**Asia-Pacific
Economic Cooperation**

Project Final Report

**Symposium on "Promoting Human Security in APEC: Development
of e-Health Systems as a Tool for Management in the Health Area of
APEC Economies"**

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Introduction

APEC economies pay great attention to the introduction of e-health systems, their development and improvement on the national level. As a result of the lack of experience in the implementation of electronic systems in general, many APEC economies do not have sufficient capacity to gain experience in e-health on their own.

E-health has been discussed multiple times in APEC over the years. Mainly this issue was addressed by Counter-Terrorism Task Force and Telecommunications and Information Working Group. However, Health Working Group has paid the most attention to the topic. APEC held different workshops and technical forums on e-health, such as "Enhanced APEC Health Communications: Collaborative Preparedness in Asia Pacific" (United States, 2008); Workshop on e-health in APEC (Korea, 2009); APEC Workshop on innovative "telehealth" (Taipei, 2009) to name a few.

They have significantly contributed to the exchange of experience and knowledge in this area within APEC.

Continued work in this area is crucial.

The main objectives of the project entitled "Promoting Human Security in APEC: Development of e-Health Systems as a Tool for Management in the Health Area of APEC Economies" were:

- To exchange experience and best practices on implementing e-health systems in various APEC economies;
- To discuss the principles of e-health systems depending on the level of economic and technological development in various regions;
- To share the advanced development of e-health systems, their use and management as a tool for monitoring the health of a person.

Experience exchange and recommendations on e-health systems implementation in different APEC economies ultimately affect people's health, being one of the most valuable things. It is further proposed to consider the existing options for organizing, use and management of e-health systems, their development in various APEC economies and the existing technologies for mobile health monitoring.

Outcomes

Exchange of best practices on implementation of e-health systems in various APEC economies and Recommendations

The purpose of the symposium on "Promoting Human Security in APEC: Development of e-health systems as a tool for management in the health area of APEC's economies" was the exchange of best practices in the area of health care management and the development of recommendations to be used in APEC economies.

Three main topics were discussed within the symposium:
• Experience in creation of the government information systems in health care;
• Information technology currently applied in health care in APEC economies;
• Advanced development of e-health systems, their use and management.

Productive discussion allowed to gather information on the experience of creation of the different health information systems in some APEC economies, and also to make the following recommendations:

China

Health care system in China is divided into medical and health care.

China established Center for Disease Control operating at the national and provincial levels. Chinese government considers information technology in relation to the health care reform in order to improve the efficiency of health care delivery. Prior to 2003, computers were used only in certain institutions. After 2003, China encountered a problem of information exchange between health units and government. Due to compulsory insurance reform completion the patients flow has increased leading to difficulties in hospitals, therefore it was necessary to actively introduce the information systems.

The government has initiated a pilot project in this area. Regional information monitoring system proved to be very contributing as the managing tool and successful for the health care reform. It allowed distributing resources properly and solving the problem of hospitals excessive workload.

Research and preparation:
1. Before 2009, the Ministry of Health developed some electronic health records data set standard, guidelines for Regional Health Information Network and encouraged pilot study.
2. In 2010, the government selected Shanghai, Zhejiang, Anhui, Chongqing, and Xinjiang to adopt Regional Health Information Network.
3. In 2013, it is planned to set up Regional Health Information Network in 134 prefecture city and 387 counties.

China has established unions of various medical institutions. To address the issue of great number (over 5,000) hospitals interaction, patients were given a special card that allows receiving services in any hospital related to this union. Also, this card enables patient data exchange and can be used as a universal payment tool. Hospitals can conduct teleconsultation as well.

China has not introduced integrated electronic health system yet. Provinces and prefectures adopted separate systems of e-health. The information is collected and isolated from system to system. In most cases cards of specific medical institutions are used. They differ in their purposes (Insurance card, Hospital card, Immunization Card, Debit card etc). Thus the problem of common health care hub creation is now urgent in China.

The central government has planned to interconnect all the regions in order to take this system from the county and township to the prefecture level, and then centralize it establishing the exchange of information, monitor and evaluation of medical institutions activities.

Recommendations for APEC economies are the following:
1. Increase investments in information technology in health care;
2. Improve medical stuff computer skills;
3. Develop telemedicine;
4. Create a single electronic system standard;
5. Create a single unified electronic patient card and create legal framework for the electronic health records;
6. Enable secure exchange and use of health data in electronic form;

7. Provide enhanced interaction and exchange of information between patients, health care providers, payers, and other stakeholders through electronic systems.

