Telemedicine and Information Society
Research Division

The e-Health Development Framework in Spain

Co-ordinator: **José Luis Monteagudo Peña**

Instituto de Salud Carlos III
Ministerio de Sanidad y Consumo

Unidad Coordinación
de Informática Sanitaria

TELEMEDICINE AND INFORMATION SOCIETY
RESEARCH DIVISION
CARLOS III INSTITUTE OF HEALTH (*INSTITUTO DE SALUD CARLOS III*)

Management
José Luis Monteagudo

Co-ordination
Pilar García Santesmases

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Participants

Study Director

José Luis Monteagudo
Carlos III Institute of Health

Co-ordinating Team

Manuel Carrasco Mallén   Diego Esteban   Juan Reig Redondo   Ignacio Riesgo
Carlos III Institute of Health   Heidrick &Struggles   Consultores Euroamericanos Asoc.   Arthur
Andersen

Panel of Experts

Barcelona, 19 September 2000

Antoni Esteve	Manager, Laboratorios Dr. Esteve
John A. Keeler	Director. General de Sanofi-Synthelabo
José María Taboada	Manager, Sanofi-Synthelabo
Joan Morell	Medical Manager, Sanofi-Synthelabo
José Terol	Group Palex
Carlos Pascual	Senior Vice President, Instrumentation Laboratory
Javier Uriarte	Health Manager, Hewlett Packard
Ramón Massaguer	Secretary-General, Dept. of Health & Social Security (Departament Sanitat I Seguretat Social)
Josep Prat	Director, Catalonia n Health Service (Servei Català de la Salut)
Joan Grau	General Manager, Hospital Clinic
Carlos Nueno	Founding Member, Centro Médico Virtual
Jorge Rivera	General Manager, Winterthur Salud
Ramón Carranza	General Manager, L'Aliança

Seville, 24 October 2000

Nicolás Pérez de la Blanca	University of Granada
Natalia Palomino	El Sendero Caymasa
Carlos Celaya	Ericsson Applications Marketing Centre
Jose Joaquim Lupi	General Administrator, My study.com
Bernard Clements	Head of Unit, IPTS. European Commission
Javier Carnicero	Director-General, Primary Care. Navarre
Ignacio Ayerdi	General Manager, Philips Ibérica
Joaquim Camprubí	Manager of Institutional Relations, MSD
Carlos Hermoso de Mesa	Medical Manager, Socecaser S.A. (Caser Group)
Juan Peña	Managing Director, Sandetel
Juan Manuel Rosauro	Manager, Supercable
Jesús Macías	General Manager, Sadiel S.A.
Pedro Márquez	Managing Director, Círculo Blanco
Pilar Santesmases	Head of Innovation and Technology Transfer, Carlos III Institute of Health (ISCIII)
Javier Clavero	Confederation of Andalusian Industries (Conf. de Empresarios de Andalucía)
Francisco Morillo	Manager, SMS

Madrid, 26 October 2000

Javier Murillo	General Manager, Adeslas
Julián Ruiz Ferranz	Manager, Medical Division, Sanitas
Alfredo Macho Fernández	General Manager, Gregorio Marañón Hospital
Joaquín Esperalba	Manager, San Pablo Hospital, Barcelona
Manuel Martínez	General Manager, Laboratories Láncer, S.A.
Joaquín García Guajardo	Manager, Haya Negocios Tecnológicos
Marcelo Sosa	e-health Consultant
Rafael Lamas Cedrón	Technical Manager, Airtel Móvil Foundation
José Antonio Martín	General Manager, Salutia.com Spain
Fernando Largo	General Manager, Ibérica de Diagnóstico y Cirugía
Joaquim Esperalba	General Manager, Santa Creu I Sant Pau Hospital
José Soto Bonel	Manager, San Carlos Clinical Hospital
Ignacio Para Rodríguez	Health Manager, Indra Ssi, S.A.
José Juan Moratilla	Production Manger, SMS
Juan José Equiza	General Manager, San Carlos Clinical Hospital
Pilar Santesmases	Head of Innovation and Technology Transfer, ISCIII
Luciano Saez	Head of Healthcare Informatics Co-ordination Unit, ISCIII

INTRODUCTION

The phenomenon that has come to be known as globalisation (or mondialisation in French) seems to be dictating the first steps in the dawning of this new century. Albeit nothing new historically speaking, it is a phenomenon that has recently displayed certain traits that render it somehow different, namely, a physical space that expands in geographical terms and yet contracts time, an exponential rise in the capacity to exchange goods and services and, above all, a greater interdependence between individuals, organisations and technologies.

Intrinsic to the explosion and singularity of this phenomenon is the impetus it has received from new information technologies. Of late, new tools such as the Internet, cell phones and communication media networks, have made for interconnection on a scale that has never before existed between individuals, and between these and all manner of bodies and institutions. This, in turn, has led to ever easier access to information and training and to a far swifter exchange of data and ideas.

The challenge, as much of our time as of times to come, is to ensure that these new possibilities (which new technologies make available to us) are disseminated and distributed as widely as possible, serve to improve the quality of life and well-being of the general public and, lastly, help reduce imbalances and inequalities in society while favouring the development and growth of the economy. In brief it is a, matter of advancing, not merely towards a better interconnected but rather towards a better integrated world.

From a European Union perspective, Member States have launched an initiative dubbed «e-Europe»,with the ambitious aim of placing Europe at the forefront of the new economy. This political impetus is embodied in the June 2000 Action Plan, which identifies eleven key lines of action, including one specifically targeting «e-health».

Against this backdrop, the Carlos III Institute of Health (Instituto de Salud Carlos II – ISCIII), the body tasked with furnishing scientific and technical support to Spain's National Health System, has seen fit to issue this Status Report, intended to provide an overview of the present situation of «e-health» in Spain and any possible actions that would serve to boost the development of same, both in a purely domestic and in a European cross-border setting.

In the drawing-up of this study the contribution of a group of prestigious professionals has been essential, professionals who, in different institutions and centres across the country, experience this important scientific, health and social transformation on a day-to-day basis. Their opinions, comments, ideas and suggestions, as collected from panels of experts, have been fundamental in drafting this document; indeed, special mention must be made of the job of co-ordination done

by Dr. José Luis Monteagudo, Head of the Telemedicine and Information Society Research Division at the Carlos III Institute of Health.

Network characteristics, end-user demands and needs, new developments promoted and demanded by healthcare organisations, product and market segmentation, development of links between the public and private sectors, new applications in the field of tele-health, and new expert systems in mobile telephony, are just some of the topics of debate covered below.

May this study therefore act as a starting point, so that by stint of ongoing analysis, reflection and criticism, we are then able to advance together and find proposals that will guide and enable us to respond successfully to the new and stimulating challenges posed by «e-health».

Antonio Campos Muñoz
Director, Carlos III Institute of Health

EXECUTIVE SUMMARY

- The transition towards the Information Society is a challenge now facing developed countries. The twin explosions seen in Internet use and mobile communications are a sign of the magnitude of the change that is currently under way.

- The gradual integration into the industrialised world of what has come to be called the «new economy» is giving rise to profound changes in the processes of organisation and management, and is affecting all production and services sectors, including Health.

- In June 2000, the European Council of Feira approved an Action Plan for «*e-Europe*», ultimately aimed at ensuring that European citizens as a whole enjoyed the benefits of the information Society, that Europe took its place in the vanguard of the new Economy, and that the possibilities of Internet were fully exploited. Within the context of this initiative, 11 areas of action were identified and grouped under 3 main objectives, with the field of «**Health On-line**» being included under objective 3 and introduced as follows:

- *«The prime objective of this action is to develop an infrastructure of user-friendly, validated and interoperable systems for health education, disease prevention and medical care» in order that Member States can «move towards the implementation of the infrastructure in a coherent way which enables them to use technology to achieve their health objectives».*

- To this end, four areas of activity were established, namely:

  - identification and dissemination of best practices and establishment of benchmarking criteria;
  - development of criteria to assess the quality and authenticity of health-related information addressed to citizens relying on the Internet;
  - setting-up of health-data and –technology evaluation networks; and,
  - actions in the areas of data protection and legal criteria.

- This document sets out to identify the strategic lines, framework for action and *status quo*. Moreover, it seeks to pinpoint recommendations designed to foster the development of e-health in this country and meet any potential demand in a European context arising from an institutional commitment to lend impetus to the Information Society in Health, in the shape of the «Strategic Initiative for the

Development of the Information Society» (*Iniciativa estratégica para el Desarrollo de Sociedad de la Información* - Info XXI) and the National Research, Development and Innovation Plan (2000-2003).

- To analyse the e-health phenomenon and attempt to reflect the situation in real time, all literature, documents and prospective studies, along with reports of the type that continually appear in newspapers or specialised journals were subjected to analysis.

- Essential input for the study was obtained from contributions made by members of the Co-ordinating Team and the three Panels of Experts that met in Barcelona, Seville and Madrid
  in the last quarter of 2000.

- When speaking of e-health, we are referring to the use of digital multimedia data network technologies (Internet) for health purposes**.** Internet affords the alternative of a low-cost technology infrastructure for a common world-wide platform upon which a wide variety of applications can be run, in tandem with transactions connected with patient management and general administration of services.

- e-health is characterised by a range of applications that tend to be classified in five categories: information services, e-commerce, connectivity, on-line applications, and medical or telemedicine applications.

- Reliance on basic e-mail and web-browsing services for accessing information and bibliographic databases, represents the brunt of traditional Internet use in the healthcare field and the core around which the greatest volume of initiatives geared to on-line information services and portals have been developed

- The current wave is protagonised, above all, by the impetus received from e-commerce and the development of corporate connectivity platforms (intra-nets, extra-nets, Internet).

- Migration to on-line applications appears to be the natural trend in the immediate future for applications such as electronic health record, with smart cards being used as a security device and tool to integrate clinical practice with management across the system. Lastly, although medical-service (telemedicine) support applications offer greatest added value in health terms, they are nevertheless more complex to implement, and as a result may spread more slowly.

- Among the principal foreseeable elements and factors, stress should be laid on the characteristics of the health sector in general, and on the major e-health user groups in particular, viz., consumers (general public), patients, professionals and healthcare organisations.

- On reviewing these groups, account was taken of their respective dimensions, degree of Internet penetration, demands, applications, needs, and present and future expectations.

- The health sector has certain features which differentiate it from other sectors and must be borne in mind when drawing up strategies to promote and foster the introduction of these new technologies. Health is one of the most information-intensive sectors; so much so indeed, that it could be singled out as the prototype of a «knowledge-based industry». Other factors to be borne in mind are that it is a sector which: is subjected to a high degree of regulation; has a management structure that is essentially public in nature; is highly fragmented; is rendered fairly cost-inelastic by indirect payment; and is heavily influenced by information.

- Analysis of barriers and driving forces shows that a given element may act as a hindrance in one context and as an aid in another. Logically, views tend to change according to the actor involved.

- In the case of driving forces, one of the main reasons for application of information technologies by healthcare organisations, public and private, lies in the ensuing improvement to management efficiency.

- A further favourable factor is the development of e-commerce and the new economy, its driving force being linked to the widespread dissemination given by technological agents and to consumers' growing experience in other sectors, such as banking.

- One of the courses of action having greatest overall driving force is a major political initiative, national or regional, of the type launched in the European Union.

