ATHEALTH CENTER – DEVELOPMENT OF SUSTAINABLE CAPACITY OF THE CENTER FOR APPLIED TECHNOLOGY RELATED TO HEALTH

GOOD PRACTICE - PROJECT

European Union
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Contents

Introduction to the Good Practice:

This project responds to the need for developing the capacity of faculty interdisciplinary center for applied research and innovative technologies related to health. As a result of project activities the previously missing environment for the deployment of virtual infrastructures, remote sensing and mobile applications was ensured in an university in cooperation with local business. The center became the basis for building a network of virtual laboratories for remote monitoring at national level. The use of mobile devices allows access to the information and equipment at the principle of availability 24/7, which is crucial for the effectiveness of continuous monitoring.

Problem:

1. Applied research centers in Bulgaria face serious limitations in their activities due to lack of funding to expand the extent of the research programs of applied nature.
2. There are not enough funds for investments in modern equipment, or for upgrade existing infrastructure to optimize the technology to carry out research and development.
3. The need for technological equipment was the major constraint to the continued expansion of the innovation center in the direction of remote and mobile monitoring is.

Solution:

As a result of project activities the center provides opportunities for the realization of cloud services. Thanks to their base and applying virtual infrastructures it became the basis for building a network of virtual laboratories for remote monitoring. The use of mobile devices is allowing access to information and equipment to implement the principle 24/7, which is crucial for the effectiveness of continuous monitoring in home care. The project created capacity for continuing education nationally in the field of providing distance monitoring of health in home care.

The Center organizes annual scientific conferences «Innovation & Business», an event which brings together professionals from the academia, high-tech business, and organizations involved in healthcare services towards the creation of innovative tools, services, and solutions in support of healthcare activities, improving the quality of life of patients with special needs, and facilitating the activities of organizations that provide support to patients in their homes as well as to their families.

Impact:

The Applied Technology in Health center carries out interdisciplinary research and technology development activities that consolidate knowledge accumulated in the areas of healthcare, telemedicine, information and communication technology. These activities aim to create high-tech tools and services in support of the prevention, diagnostics, and treatment of diseases with pronounced social significance. The main efforts are focused on the development of advanced methods for breast cancer diagnostics, technological support to the diagnostics of the Alzheimer's disease, the detection of negative emotional states and neurological disorders, stress level assessment etc. The Center coordinates and supports national and international projects, and organizes training courses, workshops, and scientific events. The project is important as an opportunity to create a center supporting the development of e-health within the structure of the University and in partnership with other universities and businesses that provide services in the field of non-hospital care. As a leading partner the Technical University Varna (the second in Bulgaria) links the three key factors needed to build a dynamic economic model, sustainable development and jobs - education, research and innovation, according to the National Roadmap for scientific infrastructure (in Bulgaria) and thus be part of the nationwide interests of the Republic of Bulgaria. The center offers open access of scientists, scientific groups and partners from universities, medical centers and the private sector with the aim of developing joint projects in the field of home care.

1. Relevancy of the Good Practise (GP) project

The “Relevancy of the GP project” section provides quick check and definition of its relevancy in regards to HoCare project objectives.

Good practice of quadruple-helix cooperation in R&I?	Yes, this GP project includes good practices of quadruple-helix cooperation in R&I
Good practice of delivery of Home Care R&I?	Yes, this GP project includes good practices of delivery of Home Care R&I.
Generation of innovation in home care through answering unmet needs identified by formal or informal healthcare providers?	Yes, this GP project includes good practices of innovation through answering unmet needs.
Generation of innovation in home care through public driven innovation?	Yes, this GP project includes good practices of public driven innovation.
Generation of innovation in home care via quadruple-helix cooperation for quicker delivery to the market?	Yes, this GP project includes good practices of innovation via cooperation for quicker delivery to the market.

2. Quick overview of the GP project

The “Quick overview of the GP project” section provides initial overview of the good practice project (GP project) and enables readers to see if this GP project idea is relevant for possible transfer to their organization potential innovation activities.

