PROJECT PRESENTATION PLAN

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INFORMATION SOCIETIES TECHNOLOGY
(IST)
PROGRAMME

PROJECT PRESENTATION

IST-2001-37778 WEALTHY

Wearable Health Care System

SUMMARY

A new concept in healthcare, aimed to providing continous remote monitoring of user vital signs, is emerging.
The smart material in fiber and yarn form endowed with a wide range of electrophysical properties (conducting, piezoresistive, etc) will be integrated and used as basic elements to be woven or knitted in fabric form. The simultaneous recording of vital signs will allow parameters' extrapolation and inter-signal elaboration, that contribute to make alert messages and synoptic patient table. WEALTHY system will be implemented by integrating computing techniques, smart sensors, portable devices and telecommunications, together with local intelligence and decision support system. The proposed system will assist patients during rehabilitation or subjects working in extreme stressful environment conditions, ensure continous intelligent monitoring.

Setting the Scene

WEALTHY has the aim to set up a comfortable health monitoring system for data recording which will be able to give intelligent patient feedback and deliver appropriate information to target professionals and in case of emergency will trigger off alert functions. This will be based on a "wearable" interface, enabling a data transfer between the human wearer and a computerized system. This interface will be implemented by integrating smart sensors (in fiber and yarn form), advanced signal processing techniques and modern telecommunication systems on a textile surface. The aim is a wearable and wireless garment which is able to detect user-specific physiological signals and to transmit them wherever wanted.

This new health monitoring system may be used in different contexts: at home, at work; during outdoor activities as well as in hospitals or rehabilitation centres. Users with health risks or during rehabilitation will find a comfortable and assuring health system accompanying them in their daily activities.

Approach

Monitoring of patient's health status for early disease detection and preventive treatment is the main goal of WEALTHY. This will be a **cost-effective**, **non-invasive** wearable system, based on flexible and smart technologies adapted to the human body. The system is focused on the development of **new sensor technologies** as well as **intelligent decision support systems**.

Ubiquity and user friendliness, the two ingredients of the "*ambient intelligence*" concept defined in the **IST Programme** vision, are as well the core assets of WEALTHY:

- The objective of ubiquity is perfectly fulfilled by the characteristics of the WEALTHY

application, which ensure the availability of data and service *anywhere* (at home, at work, during rehabilitation activities) and *any time*: the garment produced by WEALTHY will be comfortably wearable even during night time when sleeping.

- User-friendliness is considered within two perspectives: the non-invasive characteristics of the WEALTHY equipment (it will be tailored as a comfortable shirt) and a friendly interface for professionals. Due to the high level and heterogeneity of technologies, technical compatibility is the primary feature for making the system feasible and effective.

WEALTHY meets the three main societal needs in the framework of the KEY ACTION 1 "**Systems and services for Citizens**" as the system is designed to:

- provide an integrated view of normal and abnormal patterns of activity which would be otherwise impossible to detect by recording each signal in different time, in situations that are usually uncontrollable by *physicists*.

- improve the quality of care for *patients*, by monitoring health status during rehabilitation activities, allowing patients to perform their everyday activity.

- perform early monitoring of *professional workers* operating in extreme environmental conditions, the system will also serve *citizens* as a preventive tool in case of critical state of health.

WEALTHY addresses not only the priorities of KEY ACTION I.1.1 **"Intelligent system for the monitoring of health status"** but also those of KEY ACTION I.2.1 "**Systems for independent living**". Successful results of this proposal will not just be limited to the pilot user categories, but in addition will help various categories of people, including impaired persons and elderly people, to partially or completely find the way back to an independent way of living. This also entirely meets the requirements of the Programme. WEALTHY may also be applied to other fields, such as active sports, fitness, rehabilitation, automotive context.

Finally, WEALTHY perfectly matches the objective to foster closer collaboration between academic and industry driven research activities in biomedical engineering, advanced microelectronics and communication technologies as well as health telematics and to speed up end user applications.

WEALTHY system is oriented towards the development of intelligence in the management of health data; it is person-centred. Therefore the structure of the project, the related innovation and the objectives are toned with the philosophy of the next **6th Framework Programme.**

Results and Achievements

The WEALTHY activity is planned over 30 months and is organised in three main phases:

1. specification
2. implementation
3. validation

As a result of the user needs and technological requirements the specification of the wearable health monitoring system will be defined, as well as the pilot application.
The following steps need to be considered:

- **Development of a new multifunctional fabric, integrating smart material in form of fiber or yarn:** advanced textile technology will be used considering comfort and fitting.

- **Development of the portable part in charge of medical signal recording as well as information and communication management** . The implementation of the future UMTS standard will be examined.

- **Data processing and representation module** will perform the recording of physiological parameters, diagnosis, feedback to the patient and to the medical team. Security mechanisms will be implemented to control the access and manipulation of data and to protect sensitive information.

Major Innovations

The WEALTHY project presents two main innovations: the new type of sensors manufactured in textile form to provide a smart and comfortable textile interface, and a new service based on the monitoring system.

