition, a certain section of the Framework Programme allows a financial contribution to such partners.

Programme Conference

The transition from the third to the

fourth Framework Programme will be marked by a user and policy oriented health telematics conference in Lisbon, December 1994, open to all interested parties.

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