- A series of factors can be identified which act as brakes, slowing the development of e-health. Among these are matters such as acceptability to health professionals and problems of infrastructures, training in the use of new technologies, interoperability of clinical information systems, lack of protocols in telematic procedures, the need to alter and remodel the administrative and

organisational structures of existing health institutions, to say nothing of the legal aspects and the question of funding.

- Internet penetration in Spain lags behind that of other European countries. However, the speed of spread is such that expectations for the future are promising, particularly as regards mobile-phone and Internet use among the younger generation. Even so, present access rates are far higher than the European average.

- There is widespread concern about guaranteeing web-content quality in order to protect public health and prevent undesirable practices.

- Taken together, the above lag in general Internet penetration and the low level of development of Information and Communications Technologies in Health historically, call for a reaction to this situation, to avoid an irreversible delay vis-à-vis the future should the present pace (one set with signs of visible urgency by the EU Council on introducing the e-Europe initiative) fail to be maintained.

- Figuring among the principal core issues identified as being linked to e-health development in Spain, are the following:

    a) alignment with the strategic and development plans of the different health systems
    b) acceptability to professionals
    c) quality of Internet content
    d) data security and confidentiality
    e) legal and administrative framework
    f) funding; sustainable business models
    g) Internet access.
    h) technological aspects

- One inference to be drawn from the analysis contained in the report is that a need exists for a framework of action in line with the political impetus coming from domestic initiatives such as Info XXI and the National Research, Development and Innovation (R,D&I) Plan, as well as e-Europe and initiatives launched as part of the EU's Information Society Technologies (IST) Research Programme.

- Effective implementation of e-health in a setting as complex as that of healthcare requires vision, commitment, leadership at the highest levels and a solid well-structured agenda, underpinned by a team of active and capable participants.

- There are risks of our falling behind technologically and using resources inefficiently, developments which would decisively determine the future of the health sector in this country in the next decade, if no move is made towards adopting an e-health strategy.

- Effective implementation of the e-health strategy calls for a major effort in terms of infrastructures and statutory regulation. In this context, the role of the Health Authorities, basically the Ministry of Health & Consumer Affairs, in collaboration with the various Autonomous Regions and private sector, is fundamental.

- It would be idle to expect an e-health strategy -which basically means intercommunicability and interoperability of the system-to be introduced in the health sector without leadership coming from the health authorities at the very highest level and without it being approached from the perspective of state policy, aimed at dispelling uncertainties and aligning efforts.

- It would be equally idle to expect that a strategy of this scope could be implemented by a set of isolated and fragmented service providers, without there being a dynamic framework from within the health system itself to give impetus to the process.

- The relevance of this issue leads one to think of the suitability of aligning efforts and so bringing together the various players involved in something that could termed a «Sector Agreement » or «common interest platform».

- The action-policy model implies making full use of the available R&D results yielded by the National Plan, the European Programmes and other sources. Crucial to all this is the function of «Health-related Information Society Research» which enables strategic decision-making elements to be obtained.

- The process takes place within a conceptual impetus and a financial framework appropriate to the effort required, taking due account of the fundamental role of the various players, i.e., consumers, professionals and managers.

- Under the proposed model, the actions suggested are concentrated around the following pivotal areas:

- general measures
- research and development activities
- training activities
- support activities for innovation and interface between the public and private sectors.

- The lines of action envisaged incorporate the demands and needs detected in the study in respect of users, professionals, technology companies, e-health operators and enterprises, and healthcare providers.

- The incorporation of the Internet into the health world (e-health) is seen as a force for change that will enhance the public's quality of life, something that is going to favour the development of tools targeted at meeting this demand in areas such as research, management, planning, information, prevention and promotion, or in diagnosis and treatment. The challenge resides in technology's being able to furnish the basis upon which genuinely useful applications can be implemented. In this respect, it is of the utmost importance that health-system-related research and technology transfer activities take place in an environment in which there is collaboration between all the various agents involved.

ACKNOWLEDGEMENTS

INTRODUCTION

1. General

New technologies are penetrating modern-day society, changing the way in which people communicate, disseminate and access information, do business, study, work or even seek entertainment. Furthermore, the speed of technological change is already surpassing forecasts of just a few years ago. The explosion in the Internet and in mobile communications is a sign of the magnitude of the evolution that is under way due, not only to the very nature of the new applications which are emerging, but basically also to the extension of the scope of this change to all fields of activity, and, above all, to the fact that it is involving citizens the world over.

health is one of the most information-intensive sectors; so much so in fact that it could be singled out as a prototype of «knowledge-based industry»

As is happening in other fields, the Internet is becoming ever more present in the field of health. This should come as no surprise, seeing as health is one of the most information-intensive sectors; so much so in fact that it could be singled out as a prototype of «knowledge-based industry». Clinical practice turns on data, information and knowledge. For instance, it is estimated that a general practitioner devotes close on half his time to information-handling tasks and has to read 19 scientific papers, 365 days a year just to keep his knowledge up to date [1]. Indeed, the Internet is becoming the greatest source of health information for professionals and patients alike. Moreover, a whole host of medical and healthcare applications initiatives are appearing, which, apart from providing information services, allow for the possibility of consulting medical practitioners, a second opinion, patient-support groups, telemedicine services and a wide range of possibilities that are beginning to be a practical reality. All the evidence supports the view that in the immediate future the development of infrastructures for corporate digital communications networks and generalised Internet access will facilitate the flow of information among all the various actors; and, in turn, use of electronic clinical histories in a secure environment will enhance the quality of service and ensure the public of more efficient and more convenient management. The thrust of initiatives, such as e-Europe, reflects the political resolve of the European Union and its Member States, including Spain, to see that these possibilities become a reality in a matter of a few years.

in the immediate future, the development of infrastructures for corporate digital communications networks and generalised Internet access will facilitate the flow of information among all the various actors

2. Objective and scope

This document reviews the situation and the factors influencing the development of Health On-line (e-health) in Spain, with the aim of identifying strategic elements and action guidelines in research, development and innovation within the framework of the European initiative (e-Europe), while taking into account the overall evolution of the Information Society and the expectations of the national agents involved.

3. Underlying reasons

The driving forces behind Internet use in Health are very powerful and come from outside the sector itself. The changes being wrought by information and telecommunications technologies are different in nature, more profound and wider in scope than those due to any other technology in medical practice to date. Added to this factor for change are a combination of other economic and social policy factors that are acting on health to bring about new management and organisation models in which the Internet constitutes an essential technological element for the support of such new structures.

The political impetus emanating from the e-Europe initiative [2] includes a vision of action in the health area, along the lines of what has come to be called «Health On-line»

The political impetus emanating from the e-Europe initiative [2] includes a vision of action in the health area, along the lines of what has come to be called «Health On-line». The proposed actions make up a policy timetable scheduled for imminent implementation by Member States, with results being sought in the immediate short term. In the years to come, a large proportion of research and development priorities will be determined by e-Europe objectives. Hence, the importance and the urgency of identifying strategies and practical lines of action from the standpoint of Spain's national reality.

In this context, the «Strategic Initiative for the Development of the Information Society» (Iniciativa estratégica para el Desarrollo de Sociedad de la Información - Info XXI), approved by the Government in December 1999, assumes relevance, as do actions linked to health technology and telemedicine included in the National Research, Development and Innovation Programme (2000-2003) run by the Carlos III Institute of Health.

These are fast-changing times, with a multitude of initiatives taking place under the banner of e-health, both at an international and at a national level. Indeed, the tail-end of the year 2000 witnessed important changes in corporate technology markets in general, and in the so-called health-related sector in particular.

what is the foreseeable impact of the Internet in a health setting?; what applications are emerging and which of these, if any, will become consolidated?; what factors make for change and that are the issues that will arise and determine the trend and pace of such change?

Faced with a situation of this nature, it would seem pertinent to pose questions such as: what is the foreseeable impact of the Internet in a health setting?; what applications are emerging and which of these, if any, will become consolidated?; what factors make for change and what are the issues that will arise and determine the trend and pace of such change?; what lines of strategic action are taking shape?; how are efforts to be aligned in a national and European context?; what role should R&D play?; and what type of training, awareness-raising and dissemination measures are called for?

4. Input and drafting

The preparation and drawing-up of this report has been the result of a genuinely collaborative effort, with the invaluable contribution of a large national group of experts, who gave their opinions and the benefit of knowledge culled from the different agents and sectors involved: health professionals, hospital managers, senior executives in charge of health services, health insurance companies, the pharmaceutical sector, the telecommunications sector, electromedicine firms, emerging companies in the new economy, the research and university world and Internet health specialists. A simple glance at the list of participants will suffice to indicate the sheer breadth and the calibre of this contribution of strategic experience and vision gained in the field.

the preparation of this report is the result of collaboration by national panels of experts. The task of organising these panels was undertaken by a Co-ordination Group, which acted as the focal point for discussion, duly generating the conceptual bases and identifying strategic elements

These experts were able to make their contribution by sitting on three panels that met in Barcelona, Seville and Madrid from September to October 2000. The task of organising these panels was undertaken by members of the Co-ordination Group, which acted as the focal point for discussion, duly generating the conceptual bases and identifying strategic elements. This contribution was essential to the performance of the study.

Numerous documentary sources were consulted for the purpose of drawing up this report. In view of the dynamic of the Internet phenomenon in relation to health, data obtained from scientific papers, official reports and reference books were supplemented with information that continued to appear in specialised periodicals or journals, in the conviction that, even while the report was in the process of being drafted, new e-health initiatives, information or data proceeding from the scientific or corporate world, healthcare providers or the different public authorities would be coming onto the market. The Net itself served as a basic source of information and was used intensively.

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The report naturally incorporates many elements arising from discussions and exchanges of opinions held with other colleagues during recent years in committees and working groups connected with the European Union's Framework R&D Programme and the National RD&I Plan.

5. Layout

The reflection and debates that have served as the basis for this document, have addressed three main aspects: firstly, analysis of the situation, the different driving forces and existing barriers; secondly, the various aspects, elements and needs to be dealt with when it comes to developing an e-health strategy; and, lastly, definition of the lines of action and recommendations within the framework of R&D, innovation and technology transfer.

The Introduction sets out the objectives and scope of the report along with the reasons which led to its publication and a brief outline of the contents.

This is followed by a description of e-health and its field of application, commencing with a series of clarifications as regards terminology and an explanation of the scope of e-health-specific applications.

The next part concentrates on the European context and on «Health On-line» actions envisaged under the e-Europe initiative, and indeed brings to an end the first major section devoted to introducing the frame of reference.

The following head sets out to review the «e-health development scenario in Spain», and amounts to an overview of the health sector and the characteristics of the major e-health user groups, including consumers (the general public), patients, professionals and institutions.

The results of the situation analysis are then presented, listing the factors which promote or hinder the development of e-health in Spain, and which were identified in the study essentially on the basis of the contributions from the panels of experts. Complementing this is a discussion with a breakdown by user category.

Following the situation analysis, the issue of devising an e-health action strategy is then tackled. To this end, a status report is presented, along with a view of the role of e-health in the prevailing health scene, together with prospects for progress and the context for development. The last part of this section identifies key core issues and describes these in some detail.