Name of the GP project	ATHealth - Development of sustainable capacity of the center for applied technology related to health
Region of origin of GP project	Bulgaria
5 keywords that best describe the content of the GP project	Creating an environment conducive to the development of innovation in support of Health An incubator for innovative technologies in support of health. Forming strategic partnerships and interdisciplinary community
Relevant Programme name through which the GP project has been funded	Operational programme "development of the competitiveness of the bulgarian economy" 2007 – 2013 (Оперативна програма „развитие на конкурентоспособността на българската икономика" 2007-2013)
Relevant support programme / intervention area name of the GP project through which it was funded	"Development of applied research in research organizations in Bulgaria" (BG161PO003-1.2.04 „Развитие на приложните изследвания в изследователските организации в България“)
Single or multiple recipients?	single recipient
Type of lead recipient and its role (SME, LME, research centre, innovation centre, network/association,	University

university/school, municipality, other public body, other (specify)	
Types of participating partners and their roles (list all participating partner types. E.g.: hospital, social house, senior house, patient association, networks, SMEs, LMEs, research actors, business supporting organizations, public institutions/regulators, other (specify)	n/a

3. Transferability

The "Transferability" section provides more detailed review of strengths and weaknesses of this GP project including description of necessary basic conditions for region and leading organization to potentially transfer it. At the end of the section, the key threats in the successful transfer open up possibility to focus on specific relevant issues important for the successful transfer.

Strengths and weaknesses of the project

What are the GP project strengths? Why it was funded?	This project responds to the need to develop the capacity of faculty interdisciplinary center for applied research and innovative technologies related to health. As a result of project activities the previously missing environment for the deployment of virtual infrastructures, remote sensing and mobile applications was ensured The center became the basis for building a network of virtual laboratories for remote monitoring at national level. The use of mobile devices allows access to the information and equipment at the principle of availability 24/7, which is crucial for the effectiveness of continuous monitoring.
What are the key weaknesses of the GP project?	The analysis of the project shows that research and teaching are often competing for the same financial and time resources. Despite the improved interaction between research and education there are not yet enough closer relations between researchers and entrepreneurs for joint research, which would be realized with the development of the infrastructure of the center.

Basic conditions for successful transfer

Why is this GP project transferable? – innovation, impact, financial, legal, and timeframe aspects	The project might be transferred as it has a high impact level of the good practice for tackling needs in countries in which the pro-innovation environment is still in process of development. The relevance of the development of similar innovation centers is summarized as: • Creating opportunities for the Initiation of new application projects based on advanced infrastructure for collection, processing and analysis of data relating to the parameters of the internal environment that affects the health of people. • Ensured conditions for the analysis of the collected data will lead to improved quality of service in health and prevention based on increased success rate in detecting and diagnosing the causes of diseases. • The environment created for receiving real-time data will lead to opportunities for creating new methods for remote diagnosis and telemedicine development and to implement the remote control of the parameters of the working environment.

	• The integrated environment created for computer modelling and simulations will expand contacts of the applied research center internationally. • it will improve the conditions and methods for qualification and training of students and other professionals from the quadruple-helix
What are the basic conditions the region needs to have to be successful in transferring this good practise?	The project requires no specific conditions to be transferred.
What are the basic conditions the leading recipient from the region needs to have to be successful in transferring this good practice?	To benefit from the project the leading recipient should involve more representatives from the quadruple-helix system to ensure a quicker access to the market for the services which delivery will be ensured by the project.

Key threats in GP project transfer

What are the key potential threats for the GP project transfer?	In Bulgaria the cooperation between the academia and the business are still very weak and this projects just puts a base for a similar cooperation. The lack of tight liaisons between the academia and the market are the main obstacles in transferring the project.

4. Description of the GP project

The “Description of the GP project” section provides more detailed information on the Good Practice project (GP project) and enables readers to get further detailed inspiration and easy ready-to-use information for possible innovation transfer to other project applications. This includes: tackled problem, time length of the GP project, objectives, phases, activities and deliverables of the GP project, its main innovation and target group.

Description of the tackled problem

What was the problem / challenge tackled by the project?	There are no conditions for providing remote monitoring, which allows the observation and monitoring of environment and of biometric indicators, especially in the provision of home care. This determined the need for project activities to create infrastructure through the purchase of equipment which allows using different types of high-tech detectors to be collect (on-line) in real time information on living conditions in working or learning environment and basic biometric parameters. This information will be transmitted based on TCP / IP protocols to high-performance cluster system, where they will organize its storage in a database. They will be used for subsequent analysis, simulation and forecasting of the factors of the living environment. The participation of students in the work of the center guarantees a multiplier effect. Combining the capabilities of modern detectors to control the conditions of living environment, as well as sensors for monitoring biometrics to transmit collected information via protected communication channels in reliable remote servers provides the basis for the development of diagnostic telemedicine. The center collects information on key indicators such as humidity, air temperature, dust, noise, background radiation work, school or recreational health protection, indicating the influence of the working capacity of the working staff. With the purchase of the planned equipment the center for applied technologies in health ensures the monitoring of these parameters and the measurement of important biometric data on workers, employees, students or recovering health patients that will be carried out remotely via Internet and mobile devices. This will allow access to information on the principle of availability 24/7, which is crucial for the effectiveness of continuous monitoring.