In terms of technological innovation, WEALTHY will focus on the following issues, which provide several progress steps compared to the current state-of-the-art:

- **"Smart" garment fabrics will be developed and tested:** these will allow the sensing and pre-processing steps to be "wearable", thus increasing the mobility and safety of the user, and limiting the amount of data to be transferred .

- **Direct wireless communication over the public network:** real-time data transfer will be made possible from anywhere the patient is located, and not limited to home or hospital.

- **Intelligent decision support system:** userfriendly interfaces will help the interpretation of physiological signals by medical staff and help them taking the right decisions.

- **Miniaturisation and power consumption:** this issue will also be addressed by the project in order to make the design portable.

The possibility of simultaneously recording various physiological signals will provide an integrated view of normal and abnormal patterns of activity which could be otherwise impossible to detect by recording each signal in different time.

It must be outlined that the possibility of recording physiological variables in a “natural” environment may help to identify the influence of psycho-emotional factors while the user is performing a physical activity..

A further innovation is the in-context data interpretation. While a simple telemonitoring

system would just transmit or record real-time physiological signals, the WEALTHY system will be able to process physiological parameters in context, so that appropriate feedback can be given to the patient.

The proposed solution represents an innovation in products and processes compared to the present state of the art.

Ethical and social issues

WEALTHY addresses one of the most burning issues in telemedicine and healthcare systems which is to improve the early disease detection and to show when medical intervention is necessary.

WEALTHY equipment will be extremely comfortable and fitting. Together with the safety aspect - various interactions with the doctor - will provide the patient with the necessary confidence and give him a reassuring feeling.

The monitoring of the daily physical activity of high risk patients with cardiovascular problems can be extremely useful to provide an instant feed-back to the person affected. Important information may be transferred to a remote medical operator, in order to achieve an optimal recovery reducing hospitalisation and ensuring a rapid integration in normal life after a surgery for instance.

The WEALTY Service will also be used as a preventive instrument for monitoring the health status of patients during their rehabilitation , for professional sportsmen engaged in (intense) physical activity (sports – cycling, skiing, climbing, diving, etc) or for professional workers in extreme environmental conditions (fire fighters, rescue operators, ...)

Innovation and employment opportunities

WEALTHY is a great opportunity to demonstrate the competitiveness of the Industrial district of Prato by pushing ahead technological research and following up with new strategies. This will stimulate investments in order to plan for the future, creating new advanced know how and skills and acting as a model for the rest of the district.

Up till now the progress of the Italian textile system has been principally based on its creativity in producing high quality products. Due to the lack of patent ownership and negative know how transfer, competition is increasing while the original industrial structure is decreasing.
The companies of the district have not invested sufficiently in activities that will affect the long term production, and, due to the sector crisis, also research for the short-term production is decreasing, as no investment actions are carried out. This scenario depicts a situation in which there is a clear need for a long-term research program to innovate new products and processes in order for the region to survive.

To start this process of evolution, it is necessary to select the companies able to invest also for long-term research activity. The rise of these companies will lead to an enrichment of the technology of the entire sector, as a consequence of the typical emulation process of the small factories toward the big ones.
Within this perspective, the duo "innovation-employment" is evident: increased competitiveness will open new markets by fulfilling the emerging demand for "smart" products. These conditions will cause a cascade effect, and work opportunities will follow being characterised by a high level of qualification. In Italy, this situation is particularly desirable since the country has one of the highest

unemployment rates in Europe.

Target Markets

The target groups can be described as follows:

1. Patients with cardiovascular diseases or pulmonary disorders all over Europe.
2. Hospitals, medical doctors, general practitioners: the buying staff of important hospitals for cardiovascular diseases and pulmonary disorders
3. Lead users: reputed doctors
4. Insurance companies and social security institutions
5. Existing and future service providers: e.g. Philips Telemedicine Service, Medgate
6. Medical associations: e.g. European Cardiology Society, European Respiratory Society etc.
7. Active sports associations and professional clothing associations
8. Manufacturers in the garment industry, medical device industry
9. Consumer oriented institutions in the healthcare sector
10. Exhibitors and visitors of Messe Frankfurt-Avantex and of other medical related events in Frankfurt (Allergica, DialogDiabetes and LifeTime) and co operation partners of the Avantex (for example Telemedicine & Telecare – International Trade Fair in Luxembourg), partners of the scientific committee of Avantex; research institutes and highschools.

In Germany there will be a new accounting system set up with the beginning of 2004 – the so called Diagnosis related groups. Every hospital receives special tariffs for the treatment of the respective disease. The aim is to increase the volume of patients and to reduce the number of in-patient days. This is a crucial change getting obligatory from the beginning of 2007. Patient empowerment will then be a vital parameter and new healthcare systems for medical prevention and rehabilitation like the WEALTHY system becoming even more important

Contact Details

Project Name:

Wealthy: Wearable Health Care System

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"Intelligent system for the monitoring of health status" and *"Systems for independent living"*

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