Following the situation analysis, the issue of devising an e-Health action strategy is then tackled

The final section, which concludes the entire report, seeks to draw up a framework for action from the perspective of using any R&D, Training, or Innovation and Technology Transfer instruments that are in line with e-Europe's «Health On-line» and national actions such as Info XXI and the National RD&I Plan.

E-HEALTH AND ITS FIELD OF APPLICATION

1. General

The very nature of the Internet, its sheer coverage and user connectivity, makes it an ideal medium for facilitating communication among a multitude of agents, as is the case of practical healthcare, where a variety of participants (medical practitioners, nurses, patients, administrative staff, laboratories, pharmacies) have to exchange information in a reliable and timely manner for healthcare delivery purposes. The Internet provides an economical and simple way of linking up all the participant bodies, individuals and equipment, and enabling them to share information regardless of place or time.

The perceived impact of the Internet and digital communication technologies goes far beyond the introduction of on-line health portals targeted at end-users or professionals. When talking of Health On-line (e-health), one is really talking of **reinventing the information infrastructure for health purposes**.

The Internet offers the alternative of a low-cost technological infrastructure for a common platform, which is global in scope and upon which a wide range of functions can be run alongside transactions relating to patient management and general administration of services.

2. Defining e-health

Over recent years a series of terms have been introduced, which are often interchangeable or overlapping. Among these are some more traditional ones, such as *health telematics* and *telemedicine*, to which have now been added others such as e-health, *(*directly translated into Spanish as "*e-Salud*") *Health On-line*, *Electronic Health* and *Health on the Net.* The following terms will be used in this report:

e-health (=*Health On-line=Health on the Net=Electronic Health*): healthcare infrastructures and applications using digital-network multimedia data communications technologies, fundamentally the Internet. In a simplified form, these terms will be used to refer to «*Internet in Health*». There is a trend at present, particularly in the European Union, to use this term in a broad sense to include all «health telematics applications».

Application of Information and Communications Technologies to Health: a wider and general term that includes all aspects of use of electronic, computer software and communications systems across the entire spectrum of applications.

Health telematics: application of telematics technologies in the health sphere. This is accepted as a broad term which, aside from including administrative, information and clinical-practice support applications, must be taken to embrace telemedicine as a subset of health telematics applications. It is a term which owes its spread to European R&D Programmes.

Telemedicine: in a strict sense this is understood as «provision of distance medical services using electronic communications». There are telemedicine applications in e-health (e.g., use of the Internet for teleconsulting between professionals). At present, however, most of the existing telemedicine applications do not use the Internet. In Spain, the term has usually been given the more traditional narrower meaning. More recently however, and due in particular to the expressive synthesis it manages to encapsulate, the term has been given a far wider meaning, almost synonymous with health telematics.

The e-health conception in relation to Health Telematics and Telemedicine is schematically shown in Fig. 1. Also depicted is e-health's sphere of action vis-à-vis the fields of Public Health, Healthcare, and Research in Biomedicine and Health. Note too that superimposed on the diagram are references to education and prevention, both of which are, like healthcare, designated e-Europe «Health On-line» objectives.

The concept of e-Health in relation to Health Telematics and Telemedicine is schematically shown in Fig. 1
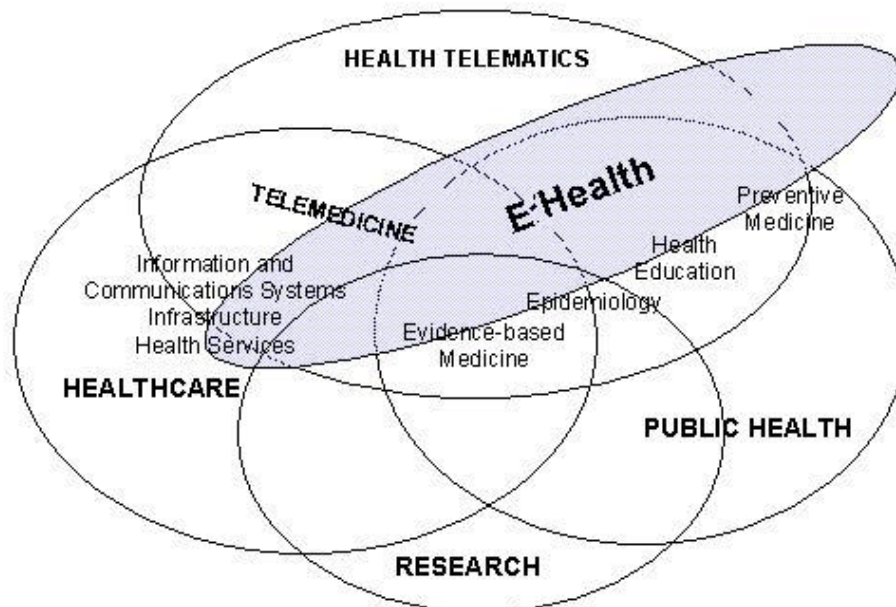

Figure 1. Schematic depiction of the position of eHealth relative to that of Health Telematics and Telemedicine, as well as its sphere of application in Healthcare, Public Health and Research

3. From infrastructures to applications

When speaking of the Internet, it is advisable to draw a distinction between technological infrastructure (Internet), which provides the requisite connectivity for digital data communication, generic telematics services (e-mail, www, ftp, telnet, chats, etc), and health-specific applications (e.g., electronic health record) needed to support medical services (teleconsulting, second opinion or teletraining). The thrust of our e-health analysis is squarely directed at this last layer, comprising health-specific applications.

The thrust of our e-Health analysis is squarely directed at the layer of health-specific applications

4. Scope of e-health applications

The scope of e-health applications includes different lines of development, which can be classified as:

> a) Information services
> b) E-commerce
> c) Electronic connectivity and messaging
> d) On-line computer-software applications
> e) Medical services (telemedicine)

a) On-line information systems (institutional web pages, portals) constitute the most visible group of Internet-based WWW applications and corporate applications from the new "dotcom" enterprises that have sprung up in recent months. There are growing numbers of Internet-based medical applications, as can be seen, *inter alia*, from the proliferation of web pages offering information and on-line medical services, with a supply side in excess of 15,000 web sites and a very considerable demand, estimated at around 40% of all Internet users. To date, most Internet initiatives have answered to the description of services tailored to the patient or health professional seen as individual consumers.

There are growing numbers of Internet-based medical applications, as can be seen from the proliferation of web Páginas offering on-line information and medical services, with a supply side in excess of 15,000 web sites

b) The development of *e-commerce* and what, by extension, has come to be called e-business, together constitute a fast expanding segment, whose growing association with the health sector can be seen in the form of major initiatives, with a proliferation of platforms for the purchase of goods and services.

All the evidence indicates that the Internet will inevitably have a relevant impact on hospital procurement and logistics systems.

All the evidence indicates that the Internet will inevitably have a relevant impact on hospital procurement and logistics systems. The Internet affords the means of eliminating inefficiencies, in that it allows for an overall solution to be provided for the whole cycle, ranging from the original request for information through to purchase and delivery of the final product. On-line markets for healthcare centres and providers are beginning to mushroom all over Europe, including Spain. Comprehensive procurement systems of this type set out to expedite contracting processes and cut costs. The added value to be had from such virtual markets lies in

automation of processes, integration of information systems, integration of payments and reduction in dispatch errors.

In terms of turnover, everything seems to point to a predominance of B2B over B2C. B2C activities are mainly linked to horizontal portals. The typical articles now being bought are books, a variety of medical, dietary and nutritional products, cosmetics, paramedicine and insurance. However, the development of general e-commerce applications has very important implications for health, in the form of elements such as payment solution systems and security measures, including electronic signature and deployment of public key infrastructures (PKI).

The Internet offers an economical, reliable, standardised platform at a global level to be used as an infrastructure for the digital connectivity of information systems

c) The Internet offers an economical, reliable, standardised platform at a global level to be used as an infrastructure for the digital *connectivity* of information systems. It is this factor that is lending impetus to the generalised adoption of the Internet and Internet technology to set up intra- and extra-nets in all organisations, including health institutions. The connectivity infrastructure serves to provide general access to common services, such as e-mail and web-browsing facilities, as well as other telematics services for electronic data interchange (EDI) between EDI applications. The health system requires a considerable exchange of messages, and replacing the paper-based system affords wide scope for improvement. Consequently, the use of electronic systems for direct communication between computers (EDI) has been the target for a concerted standardisation effort in the medical area in recent years (EDIFACT, HL7). The trend in present development is towards migration to Internet compatibility using XML.

Aspects such as «electronic prescription» are the types of electronic-messaging-based applications that are replacing paper-based systems.

d) *Internet-based applications* constitute a line of natural migration for current departmental-type applications, used in hospital information system (HIS) and health area information systems. Experts point to Web-ID as the application that will dominate the market («killer application»), i.e., on-line medical-record access systems using a standardised web-browser interface.

e) *Healthcare applications* include telemedicine services for remote consultation with specialists, home-based tele-assistance for the elderly and chronically sick, second opinion, and chronic patient management («disease management») services. Medical Internet applications of choice will be those that contribute greatest value to the health system, by ensuring enhanced access and continuity of care. Even so, such applications will have the slowest rate of penetration.

Healthcare applications include telemedicine tele-assistance, second opinion, and chronic patient management (disease management) services

Telemedicine applications cover a broad spectrum of work modes and in general encompass the above-mentioned types of applications, namely, information services, multimedia messaging, e-commerce, and on-line applications.

EUROPEAN FRAMEWORK AND GLOBAL CONTEXT

1. e-health within the e-Europe initiative

The Lisbon European Council of 23-24 March 2000 set the ambitious goal of placing Europe among the forerunners of the new economy and, in particular, of exploiting the possibilities of the Internet

In December 1999, the European Union introduced the e-Europe political strategy [3], which seeks to bring the benefits of the Information Society to all European citizens. The Lisbon European Council of 23-24 March 2000 set the ambitious goal of placing Europe among the forerunners of the new economy and, in particular, of exploiting the possibilities of the Internet. In the EC Action Plan of 19-20 June 2000 [2] eleven areas of priority action were identified and grouped under three main objectives, as shown on Chart 1 overleaf. Included under objective 3, "Stimulate the use of Internet", is the line of action entitled «Health on-line».

According to this document, *«Every Member State must be prepared to establish new priorities and ensure that barriers to achieving the objectives are removed. Each will have to alert its citizens to the emerging possibilities of digital technologies»*.

An important aspect is the time scale, which demands rapid actions, the year 2002 being designated as the deadline.

In all Member States, health services tend to be large, expensive and complex sectors to administrate. The prime objective of this action is to develop an infrastructure of user-friendly, validated and interoperable systems for health education, disease

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Chart 1. Lines of action for e-Europe

1. A cheaper, faster, secure Internet
a) Cheaper and faster Internet access
b) Faster Internet for researchers and students
c) Secure networks and smart cards

2. Investing in people and skills
a) European youth into the digital age
b) Working in the knowledge-based economy
c) Participation for all in the knowledge-based economy

3. Stimulate the use of Internet
a) Accelerating e-Commerce
b) Government online : electronic access to public services
c) *Health online*
d) Digital content for global networks
e) Intelligent transport systems

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prevention and medical care. Many of the tools for the building of such an infrastructure exist, yet efforts are needed at a Member State level to move towards the implementation of the infrastructure in a coherent way that enables such States to use technology to achieve their respective health objectives.