What were the reasons for the problem?	Applied research centers in Bulgaria face serious limitations in their activities due to lack of funding to expand the extent of the research programs of applied nature. There are not enough funds for investments in modern equipment, or for upgrade existing infrastructure to optimize the technology to carry out research and development. A major constraint to the continued expansion of the innovation center in the direction of remote and mobile monitoring is the need for technological equipment.

Time length of the GP project

What was the time length of the GP project in months?	18 months

Objectives of the GP project

Describe the overall and specific objectives of the GP project	The project is in accordance with the priority axis "Development of economy based on knowledge and innovation" and area of impact "Improvement of the pro-innovative infrastructure" Operational Programme Competitiveness. The activities covered by the project are to support the renovation of applied research equipment of the Interdisciplinary Centre for Technology for health (ITSTZ) (ahc.tu-varna.bg). The equipment acquired from the funding under this procedure is used only for non-economic activities. The project is in line with the priorities of the operational program concerning the application of technologies for health: - Providing education qualification of human resources in the field of technology related to health through the development of learning environment in the faculty center; - Implementation of independent research and development (R & D) in the field of measuring the factors of environment and its influence on biometric identifiers - Better understanding of the opportunities of technology to create a high quality of life. - Development of the basis for research and development activities in collaboration with the Medical University of Varna, businesses, medical centers and European universities. - Dissemination of results of operations. The specific objectives of the project aim for upgrading the infrastructure of the center and the creation of high-tech capacity for applied research, verification and implementation in practice of technology related to health: - Upgrading the center with 8 newly equipped working places and training activities related to the evaluation of the quality of the environment (temperature, humidity, radiation pollution, illumination) and their remote tracking sensor networks and mobile Internet access. (Laboratory of sensor networks). - Development and equipment of the center with measuring stands for calibration of instruments for measuring and assessing the environment (Laboratory for Embedded Systems); - Equipment of two working places for the Study of biometric identifiers in the laboratory of Biomedical Engineering Center; - Purchase of cluster structure for the integration of laboratories in the center and high-speed data processing (Laboratory of digital signal processing) ;. Further development of the material base of the center with modern equipment for remote measurement of parameters of the environment and computing improve opportunities for application and development and improve the efficiency of cooperation with the Medical University - Varna, international partnerships and links with businesses in the field of providing home care.

Phases, activities and deliverables

List all main phases of the GP project including their time length	1. Organization and management of project activities – 18 months 2. Purchase of new equipment – 6 months 3. Purchase of materials and supplies – 4 months 4. Commissioning of equipment, conducting R & D activities – 5 months 5. Dissemination and Visualization Project – 18 months
List and describe all **main activities that were implemented by the GP project**	Activities in the project proposal are grouped into three stages: 1. organization of acquisition of fixed assets through the preparation and conduct of public procedure PPA organized by the Technical University of Varna (within the first 6 months) of expert tenders • A system for collecting and processing data - the system provides automated (in dialog mode) or automatic (independent) data collection with the help of sensors of different types and using integrated software. It creates an opportunity for developing applications with graphical programming and transmission of information by radio to cover the frequency ranges FM radio, GPS, GSM, radar and ISM. • Wireless sensor network, with various sensor nodes with router • laboratory test rig - 8 stands • Complete workplace for calibration of sensor modules to control environmental parameters • Cluster Server • Monitor blood pressure (BP) and electrocardiogram (ECG) • ionization camera / detector for X-ray and gamma rays • electrical safety analyzer • Phantom breast The phantom used for the validation of different methods for the preparation of X-ray transmission imaging, computed tomography, digital tomosynthesis and others. 2. integrating and commissioning of the purchased equipment (months 6 and 7) Purchase of materials and supplies • sensors for ambient temperature • Sensors for relative humidity • Sensors for atmospheric pressure • Sensors for gases - CO2, CO • Sensors for lighting • Sensors noise • Sensors for radiation • Sensors for speed air flow • Counters of particulate matter in the air • Batteries for wireless sensor modules. 3. R & D and application development projects (months 8-18) Commissioning of equipment, conducting R & D • Installation and configuration stands in the laboratories of the center • organizing job training and applied research activities • Integration and adjustment of the equipment in the center of this remote measurements • configure virtual infrastructure that supports parallel operation of individual components of the center; • Building an effective secure remote access to the center; • building a database for analysis, simulation and forecasting of the factors of the living environment. In parallel with these activities throughout the duration of the project project management activities have been implemented together with dissemination of results and training of the staff of the center and young professionals to work with new equipment under the guidance of the manager and the coordinator of the project.