The prime objective of the Health On-line action is to develop an infrastructure of user friendly, validated and interoperable systems for health education, disease prevention and and medical care

Under Article 152 of the Treaty of Amsterdam, protection of public health as well as prevention and promotion of health come within the EU's scope of competence. In contrast, the tasks of management and operation of health services fall to the individual Member States.

Using the resources of the 5th Framework Research Programme, the European Commission is to launch an action within the context of the IST programme, designed to identify and disseminate best practices in e-health and develop benchmarking criteria. Furthermore, in collaboration with key experts, a set of quality criteria for web sites are to be established and a communiqué on «Legal Aspects of e-health in 2001» published.

The following chart sets out the proposed actions, along with the actors tasked with same and the designated deadlines.

Action	Actor (s)	Deadline
Ensure that primary and secondary healthcare providers have health telematics infrastructure in place including regional networks	Member States	end 2002
Best Practices in electronic health services in Europe identified and disseminated benchmarking criteria set	Member States, European Commission, Private Sector	end 2001
Establish a set of quality criteria for health related web sites	European Commission, Member States, Private Sector	end 2001
Establish health technology and data assessment networks	European Commission, Member States, Private Sector	end 2002

2. The global context

When dealing with questions relating to the Internet as applied to health and, more particularly, with questions relating to technology and business in the new economy, attention must be paid to events in the United States. The USA's technological edge vis-à-vis Europe is notable, especially insofar as it is of practical application in American healthcare institutions. Obviously, the respective healthcare models are very different in terms of organisation and funding, so that in many instances neither the objectives nor the underlying reasons for given technological solutions are

comparable. Nevertheless, applications developed in the United States enjoy widespread commercial penetration thanks to their head start and the size of the market. Moreover, they represent an excellent source of experience, enabling us to observe a future that has already taken place elsewhere.

Independently of the private initiatives that dominate the sector, it is extremely interesting to take a look at US government-sponsored measures targeted at rationalising data management and security (Health Insurance Portability & Accountability Act - HIPAA), which have led to the adoption of electronic messaging standards and the important, recently enacted law to protect the confidentiality of medical data.

government-sponsored measures targeted at rationalising data management and security (HIPAA)

Equally instructive are government policies developed in Canada, which, with its federal structure and wide degree of autonomy enjoyed by its provinces, has for years maintained a national strategy of boosting information technology and advanced telecommunications infrastructures in the service of its publicly run Health System, in clear synergy with the development of the country's home-grown telecommunications industry. A similar situation is to be seen in Australia, where national e-health programmes are similarly being promoted.

THE E-HEALTH DEVELOPMENT SCENARIO IN SPAIN

1. General aspects

Spain's National Health System is based on principles of universal availability, equity, solidarity and public funding. Its aim is to provide comprehensive care, including health promotion and preventive care. The concept of health services also includes the right to information, the right to privacy and a guarantee of quality.

As in other countries, healthcare organisations find themselves involved in a very profound far-reaching change, a change which has been looming for a long time and which is visible in the reforms, or attempts at reforms that have been taking place in recent decades, in an effort to meet a growing demand for medical care, both in quantity and quality, whilst endeavouring to contain spiralling costs.

One has to bear in mind that in the development of e-Health there is a long history of Information and Communications Technologies (ICT) use in the health sector

When considering the development of e-health, one has to bear in mind that there is a long history of Information and Communications Technologies (ICT) use in the health sector. Traditionally, technology has acted as a support for health professionals, in the form of instruments and a whole range of diagnostic and therapeutic devices. More recently, information technologies, and computer software in particular, have extended the scope of their activities to healthcare enterprise management, planning and administration. Now, new digital communications technologies, of which the Internet is the most visible paradigm, are opening up their capabilities to all the actors, including patients and the general public.

The health sector has features that set it apart from other sectors, and when the situation is analysed in connection with the introduction of new technologies such as the Internet, one can neither apply the same criteria as, nor extrapolate experiences from other economic or industrial sectors. Special caution must be shown in the case of recommendations drawn from analyses or studies performed in respect of other countries having healthcare structures and funding models different to ours. Account must also be taken of cultural elements linked to end-user and professional behaviour patterns and relationships.

The health sector has features that set it apart from other sectors

2. Major e-health user groups

Depending upon the designated target user (client) segment, e-health applications are differentiated, both *per se* and in the way in which they are implemented, their operational modes and rate of development.

The following main e-Health-user categories are discernible: consumers; patients; professionals and healthcare organisations

The following main e-health-user categories are discernible: consumers; patients; professionals and healthcare organisations.

3. Consumers (general public)

In principle, consumers -the potential clientele for healthcare services- are made up of Spain's official census total of 40 million inhabitants. Yet, though all are entitled to receive healthcare from the public system, 5.5 million (14.2%) also rely on private healthcare services. One of the characteristics of this population is the demographic trend towards ageing. Another trend is growing mobility, due to tourism, work, and internal and external migration.

When considering potential e-Health consumers, a factor to be borne in mind is their level of access to information technologies and, in particular, to the Internet

When considering potential e-health consumers, a factor to be borne in mind is their level of access to information technologies and, in particular, to the Internet. According to the most recent data, there were 6 million Spaniards linked up to the Internet in November 2000, and, what is more important, this was practically double the number in the previous year. Nevertheless, Internet penetration continues to lag behind the European average and is, at the same time, characterised by a high cost of access [3].

Internet x 100 habitantes -1999

Source: Computer Industry Almanach
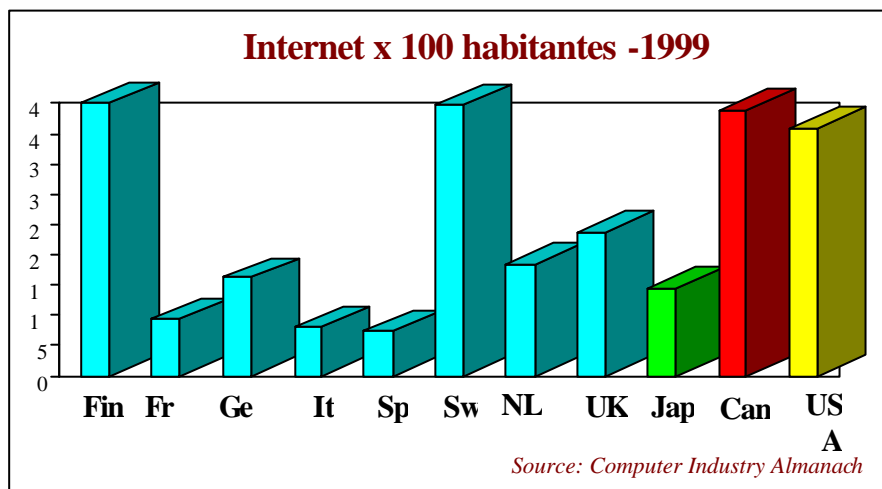
The data reflect that the Internet is a recent phenomenon in Spain, 46.2% of users having had an Internet link for less than a year, and that, in addition, it is a youth-based market, with 63% of all internauts being under the age of 35. The proportion of women accessing the Internet, 35.4%, stands below that of other countries, such as the United States with a figure of 47.6%.

the considerable penetration of mobile telephony, it being estimated that by the end of 2000, there were some 24-25 million subscribers in Spain

Furthermore, attention should be drawn to the considerable penetration of mobile telephony, it being estimated that by the end of 2000, there were some 24-25 million subscribers in Spain. Equally noteworthy is the mass spread of these devices among the country's youth, as well as this segment's use of the short message system (SMS).

In the specific field of e-health, international studies coincide in underlining the fact that over 40% of all internet searches concern health topics. There are estimates [4] to indicate that in the year 2005, around 90 million people will be seeking health-related content via the Web and that the number of health e-commerce users will have risen from the present figure of 11 million to 55 million. According to this study, over 30% of internauts who browse the Net would be willing to pay a fee in order to be able to manage their medical services over the Internet. The report also states that they are chiefly seeking direct access to practitioners, accessibility and accuracy in portal content as well as in-depth coverage and credibility.

There are estimate to indicate that in the year 2005, around 90 million people will be seeking health-related content via the Web

According to other studies [5], persons aged around 50 years are more prone to use Internet health services and, furthermore, the health sector is one of three areas in which women outstrip men in Internet use, looking, above all, for healthcare information on behalf of their children and parents.

A Spanish survey by Egalenia.com of over 500 persons on their Internet health habits shows that healthcare topics of most concern to users are general state of health (14.4%), followed by cancer (13.5%) and nutrition (9.5%).

healthcare topics o most concern to users are general state of health, followed by cancer and nutrition

4. Patients

Within the general public as a whole, individuals affected by health problems assume special importance as potential users of e-health applications. An indicator of the scope of possibilities lies in the fact that Spanish health systems registered 220 million medical visits during the course of the year 2000. Patients are extremely sensitive to the personal relationship with «their» doctor and «their» hospital. The essential relationship is one of trust, and the greatest single guarantee to the user resides in the prestige of the professionals and the health institutions.

Target groups for E-Health applications, are the elderly, chronically ill and patients associations

Among patients there are loose groupings that can be regarded as target groups for e-health applications, e.g., the elderly, chronically infirm and groups of patients organised into associations. The last-mentioned, in particular, have been empowered by the Internet, in that it has enabled such patients or their caregivers to set up their own on-line self-help groups.

5. Professionals

«Health professionals» are a very important category of potential e-health users, owing to the pivotal role they play in the provision of medical care and to the fact that they constitute the knowledge base that underpins and powers healthcare organisations. In Spain, this body is represented by around 159,000 medical practitioners, 168,000 nurses, and 40,000 pharmacists.

In addition, there are over 350,000 professionals of other types working directly in the sector.

Medical practitioners mainly use the Web for matters relating to their profession. Applications most used are e-mail, bibliographic information, and searches on clinical topics, with on-line access to Medline taking pride of place. Equally highly regarded is the ability to access the complete text of scientific papers in electronically published journals, owing to the advance this represents on the availability of printed numbers and to the relative ease of access vis-à-vis the traditional system with its need for physical presence at a library. For many professionals, Internet access to databases has extended the possibility of working in compliance with evidence-based medicine guidelines.

The most intensive use of the Internet is made by staff involved in research or connected with a university environment, where the provision of access via the Spanish research network (*Red Iris*) has proved to be a key element.

There are growing numbers of ISPs supplying services and portals geared to health professionals. Among the promoters of such portals are professional associations, societies and boards, non-profit institutions, the pharmaceutical industry, health-product manufacturers and on-line enterprises. Instances of web resources for professionals are: medical education and continuous medical education; electronic versions of medical journals; medical atlases; information on clinical trials; pharmaceutical information; clinical practice handbooks; and on-line forums.

There are no accurate data on Internet use by healthcare professionals in Spain. It would seem logical to assume that most of these would access the Internet from their work centres, since that is where most of their time is spent. However, things would not appear to be quite that simple. In Catalonian hospitals, for example, there is an average of one Internet access for every 8 workers. This situation is also reflected in the results of a survey conducted by *Diariomedico.com*: 55.70% of the 456 subjects surveyed felt that accessing the Internet from work was complicated versus 31.57% who felt that access from hospitals was simple. A further revealing fact is that peak times of maximum use by medical practitioners are from 12 midnight to 2 a.m., and again at 4 a.m., indicating an important degree of home-based use.

This state of affairs appears to be the norm in other countries as well. According to the latest survey on Internet use undertaken by Health On the Net and covering a population of over 3,200, medical practitioners were observed to be reluctant to use Internet in the workplace. A total of 74% of American professionals and 55% of their European colleagues admit that in their view the Internet is a waste of time and that they prefer to link up from home.

Nevertheless, in some prospective studies, such as HealthCast2010 [2], it is estimated that over 20% of all medical visits could be eliminated by using the Internet to

facilitate communication between patient and doctor. According to this same prospective study, over 30% of medical practitioners' time would be devoted to using Web-based tools.

An important agent insofar as professionals are concerned is the pharmaceutical industry. Laboratories are estimated to invest 20% of their sales in marketing to maintain their network of sales personnel who visit physicians in their surgeries. Direct communication between laboratories and medical practitioners via the Internet is envisaged as a new avenue of advertising. Indeed, this is being explored with various initiatives, using web sites and portals aimed at catching the practitioner's attention and supplying him with interesting material, such as on-line medical reference publications, information on drug approvals, and other topics of interest.

According to a study published by Inforpress and the National Association of Health Journalists (*Asociación Nacional de Informadores Sanitarios*), carried out from January to March 2000 and targeting 38 Spanish laboratories with a turnover of over 500 million pesetas, 32% of the companies used the Internet to publicise their new products, even though none of them had been using this medium of communication as an advertising vehicle as recently as 1998. However, despite the swift introduction of the Internet into Spanish laboratories, the specialist and general press and periodicals continue to be the media of preference for over 80% of the companies surveyed.

A related question is that of electronic prescriptions, something that is as yet unregulated and would allow for prescriptions to be channelled directly to the pharmacist

A related question is that of electronic prescriptions, something that is as yet unregulated and would allow for prescriptions to be channelled directly to the pharmacist. Work is already under way on several pilot projects. It is a method that would serve to eliminate dispensing errors (since there would be no problems of illegibility), expedite care and improve billing vis-à-vis the Social Security.

6. Healthcare organisations

The Health System is large, complex and acts as umbrella for a range of very different organisations. Insofar as e-health is concerned, a very important role is played by major institutional bodies, such as the Ministry of Health & Consumer Affairs and the Regional Public Health Authorities.

From the standpoint of implementation of e-health applications, the central core of «major user enterprises» is made up of leading public health service operators, such as the National Health Institute (*Instituto Nacional de Salud*-INSALUD), Basque Country Health Service (*Servicio Vasco de Salud*-SVS), Catalonian Health Institute (*Instituto Catalán de la Salud*-ICS), Andalusian Health Service (*Servicio Andaluz de Salud*-SAS), and Galician Health Service (*Servicio Galego de Salud*-SERGAS) etc., with their combined infrastructure of 550 hospitals and 164,000 beds.

In addition, there are other public organisations, such as defence facilities, municipal services, etc., along with non-profit institutions, such as the Red Cross.

One also has to consider organisations in the private sector, in which over 40 health insurance companies are active.

One of the main reasons for application of information technologies by healthcare organisations, public and private, lies in the ensuing improvement to management efficiency. Provision of healthcare entails the participation of a multiplicity of agents that need to communicate, i.e., to share and exchange information. To date, these functions have generally been performed somewhat inefficiently, relying upon paper-based transactions, with traditional mail systems, and the patients themselves acting as the means of conveyance of their clinical data. Although no economic data on current inefficiency levels are available, it is in no way rash to assume that it would be at least of the same order as that found in most developed countries, such as the United States, where expenses generated by inefficiency and redundant or unnecessary action are estimated to account for 25%-30% of management costs [5]. This is exerting pressure for the adoption of inter- and intra-institutional electronic communication infrastructures with a capability to support applications in lieu of the «paper» system.

One of the main reasons for application of information technologies by healthcare organisations lies in the ensuing improvement to management efficiency

The Internet offers appropriate functionalities for ensuring continuity of care, since it allows for a shared electronic health record, communicable throughout the health system. Furthermore, it is also a medium that can help enhance equity of access, by spanning distances, be these of a geographical, temporal or other nature, through the implementation of telemedicine services, such as teleradiology, telecardiography, general teleconsulting, specialised primary communication, or hospital at home.

The Internet offers appropriate functionalities, since it allows for a shared electronic health records, communicable throughout the health system

A topic of maximum interest to the health authorities concerns applications in the pharmaceutical sphere, an issue which, besides having an undeniable economic dimension is also intrinsically linked to improvements in the rational use of medication and avoidance of problems caused by adverse drug reactions (ADR).

The application of information technologies enables quality to be improved and costs avoided, as certain types of medical errors can be reduced. This has now become an issue of priority interest for governments in some countries, such as the United States, where it is estimated that somewhere between 44,000 and 98,000 patients die every year as a result of medical errors linked to the handling of information. Of such deaths, 7,000 are said to be ascribable to misinterpretation of medical prescriptions, and 25%, just under 2,000, to the illegible handwriting of practitioners. Although no data as to the dimension of this problem in Spain are available, there can be no doubt that it should be seen as a relevant target for improvement, and one on which the implementation of e-health applications would have a positive effect.

There are no data regarding the levels of penetration attained by Internet technologies with respect to the National Health System as a whole. Indeed, it is difficult to make

estimates, in view of the pace of change in many institutions, and the variability, not only between Autonomous Regions but even within the institutions themselves.

100% of INSALUD health centres are linked to the body's corporate network, which covers central departments, territorial and provincial directorates, specialist care, primary care and special emergency services. According to the latest data, this system serves 1,536 facilities and provides 24,227 e-mail addresses. Implementation extends to 92 hospitals with 11,086 PCs. In the case of primary care on the other hand, there are 281 computerised health centres and 183 outpatient surgeries equipped with 1,188 computers for admissions and 3,495 for medical consulting purposes.

There are known to be 69 hospitals with research units linked to the Internet via *Red Iris* (Spain's research network); to these one would then have to add all those having a link-up supplied by other Internet service providers. According to data from an Information Society Secretariat study covering 154 health centres in Catalonia, 60 of these -39%- are present on the Internet with a web page, a percentage that rises to 57.7% if only acute-care hospitals with a capacity of over 100 beds are considered. Overall, health centres have 17,436 computers, 16,490 of which are in hospitals and 946 in primary-care centres. This gives a ratio of 3.7 workers per computer in hospitals. In addition, 43%-48% of computers are linked up to Internet, yielding a ratio of 7-9 workers per network access point, a proportion that climbs to 17 workers per access point in primary-care centres. A total of 11,614 employees, amounting to 18.9% of the total workforce, have an e-mail address.

SITUATION ANALYSIS

From all the experts and the literature consulted one gets the clear perception of being involved in a revolution. Although this is a revolution that is going to affect the health sector as much as the remaining sectors, it will conceivably affect the former to a greater extent owing to its special social and economic sensitivity.

Analysis of barriers and driving forces at work shows that a given element may act as a hindrance in one context and as an aid in another. Logically, views tend to differ according to the actor in question.

1. Driving forces

The basic impetus for Internet development lies in its very nature, in the potential of its practical applications to render it desirable to users, be these individuals or organisations. It is economical, flexible, open and freely accessible. Its present users (patients, medical practitioners, managers) see in the Internet a possibility of satisfying their needs and obtaining benefits. Logically, the precise nature of and interest in such benefits will depend on the individual actor. In this regard, a great amount of influence is exerted by the specific setting, the user's experience in Internet use (e.g., whether in a university context or in multicentre research projects) and, in the case of organisations, their degree of technological maturity and adaptation to change.

The social environment is having an undeniable influence on consumers, who are becoming increasingly accustomed to the use of Internet-mediated electronic means of payment and management backed by sectors such as banking, transport and tourism. This exponential growth in Internet-based users will in turn influence the development of e-health-specific technologies, applications and uses.

Economic, social and political forces have been at work on the healthcare sector for a number of years now, lending impetus to new organisation and management models. Such changes require information systems with wide-ranging capabilities, and the Internet is therefore perceived as the basic technology for change.

The boost given to health products by e-commerce will have positive repercussions on the purchasers themselves, who will benefit from on-line product catalogues, enhanced inventory control, shorter delivery times, reduced costs, etc. Working from the Net, suppliers for their part, will, among other advantages, be able to plan production better, reduce marketing costs and increase market share.

The pharmaceutical industry is a sector that has traditionally been ahead in the use of data networks. At present, it is very actively engaged in encouraging Internet use for

its own operations, yet it is also furnishing web-based information services and on-line professional training.

The telecommunications sector, and the major telephony operators in particular, constitute one of the major forces fostering the use of the Internet and the new data services, though the nature of this drive is general and without any strategy specifically focused on the health sector.

One of the lines having greatest impetus is political in origin. At all levels, local, regional, national and EU authorities are promoting information and communications technologies by means of different actions that are basically being implemented via R&D programmes, the legal and regulatory framework, human resource promotion, and dissemination. In this context, the e-Europe initiative and IST Programme must be seen in an EU framework, as must the National RD&I Programme.

One of the lines having greatest impetus is political in origin. Basically being implemented via the e-Europe initiative, the IST Programme in an EU context and the National RD&I Programme

2. Barriers

A series of factors can be identified, which act as a brake on health-related Internet development. Among these are issues of user acceptance and of problems of infrastructures, training in the use of new technologies, interoperability of clinical information systems, the lack of protocols in telematics procedures, updating the administrative and organisational structures of existing health institutions, not to mention the legal aspects and, of course, funding.

The relatively low penetration of personal computers and Internet connection in Spanish homes is regarded as an element holding back the potential development of e-Health applications

The relatively low penetration of personal computers and Internet connection in Spanish homes is regarded as an element holding back the potential development of e-health applications targeted at the general consumer, who encounters barriers to Internet use in the shape of basic equipment costs, problems of quality and low access speed, and the high rates charged for telephone connection and use. For consumers in Spain, this signify an objective constraint vis-à-vis other OECD countries.

One of the critical factors is the ambivalence of healthcare professionals who are divided in their reaction to the Internet: on the one hand they seem to be fascinated, and on the other, they harbour certain reservations about its use. While many appreciate the value of having better informed patients, there is a parallel concern about a possible loss of control over the doctor-patient relationship. The medical fraternity tends to be conservative and cautious, especially with regard to technologies that could alter the doctor-patient relationship, and the Internet is one such technology.

Recent years have witnessed a significant increase in the use of computerised systems on the part of medical practitioners for administrative functions (such as appointments, checking patient data, intra-professional exchange of medical records) and certain clinical applications, yet there is a long way to go before the point is

reached where the potential capabilities offered by the available technologies are being exploited to the full.

In the context of applications targeted at organisations, the development of e-health in Spain has clear limitations in terms of the health system's lack of computerisation, the heterogeneity of the systems implemented, and the questions of interoperability and adoption of common standards by the different organisations. A core issue here is the retraining and adaptation of human resources to the new working environment.

With respect to initiatives for development of new "dotcoms", venture-funding possibilities have been adversely affected by the collapse of technology stocks on the international share markets. On-line business models are currently under review.

Guaranteeing web content quality is a key aspect, and is the subject of intense discussion in the international media inasmuch as it concerns e-health applications intended for the on-line information systems segment [8] [12] [13].