	Activities related to informing and attracting businesses and target groups aimed at attracting partners and organizing application and development center for technology related to health have also been held.
List all main deliverables of the GP project	The need for the project activities are motivated by the urgent need for the creation and development of new knowledge about human health through the application of modern technologies of electronics and communications as a tool to achieve competitive advantages. The faculty center achieved to upgrade the infrastructure to implement modern technologies for remote monitoring and mobility access in the evaluation of the living environment and its influence on people, which is necessary for improving the quality of life, to build an economy based on innovation activities implemented in healthcare. As a result of project activities the center provides opportunities for the realization of cloud services. Thanks to their base and applying virtual infrastructures it became the basis for building a network of virtual laboratories for remote monitoring. The use of mobile devices is allowing access to information and equipment to implement the principle 24/7, which is crucial for the effectiveness of continuous monitoring in home care. The project created capacity for continuing education nationally in the field of providing distance monitoring of health in home care.

Main innovation of the GP project

What was the main innovation of the GP project?	The project is important as an opportunity to create a center supporting the development of e-health within the structure of the University and in partnership with other universities and businesses that provide services in the field of non-hospital care. As a leading partner the Technical University Varna (the second in Bulgaria) has the opportunities to link three key factors needed to build a dynamic economic model, sustainable development and jobs - education, research and innovation, according to the National Roadmap for scientific infrastructure (in Bulgaria) and thus be part of the nationwide interests of the Republic of Bulgaria. The center offers open access of scientists, scientific groups and partners from universities, medical centers and the private sector with the aim of developing joint projects in the field of home care. The availability of highly qualified specialists in medical electronics and wireless sensor networks in the faculty ensure the high level of research and direct application of developments in the health sector and especially in the home care solutions.

Target group of the project

Who was the main target group of the GP project? (SME, LME, research organization, university, public institution, healthcare provider, business supporting organization, other (specify)	The target group of the project were universities, SMEs, other research organizations, public institutions, healthcare providers and social services providers.
Describe the main target group	The areas of the economy that have an interest in such remote monitoring of the conditions of the working environment and biometric indicators personnel are mainly high-tech industries in industry, health, information and communication sectors in the food industry, training institutions, tourism. Analysis and processing of data contribute to creating measures to improve the quality of living environment at work, schools and health facilities. It raises the level of preventive

	measures related to occupational health and hospital recovery and is of direct use of providers of home care services. Obtaining data in real-time mobile access leads to opportunities for creating new methods for remote diagnosis and to carry out remote control of the parameters of the living environment for SME delivering services or developing SAAS products for the home care industry.

5. Impact

The “Impact” section provides more detailed information on the effect of the GP project implementation and dissemination of major outputs.

Impact

What was the level of geographical impact of the GP project? (village, city, county, country, international, other (specify)	The project has a national impact.
What were the final impact indicators including their quantification?	Obtaining data in real-time mobile access create opportunities for implementing new methods for remote diagnosis and to carry out remote control of the parameters of the living environment. An important part of the project lies in increasing the quality of ongoing applied research and qualification of the research team. It is envisaged that this be done through exchange of experience and best practices. The integration of wireless sensor networks in technological applications for remote monitoring of the working environment helps to raise standards in disease prevention and improving the quality of services in major health-related as industry. The purchased equipment of the center has the potential to make it become a regional development center. The geographical location allows to expand cooperation in technology for health across Bulgaria. The relevance of the development of the innovation center is summarized as: • Initiation of new application projects based on advanced infrastructure for collection, processing and analysis of data relating to the parameters of the internal environment and affects the health of people. • Analysis of collected data leads to improved quality of service in health and prevention based on increased success rate in diagnosing the causes of diseases. • Receiving real-time data leads to opportunities for creating new methods for remote diagnosis and telemedicine development and for implementing the remote control of the parameters of the working environment. • The creation of an integrated environment for computer modelling and simulations expand the contacts of the applied research center internationally. Indicators for results: Development of a center for technology related to health (number) - 1 Use of the center as a laboratory base in the learning process - Stands for research and development (number) – 6 items R & D projects implemented with the help of the supplied equipment for applied research (number) – 3 Supported renovation projects of applied research equipment at research institutions and universities (number) – 4 Number of established R & D jobs (number) - 2
Describe the changes	The project ensured the conditions needed for applying new technologies to help