Guaranteeing web content quality is a key aspect under intense discussion in international media

Data security and confidentiality are also burning issues. Solutions for the health field will undoubtedly benefit from advances made in electronic signature and validation, thanks to the public key infrastructures that are being deployed and promoted to facilitate e-commerce in general.

Solutions for the health field will undoubtedly benefit from advances made in electronic signature and validation

Finding solutions to these questions is considered crucial for e-health applications in the categories of e-commerce, on-line applications, messaging and telemedicine.

3. Detailed discussion with breakdown by user category

From the point of view of potential e-Health clients, it is the senior-citizen segment that has been identified as the major consumer of health resources.

In the case of **consumers**, age is regarded as a factor that is decisive and inversely proportional to the degree to which use is made of products currently available on the Internet. From the point of view of potential e-health clients, however, it is the senior-citizen segment that has been identified as the major consumer of health resources, something that is going to mean the development of new tools designed to facilitate the incorporation of this group into the new economy. In this connection, the development of applications in the field of cell-phone and digital television use are seen as new possibilities.

In the analysis of potential clients, sight must not be lost of the impetus coming from chronically ill groups in the rural world, in terms of generation of demand for specific applications, via, say, information portals, and in terms of improvements in accessibility to healthcare and one-on-one patient management (disease management).

Some of the factors that will have to be addressed are: the need to have a simpler and cheaper means of Internet access; the veracity, quality and accuracy of the information; and the supply of new products geared to specific groups.

At present, users are somewhat at a loss as to what this could mean to them in added-value terms in the short, medium and long term.

A number of analysts are of the opinion that the greatest effect of the sale of pharmaceutical products over the Internet could well be felt by the patient. Until recently, relations between laboratories and patients were limited by statutory regulations and by the practitioner acting as an intermediary, but the Internet threatens to change all that. As things stand, it is impossible, from a legal standpoint, to sell medicinal products over the Internet in Spain. The prevailing Spanish legislation makes the dispensing of any drug dependent upon physical presence in the pharmacy. The dispensing of medicinal drugs is governed by several regulations. The most general of these is European Union Council Directive 92/28/EEC on the advertising of medicinal products for human use, which provides that Member States shall prohibit advertising to the general public of any medicinal product exclusively available on medical prescription and authorises such States to subject the content of all OTC advertisements to prior vetting. In addition, Directive 97/34 forbid television sponsorship or telesale of any medication, be it with or without prescription, and Directive 97/7 entitles EU countries to exclude medicinal drugs from distance contracts.

Insofar as **health professionals** are concerned, these are seen to be very favourably disposed towards anything connected with the use of Internet resources as a source of information, but not towards incorporating such tools into their healthcare tasks, there being some doubt as to whether use of same is going to serve to improve the exercise of their activity. This can clearly be seen from the fact that the proliferation of access to professional documentation and information services (information as a key factor in competing for scarce resources, the research world, continuous training) is not equally evident in the case of other services on offer, thereby implying that there is some difficulty in perceiving the advantages of same. A possible example of this is provided by the possibility of e-mail-based doctor-patient relationships: the problem of data confidentiality and Internet security is one of the arguments currently being put forward by health professionals regarding use of applications involving electronic interchange of patients' medical data.

In this context, it is evident that efforts will have to be made in disseminating, informing and training health professionals in the use and development of IT applications, so as to enhance the acceptance of same and ensure that better advantage is taken of their potential.

Healthcare organisations are a key factor in facilitating, promoting and disseminating the use of these technologies. In this connection, the role of senior management is seen as fundamental and ought to act as a force for change in this sphere. Increased efficiency, cost savings, user satisfaction, and improvements in management or healthcare activities are factors to be borne in mind when it comes to incorporating these new technological tools. In general, initiatives set on foot by

public health institutions are geared to implementation of corporate-network (intranet) and Internet-access infrastructures. The basic model that seems to be spreading is that of regional networks or networks of health-district networks, with the prime objective of facilitating communication between levels (primary with specialised).

Health services are strongly backing Internet as a medium to facilitate internal management of administrative and healthcare services, improve healthcare and enhance relations with the public. There are projects under way in health districts in several Autonomous Regions, whereby primary-care centres can process requests for analysis and diagnostic tests in real time, without having to invest in costly equipment, applications and specific software licences. From any PC with Internet access, such health centres can access laboratories or the pertinent diagnostic services, and request or consult the results of clinical analyses, thereby saving time, bureaucratic paperwork and money.

Another application being observed with great interest are web-based appointment management systems

Another application being observed with great interest are web-based appointment management systems.

Private healthcare organisations have shown a greater degree of dynamism in the use of Internet technologies as a support tool for their business, e.g., using the web for the purposes of requesting appointments with specialists, seeking medical advice, managing services or taking out policies.

Among the barriers the lack of network infrastructures; the lack of health-sector-specific applications

Among the barriers or problems detected by institutional users, the following have been identified: the amount of investment needed to implement IT, particularly where such outlays are to be posted on the books as investment and not current expenses; the lack of network infrastructures; the lack of health-sector-specific applications; the need for greater interaction between the public and private sectors; the need, at an inter-regional level, for co-ordination in the health sphere to ensure the operational status and connectivity of the different systems, duly analysing the need for regulation and boosting widespread use of these infrastructures (health smart card, computerised health record, client link-up to healthcare providers, public procurement via the Internet, B2B, etc.).

With respect to the specific development of e-health applications for healthcare organisations, emphasis must be laid on the concern felt by the authorities about web content in general, and about accurate and quality information in particular. Also evident is the interest in new on-line information search and management products.

In the case of B2B e-commerce, an important aspect relates to the possibility of on-line public procurement over the Internet, as well as the necessary interoperability standards and protocols for linking up different healthcare providers.

DEVISING AN E-HEALTH ACTION STRATEGY

1. Summary Status Report

The driving forces propelling health-related Internet use are extremely powerful and, to a certain extent, inescapable. The key to their evolution lies outside the health sector as such. How Internet use is going to affect clinical practice and outcomes depends, both upon the way in which it is applied, and upon the general context in which other actors take part.

The data show that Spain is somewhat behind in general Internet penetration compared to the European average. Not only is this finding in line with the historically low level of ICT introduction in health, but in addition it raises the need for a reaction in the face of this situation to avoid a lag in future should the present pace slow, a development viewed with visible signs of alarm by the EU Council on putting forward the e-Europe initiative.

The relevance of the topic leads one to consider the suitability of pooling efforts, by bringing together all the actors involved into something that could be called a «Sector Agreement» or «common interest platform»

The matter is simple: the quality and economic feasibility of healthcare in the form demanded by today's society depends upon the effective incorporation of new technologies. The relevance of the topic leads one to consider the suitability of pooling efforts, by bringing together all the actors involved into something that could be called a «Sector Agreement» or «common interest platform».

After discussing the light in which the role of e-health is viewed, its prospects for evolution and the context of foreseeable development, this section then goes on to identify the key core issues.

2. Role of e-health examined

The incorporation of the Internet into the healthcare world (e-health) is perceived as a force for change destined to enhance the quality of life of the general public, a view that will favour the development of tools designed to respond to this demand in areas such as research, management, planning, information, prevention and promotion, or in diagnosis and treatment. The challenge resides in technology's being able to furnish the basis upon which genuinely useful applications can be implemented.

The incorporation of the Internet into the healthcare world (e-Health) is perceived as a force for change intended to enhance the quality of life of the general public

At all events, something about which there seems to be agreement is that the incorporation of the Internet is bound to generate changes in the relationship between health professionals and the general public, between these same professionals and the healthcare providers, and, by the same token, between the latter and the general public; not to mention the changes that are going to take place in the areas of logistics, distribution channels, supply, procurement, and in the processes of management and administration per se.

Furthermore, medicine is plainly a knowledge-based activity that makes intensive use of information. Data-collection, handling and exchange are increasingly becoming the core focus of activity. Matters ranging from doctor-patient communication to administrative relations, assurance and information flows at all levels characterise a genuine sector that requires appropriate technological infrastructures to overcome the present inefficiencies peculiar to paper-based systems.

medicine is a knowledge-based activity that makes intensive use of information

a sector that requires appropriate technological infrastructures to overcome the present inefficiencies peculiar to paper-based systems

The Internet is a very powerful medium when used as a vehicle for the health education of citizens and better-informed patients. It is also a tool of great value for updating the knowledge of and providing continuous training for health professionals.

Application of the Internet to clinical practice not only means a new way of doing things but also the possibility of doing new things. These new technologies go beyond replacing the old. A profound impact is therefore envisaged, both upon the structures of present organisations and upon the way in which they operate.

technology should be seen as a tool and not an end in itself The value lies in the ability to provide solutions to real practical problems .

However, technology should be seen as a tool and not an end in itself. The value lies in the ability to provide solutions to real practical problems, furnishing the general public with tangible improvements in quality and access to the health services of the future.

3. Prospects for progress. Context of development

The Internet has shown itself to be an important tool in continuous training and the updating of knowledge, thereby facilitating evidence-based medicine

By its very nature, the Internet goes to the very essence of healthcare activity. Its use will be dictated first and foremost by end-users. Health professionals will increasingly use the Internet to communicate with one another and to access medical and scientific information. Nevertheless, resistance can be expected to direct e-mail-based doctor-patient communication. The Internet has shown itself to be an important tool in continuous education and the updating of knowledge, thereby facilitating evidence-based medicine.

In general, healthcare organisations are not ready to fit the Internet into their modus operandi. The reality of the information systems, the administrative structures, the organisation of services, the lack of incentives and the resistance of professionals, all represent barriers limiting the spread of the Internet in a clinical setting. There is considerable resistance in the form of stringent regulation, lack of computer software and communications infrastructures, problems of security, as well as ethical, social and cultural considerations.

The use of web technology as a support for health software systems will foreseeable meet with resistance from the corporate suppliers who currently dominate the healthcare software market and who will logically do their utmost to prolong the life-cycles of their respective products as much as possible. Moreover, there are in-depth problems connected with the integration of healthcare information systems, and it is

very probable that the fragmentation of health record systems will continue in the years to come.

The next few years are expected to bring a rise in the activity of Application Service Providers (ASPs).

Healthcare organisations are attracted to the use of the Internet, preferably for commercial transactions, logistics, administrative processes and corporate image-making within the current trend in generic Internet applications and e-commerce. Yet, the spread of applications to support clinical practice per se is altogether more questionable. Talk of and proposals for web-based electronic health record abound, but it is not at all clear whether the prevailing situation will see any type of radical change.

There would appear to be possibilities for development in the chain of distribution, in that pharmaceutical companies could improve their efficiency in the procurement of basic products -such as laboratory chemicals- by acting through on-line intermediaries. The Internet will also affect the distribution of medicinal drugs here in Spain: despite the peculiarities of distribution in the sector, the chain from production to end-customer is a long and complex one.

Use of the Internet for telemedicine will see limited development for reasons of infrastructure and organisation of services. The economic, ethical and legal questions will have to be addressed to avoid uncertainties. Development of this type of application is likely to be slower than that of the administrative, management support and «e-commerce» varieties.

One of the most fondly cherished hopes is that future healthcare will make use of technological capabilities to improve equity in access, by circumventing geographical, economic, social and cultural barriers. Then again, one of the greatest concerns is that unbalanced technological development might throw up new barriers for any individuals, groups or institutions that are not incorporated into the Information Society.

Applications developed through initiatives coming from outside the public system and targeted at consumer groups are likely to move ahead more swiftly. New e-health business models will create challenges to traditional ways of providing services. Implementation of e-health allows for new (virtual) enterprise models in which the greatest value resides in knowledge-based capabilities and networks of contacts with suppliers and customers. e-health applications free knowledge resources of all constraints of geography, time and administration. At present, however, the reality is that e-health is scarcely developed, and what is offered from the Internet are solutions which have been introduced in other sectors, in other market contexts, pertaining to organisational cultures and relationships with different users.

4. Identification of core issues

Implementation of e-health applications for the construction of future healthcare poses a very wide range of challenges, not merely of a technical nature but also ethical, cultural, legal, economic and organisational. Among the principal core issues identified as being linked to the development of e-health in Spain are the following:

a) alignment of the strategic and development plans of
the various health systems
b) acceptability to professionals
c) quality of Internet content
d) data security and confidentiality
e) legal and administrative framework
f) funding and sustainable business models
g) Internet access
h) technological aspects

a) Alignment of the strategic and development plans of the various health systems

Traditionally, application of information technology to health has led to fragmentation in the sector, with a plethora of solutions, for the most part incompatible. Lack of interoperability between the information systems of different hospitals, or even between those of a single hospital, has been a reality in most of the healthcare organisations in Spain. In recent years, computerisation efforts in healthcare have led to a greater degree of uniformity with regard to the adoption of common commercial applications «at source», especially in institutions providing healthcare services in certain autonomous regions. Yet one has to bear in mind here that: many projects are adapted to or modified for a specific end-user; adoption of a set of applications from the same suppliers does not in itself guarantee interoperability, even within the same organisation; and, applications introduced in both regional health systems and, obviously, in private organisations, are not in principle designed with interoperability in mind, whether at a national or, needless to say, at a European level.

This state of affairs constitutes a fundamental problem besetting the creation of a national network of health telematics services or other services to act as electronic medical records.

Such discontinuity in information systems makes for:

- administrative inefficiencies and increased bureaucratic complexity for the public, professionals and organisations alike;
- inefficiencies in healthcare delivery, particularly in the case of cross-border movement and residence;

- breaches in data security and protection systems;
- increased costs of implementation and maintenance of information systems;
- higher overall system operating costs; and,
- greater risk of data-transcription errors in communication between the respective systems.

It would seem advisable for common strategies to be implemented at a national level, strategies designed to facilitate communication between different information systems in order to ensure continuity of care for the general public

Hence, it would seem advisable for common strategies to be implemented at a national level, strategies designed to facilitate communication between different information systems in order to ensure continuity of care for the general public.

This would entail adopting a universally agreed e-health "area" (preferably on the basis of internationally accepted regulations) for the National Health System, of a type that would rule out present inefficiencies.

In general, healthcare organisations, health professionals and computer experts acknowledge the importance of standardisation in healthcare software. The position of those who supply applications is not quite as well-defined, however, and a certain reticence can be detected. Indeed, one gets the feeling that such suppliers feel more comfortable in a situation untrammelled by any rules or regulations that might compromise the adequacy of their products. There is a fear that a demanding regulatory framework would mean increased administrative barriers, as well as additional costs and time (certificates, etc.). These conditions might perhaps change, for some suppliers at least, if they saw the possibility of a market in the event that a situation were to arise similar to that brought about the passing of the HIPAA in the United States. Yet, this has not taken place in practice, even in organisations which show willing to adopt rules, and has instead led to situations in which proprietary solutions are favoured. This is an area that calls for profound reflection at all levels on the part of those in charge of computerisation in the healthcare field. There is a manifest lack of commitment to open systems.

b) Acceptability to professionals

User behaviour plays a critical role in the recognition of e-Health services

The degree to which health professionals accept new Internet-based modes of work will be linked to the demonstration of real benefits and the perception of incentives for change. User behaviour plays a critical role in the acceptance of e-health services and human conduct is something that cannot be changed by decisions taken by managers.

To talk of the implications of the use of new technologies in medical practice is to talk of a multitude of changes. Not only will professionals' behaviour and their attitude to healthcare be affected, but also the way in which doctor and patient relate to each other. The patient of the future will

come to his doctor with a greater amount of information, which the professional will then have to weigh up and assess in order to advise the former as to what may be beneficial or prejudicial to his health. Everything points to the fact that, while the introduction of the virtual medical visit in the ambit of healthcare is in no way going to displace real medical activity, it is nonetheless going to convert the professional into a type of qualified auditor whose relationship with his patient will be guidance oriented. Patients occupy most of practitioners' time, and it thus somewhat naïve to think that they are going to find time to answer e-mail queries if there is no system of additional economic recompense.

The patient of the future will come to his doctor with a greater amount of information

Another element of rejection on the part of health-sector employees is linked to fear of change and of the possible effects on their jobs. Technological change affects the need for different professional profiles, eliminating some and calling for others, thereby creating new types of professional careers.

The California Medical Association (CMA) has joined forces with a number of high-tech companies for the purpose of setting up a body, the MoHCA, to serve as an interface between the healthcare and technological worlds, with the ultimate aim of helping to understand their mutual needs.

A vector of introduction that has been positively accepted involves the use of the Internet as a medium for continuous training. Thanks to the Internet, courses can be held, and where necessary, academic credits obtained, in such a way that there is no need for transport and travel, the timetable becomes flexible and the effort involved in training and education is rendered compatible with the daily workload.

A vector of introduction that has been positively accepted involves the use of the Internet as a medium for continuous training

c) The question of ensuring the quality of information accessible on-line

Open access to medical information via the Internet has afforded professionals, patients and the general public, new opportunities of gaining access to knowledge

Open access to medical information via the Internet has afforded professionals, patients and the general public new opportunities of gaining access to knowledge. The freedom to publish information on the Web is one of the Internet's acknowledged values. This cannot hide the fact that much of this information may be of dubious scientific rigour or susceptible to manipulation. Current estimates put the number of health-related web pages at around 100,000, only half of which contain information endorsed by professionals. We are heading towards a global database, in which web browsers will be able to find any type of information. It is not always easy to decide what is reliable, and even less so in the case of non-experts. One of the ensuing risks is that patients will reach the point where they diagnose and treat themselves on the basis of inappropriate information obtained over the Internet. Another matter that raises its head is the offer of medical therapies, often fictitious, over the Internet.

Concern about the quality and reliability of on-line healthcare content is thus a central question, as is reflected by its inclusion among the e-Europe «Health On-line» lines of action.

Among the international initiatives under way, mention should be made of the ethical codes drawn up to guarantee the quality of health-related web sites. The most relevant of these include: Health on the Net (Switzerland), Hi-Ethics (United Kingdom), e-health Ethics Initiative (United States), and the principles of the American Medical Association. In Spain, the Barcelona Board of Physicians (Colegio de Médicos) sponsors another initiative, whereby the Accredited Medical Web site (Web Médica Acreditada) seal is awarded to services that comply with its conditions.

There is debate about the role of health authorities and public sector institutions. It is clear that good faith alone will not suffice to protect users. Even seals of quality have to be verified. One has to bear in mind too that the average user does not find codes easy to understand. Indeed, the average user generally has neither the means nor the time to verify which of the services awarded the seal are really quality services, since, at the level of an individual or isolated organisation, the sheer magnitude of the Internet renders the task of monitoring impossible.

It is extremely important that stress be laid on the principle of confidentiality and protection of private data, by specifying how personal information is to be collected, what use is to be made of this and with whom it is to be shared. An aspect to be considered is the possible need for the public authorities to lay down minimum criteria for data protection in web sites.

The health sector i one of the most sensitive insofar as protection of data is concerned

d) Data security and confidentiality

The health sector is one of the most sensitive insofar as protection of data is concerned, since clinical histories and on-line medication or medical prescription data are matters requiring a high degree of privacy.

It is extremely important that the principle o confidentiality and protection of private data be stressed

Another point to be borne in mind in data transmission is that not all information has the same degree of confidentiality. Accordingly, different degrees of privacy must be assigned to messages, in that some will be addressed to a far wider public than others. For instance, a lecture or study addressed to a group of professionals is not as secret as a patient's diagnosis.

The importance of the matter is clearly reflected in the concern felt by the authorities at an international level. In the United States a federal law has just been enacted for the protection of patient data.

From a technical point of view, tools and basic procedures originally developed for on-line systems, such as encryption, electronic signature and public key infrastructures, are being further developed to facilitate e-commerce and are becoming available. In this context, the use of smart cards is emerging as an element for the provision of a secure operating environment.

e) Legal and administrative framework

As the use of e-health applications spreads, their introduction must, as with any new technology, inevitably give rise to new situations linked to the interests of the different actors involved. In one way or another, the need arises for regulation and the introduction of rules to establish a legally and administratively secure environment that will allay uncertainty and ensure appropriate use of new technologies in the ensuing social context.

A series of ethical, legal and administrative questions are connected with aspects such as protection of privacy, trade in medicinal drugs and products, protection of health, quality of information, professional competencies, etc.

By virtue of its nature, functional structure and global reach, the Internet represents an unprecedented legal and administrative space

By virtue of its nature, functional structure and global reach, the Internet represents an unprecedented legal and administrative space, to be viewed as a matter of the utmost importance in terms of its implementation in an environment as sensitive as that of healthcare.

f) Funding. Sustainable business models

The financial prospects for the e-health market are not at all clear-cut, since, although there is a feeling of undeniably great potential, experience nevertheless demonstrates the difficulty of turning expectations into real profits.

One of the main factors currently limiting e-Health in Spain is, as in other countries, the weakness of business models

One of the main factors currently limiting e-health in Spain is, as in other countries, the weakness of business models tied to models of finance which are frequently volatile and often lacking experience in the realities of the health sector. There are many additional challenges, such as obtaining a financial return for the provision of medical content, by convincing patients to pay for services. Moreover, in recent months, important movements have shaken the financial markets, which have gone from a peak of euphoria in the setting-up of new "dotcom" companies to a slump in the technology markets and the disappearance of many start-ups. Everything seems to indicate that the "crest-of-the-wave" effect has passed, giving way to more solid models of establishing on-line activities. There is a risk of a slow-down in investment in view of the trend registered in first-wave corporate stocks in the United States. Just how to make a profit on the

Internet is not at all clear. Things are proving to be more complicated, less profitable and much longer-term than expected. **Once their curiosity has been satisfied, «clients» can be expected to use only what they need.**

There are certainly opportunities in B2C e-commerce, with several niche areas that could be a success, but the problem lies in being able to predict changes in the regulations governing the sector. This said, the real challenges are nevertheless posed by logistics.

B2B services are well established in health, and relations are already in place throughout the value chain. Such intermediaries cannot be easily bypassed, and successful e-health offers will thus involve companies and organisations that can function as ASPs.

It is interesting therefore to note the development of the concept of «B2B marketplaces», which are being created around the major traditional healthcare management organisations. The provision of «Managed Care» over the Internet arouses far higher expectations in the United States than in Europe, and venture capital companies would probably prefer to invest in US-based companies looking to expand in Europe.