resulted from the project activities	diagnosing diseases with great social significance, rehabilitation and improvement of quality of life and helping the prevention of socially significant diseases. It supported the research aimed at the development of methods and technological aids for early diagnosis of cancer (breast cancer), detection of negative emotional states, for assessing stress levels, for recognition of events, episodes and behaviors associated with neurological disorders (through brain-computer interfaces), sleep disorders, emotional and behavioral disorders, cognitive disorders, neurological degenerative diseases, epilepsy, and others. The project enabled the creation of a database of biomedical signals SLADE (EEG, ECG, and GSR) and ensured the pre-conditions for implementing different studies regarding the suitability of different types of sensors.

Dissemination of outputs

Describe dissemination activities of the project outputs carried out during the GP project	Dissemination and visualization activities within the project included: • preparation of information materials • creation of a website • organizing open days • organizing courses for training of specialists • developing electronic information portal and publications in electronic media • publishing reports of applied scientific conferences and publications in scientific journals

6. Risks

The “Risks” section provides more detailed review of potential risks of this GP project implementation including their defined mitigation strategies to eliminate them.

Describe risks involved in implementing this GP project including their mitigation strategies	The risks are minor and relate primarily to strengthen the innovative potential of the center and whether building a pro-innovative infrastructure will strengthen the relationship between science and business faculty and university. No mitigation strategy has been planned.

7. Budget

The “Budget” section provides more detailed review of costs regarding the project implementation as well as operational sustainability after its end. In addition, if relevant, public tenders within the project and additional generated incomes by the project are showed and explained.

Budget

What was the overall budget of the project in EUR?	239354 EU
List relevant budget lines of the project including their % share from total budget	The whole budget has been planned for acquisition of fixed assets and materials. 246768 EU has been planned for tenders related to the above – more than 96% of the contracted amount.

Additional income generated by the project

Did the project create any additional income?	no, the GP project did not generate additional income
If yes, specify which type of income and what amount in EUR?	N/A

Public tender

Did the project include any public tender?	yes, the project included a public tender
If yes, specify what kind of contract (specific contract, general contract, other)	There was held an open tender procedure
If yes, specify in what amount in EUR	The amount was 246768 EU
Describe the public tender subject	Type of procurement: Su - Delivery Type of tender: Open procedure under PPA Subject and object of the contract: 1. A system for collecting and processing data 2. wireless sensor network, with various sensor nodes with router 3. Laboratory measuring stand 4. Complete workplace for calibration of sensor modules to control environmental parameters 5. Cluster Server 6. Monitor blood pressure (BP) and electrocardiogram (ECG) 7. ionization camera / detector for X-ray and gamma rays 8. Analyzer electrical 9. Phantom of the breast 10. Sensors 11. Batteries

Financial sustainability after GP project end

Was there an operational financial sustainability plan in the project after its end?	yes, the GP project included an operational financial sustainability plan
If yes, specify where the operational funds after project end came from?	From own funds of the University
If yes, specify the amount of operational funds in EUR	N/A

8. Other information

In this section, specific additional information about the GP project could be revealed.

Please describe any other relevant information about this GP project (if relevant)	As a result of the project implementation a regular annual business and academia partnership scientific conference started to be held “Innovations and business” that gathers together participants from the quadruple helix and promotes the implementation of new applied technologies for health and home care.

9. Information gathered by …

The information about this good practise (GP) project has been gathered for the purpose of the HoCare project (Interreg Europe Programme) by the following organization:

Region	Bulgaria
Organization name(s)	Business Agency Association (Сдружение Бизнес Агенция)
Name of the contact person(s)	Silvia Stumpf
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Business Agency Association – www.vba.bg