Private companies are already on the Internet providing an on-line service, which enables medical practitioners and their patients to communicate over a secure and confidential central messaging system

Electronic patient files (electronic health record) and telemedicine are matters that have generated keen interest among those showing potential interest in entering the market. Despite resistance from government administrations, health authorities and other parties with interests in the sector, there are already many proposals, albeit somewhat naïve. Investments appear to be directed towards companies equipped with powerful electronic facilities, targeted at specific problems, and avoiding areas coming within the concern of the public administration. Private companies are already on the Internet providing an on-line service, which enables medical practitioners and their patients to communicate over a central messaging system that is secure and confidential at all times. The system allows medical practitioners to define their own table of fees per message, maintain communication with patients and conduct the necessary follow-up in the most suitable manner. The messaging system includes functions such as «alert notification» and «listed as awaiting reply».

g) Internet access

Technological development offering greater computing power and speed of communication at lower cost will favour widespread adoption of intranet and Internet-access infrastructures.

However, Internet access not only implies having a Terminal -normally a PC and a link-up to the Net- but also calls for the necessary knowledge capability to use same. It implies user-friendly interfaces and a "one-fits-

all" design. In addition it implies cultural and linguistic aspects. It means a new working environment and timetable.

Internet access is related to the question of the digital divide. While the cost, both of equipment and of telephone traffic, is an important barrier for the general public and for professionals who tele-work from their homes, sight must also not be lost of the digital culture aspect.

Electronic access for all health professionals is a designated e-Europe «Health On-line» short-term objective

Electronic access for all health professionals is a designated e-Europe «Health On-line» short-term objective. This is a challenge targeted especially at healthcare organisations and the government. Yet it is not a simple problem of installing hard- and software. It implies training and adjustment to a new professional working environment, overcoming the type of resistance described above.

h) Technological aspects

All indicators of technological change point to a vector of Internet evolution boosted by the development of mobile communications [4]. Third-generation UMTS systems, along with WAP protocols and personal networks such as Bluetooth, are going to allow for applications that facilitate the mobility of healthcare personnel while ensuring access to clinical records and other data, anywhere and at any time, with systems equipped with a user-friendly interface.

In addition, the availability of cable will favour the possibility of using interactive digital television as a medium of access to homes, as well as development of platforms sharing content-based resources.

Internet II, with its capabilities suitably upgraded, can be expected to open the way to development of applications currently limited by transmission capacities. Areas that could particularly benefit here are research environments and those involving work with images and video.

Internet II, with its capabilities suitably upgraded, can be expected to open the way to development of applications currently limited by transmission capacities

Network reliability and guaranteed operational status are key questions for migration to new infrastructures.

PROPOSED LINES OF ACTION

The set of actions proposed below is aimed at providing a response to the challenges analysed in the course of the report for appropriate development of e-health, in accordance with the objectives and lines of action established under the e-Europe initiative, Info XXI and the National R,D&I Plan.

1. General

On posing the question of what possible actions should be embarked upon within the context of e-health in Spain, it has to be said from the very outset that the greatest problem may well reside in doing nothing, or waiting too long and missing the window of opportunity. To do nothing means to leave progress to be determined by the array of initiatives and interests highlighted by the various driving forces and barriers identified and discussed above. The situation analysis reveals that, if no move is made to adopt an e-health strategy, there is the risk of a scenario arising in which the combination of lag in technology and inefficient use of resources may decisively determine the future of the country's health sector over the next decade. It would be idle to expect an e-health strategy -which basically means intercommunicability and interoperability of the system- to be introduced in the health sector without leadership coming from the health authorities at the very highest level and without it being approached from the perspective of state policy, aimed at dispelling uncertainties and aligning efforts. It would be equally idle to expect that a strategy of this scope could be implemented by a set of isolated and fragmented service providers, without there being a dynamic framework from within the health system itself to give impetus to the process.

It would be idle to expect an e-Health strategy -which basically means intercommunicability and interoperability of the system- to be introduced in the health sector without leadership coming from the health authorities at the very highest level

Actions undertaken in recent years in the most advanced countries are extremely instructive in this respect, and are reflected in Strategic Health Information Technology Plans such as those drawn up in the United Kingdom (National Health Service), Canada and Australia. Equally enlightening are the initiatives that have been launched in France, Germany, Denmark and, needless to say, in the United States.

Adoption of such Strategic Health Information System & Technology Plans is entirely divorced from the type of health system in place (a national health service as in the United Kingdom, social security as in France and Germany, or private insurance as in the United States) and from the nation's institutional profile (the more centralised type, such as France and the United Kingdom, or the federal type, such as Germany, the United States, Canada and Australia).

Adoption of such Strategic Health Information System & Technology Plans is entirely divorced from the type of health system in place

In Spain, there is nothing at a national level akin to a Strategic Health Information System & Technology Plan. The role of the Health Authorities, essentially the Ministry of Health & Consumer Affairs, in collaboration with the various

Autonomous Regions and the Private Sector, is fundamental and must cover two key aspects:

1.regulation for the creation of a standardised environment; and

2. creation of the basic infrastructures.

In other words, it is a matter of ensuring that the system is able to communicate with itself, on the basis of establishing minimum agreed standards, and of guaranteeing the setting-up of a basic communications infrastructure. "Regulation" in this particular context refers to something of the kind enacted by the United States at a federal level, in the shape of the so-called HIPAA, a statute which lays down standards of intercommunicability for the entire American health system, along with guarantees of security and confidentiality in the use of personal data.

Furthermore, implementation of a nationally interoperable health-data communications infrastructure calls for a measure of special scope, something that should be envisaged as an extraordinary special action.

Effective implementation of e-health in an environment as complex as that of healthcare requires vision, commitment, leadership at the highest levels and a solid well-structured agenda, underpinned by a team of active and capable participants.
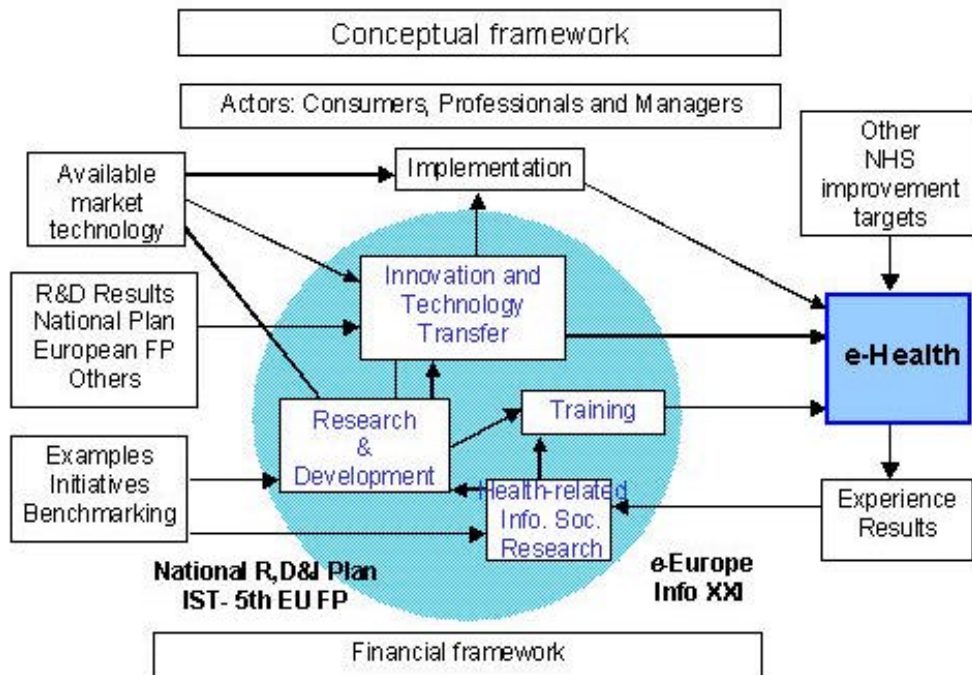

Figure 2. Action-policy model based on strategic elements of: Research & Development; Training; Innovation and Technology Transfer; and Health-related Information Society Research

2. Elements of action

Effective implementation of e-health strategy doubtless requires a great effort in terms of infrastructures and statutory regulation. However, in order to transform this potential into reality and maximise the value of technological resources, strategic actions are also required in areas such as research and development, promotion of human resources and innovation, with transfer of applications to the health sector.
Figure 2 shows the action-policy model with its ability to influence the transfer process linked to the mere workings of current market forces.

In this process full use can be made of the capabilities of the Carlos III Institute of Health, as an instrument at the service of the National Health System to provide impetus for and co-ordinate this type of activity.

In this context, a series of potential lines of action are listed. These have been suggested in order to foster the development of e-health in Spain and have been grouped under the following heads:

- General measures
- Research and Development Actions
- Education, Training and Teaching Actions
- Technology Transfer and Innovation Actions

3. General measures

- **A Strategic Health Information System & Technology Plan** to be drawn up at a national level, under the leadership of the Health Authorities, basically the Ministry of Health & Consumer Affairs, in collaboration with the various Autonomous Regions and the Private Sector, focusing on two basic points: 1) a framework for interoperability, and 2) creation of basic infrastructures.

  The drawing-up of a Strategic Health Information System & Technology Plan

- Accompanying the above: a common interest platform to be set up. Establishment of a united approach, which would bring together and incorporate all the different sectors and forces interested into something that could be called a **Sector Agreement** for the development of e-health in Spain.

- Establishment of a collaborative framework for research, development and innovation in the sector, with the participation of representative corporate sectors (Pharmaceuticals, Information Technologies, Telecommunications, Multimedia Content), to be co-ordinated by the Carlos III Institute of Health

  Establishment of a collaborative framework for research, development and innovation in the sector

- Programme to facilitate Internet access for health professionals, especially those engaged in research activities and Internet II access.

- Measures to be sponsored by the National Health System itself to encourage and facilitate Internet use by the general public for their dealings with the National Health System, e.g., plan to furnish e-mail addresses and free Internet access.

4. Research & Development Actions

Full use to be made of the capabilities of the National Plan, European Programmes and other sources of support. A basic aspect to be developed here is the function of «Health-related Information Society Research», which enables strategic decision-making elements to be obtained in this field, through analysis of experiences with initiatives in other countries (following, for instance, the benchmarking approach proposed under the e-Europe Action Plan), taking advantage of studies undertaken as a result of different initiatives, public and private, along with analysis of the experience here in Spain. In this plan, use can also be made of the capabilities of the Carlos III Institute of Health and other organisations, such as the European Commission's IPTS, or specialised foundations and institutes.

In particular, it is proposed that:

- a boost be given to increased Spanish participation in the IST Programme of the 5th European FP, EUREKA, and other EU Programmes;
- mechanisms of action proposed in the National R,D&I Plan (2000-2003) be activated;
- healthcare-application research be promoted for end use by citizens and patients -particularly senior citizens- in a daily-life setting;
- research be conducted into advanced telemedicine applications for relevant health problems; improvements in continuity and access to services; and,
- research be conducted into advanced e-health tools for clinical research purposes.

5. Education, Training and Teaching Actions

- Design of e-health training programme for healthcare professionals.
- R&D of flexible, virtual distance-based health training systems.
- R&D of education and teaching content.

6. Technology Transfer and Innovation Actions

- Identification and dissemination of best practices. Research into the establishment of benchmarking criteria, including questions of security, data protection, and confidentiality.

- Research into criteria to assess the quality and authenticity of health-related information furnished over the Internet.

- Dissemination and awareness-raising targeted at standardisation and interoperability, and also addressing the matter of the public/private-sector interface.

- Cooperation with Latin America.

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