Japan

Japan health care system is highly rated all over the world.

The development of Japan's electronic systems in health care led to a complete transition from paper to electronic medical data, which provided proper circulation of information and the effective management of health facilities. Population has electronic and personal health records that allow effective use and exchange of electronic data. Collection all of the data in a certain system allows the use of National Health Card.

The National Health Card contains information about diseases, treatments and test results. These three main types of information in electronic form help to coordinate various medical institutions enabling standardization of medical data and efficient health care system in general.

Japan actively uses the following methods of diagnosis:

1. Telepathology. With the help of digital technology physician-pathologist remotely provides counseling and diagnosis for various departments of medical institution.

2. Teleradiology enables remote deciphering of various CT or MRI images. For example, the data obtained in the university hospital is then sent to the regional hospitals and clinics. In 2011, Japan ranked first in the world by number of MRI and CT scans as more than 1 million people were examined.

These methods allow significant reduction in time and increase in number of services provided.

As for the protection of citizens' personal data, Japan adopted the law on the medical information protection, providing the medical organizations obligation to carry out a number of preventive measures and to create conditions for information protection for each patient.

Recommendations for APEC economies are the following:

1. Transfer medical records into electronic form.
2. Compile electronic medical records and create a single system of national special card.
3. Actively develop telemedicine in health care based on the use of computer and telecommunication technologies for the exchange of medical information between specialists in order to improve the quality of diagnosis and treatment of specific patients.
4. Standardize medical data.
5. Establish medical confidentiality standards.

Korea

Korea is actively developing mobile healthcare: telemedicine, telehealth, and e-health.

Telemedicine is a recent trend as it is connected with the various communication equipment and systems.

E-health is based on the electronic system, which is based on the Internet.

E-health in Korea is Internet-based and includes medical services and promotion of healthy lifestyle (prevention, diagnosis, treatment and post treatment monitoring, etc.). It uses a variety of technologies, and one of them is a technology called "YOUR HEALTH", allowing carrying out constant sensory recording and monitoring of human health via sensors placed on the various parts of a body. With the help of sensors, data is collected on smartphones and sent to a personal server via GPS, and then it is eventually viewed in the hospitals by the doctors. This technology enables continuous mobile health monitoring that is a systematized construction allowing identifying some health issues with the help of personal health devices.

Practical Configuration of Ubiquitous Health System (u-health):
1. Sensing. Measuring Biological Signals;
2. Monitoring. Filtered and Analyzed Data Display;
3. Analyzing. Long-term Data Storage Trend Analysis;
4. Feedback. Behavior Modification, Emergency Alert, Feedback-Action (Prescription, Exercise, etc).

Technology uses u-health medical sensors, which are:
1. Body Temperature;
2. ECG, EEG, EMG;
3. Blood Pressure;
4. Glucose;

5. HRV, PPG;
6. Respiration;
7. SPO2;
8. EtCO2.

Mobile monitoring system is used on smartphones, tablets, PCs and other wireless devices. A study from Manhattan Research found that 71% of physicians consider a smartphone essential to their practice and 84% said that the Internet is critical to their jobs.

It is also very important for the governmental ministries to collaborate for successful stage-by-stage development of u-health industry and in particular in the following fields:

1. **Development of u-health devices:**
• Composition of u-health industry infrastructure;
• Links of u-health industry with related industry;
• Development of the world best u-health products & services;

2. **U-health network service:**
• Construction of u-health service network;
• Providing the mobile u-health services;
• establishment of the wired & wireless health management system;

3. **U-health law & policy planning:**
• Reform of the healthcare system;
• establishment of new health policies and legal framework, the insurance system by introducing u-health;

4. **U-health smart home service u-health:**
• Conducting u-health service pilot project as part of the u-city project. (three local governments conducted u-health care pilot projects to 4500 patients in early 2009);

5. **Basic research:**
• Establishment of u-health technology infrastructure;
• Research for u-health-related application technology.

Recommendations for APEC economies are the following:

1. Develop low-cost and high-quality health care services with the use of u-health tools (mHealth, communication and image archiving systems, electronic health record, etc.)

2. Conduct a mHealth industry supporting reform through special policies and regulation.

3. Create mHealth legal framework.

4. Use technology transfer and high technology research through strategic cooperation among global corporations.

5. Create technology of medical instruments manufacture for the general use with mobile devices.

6. Develop the provision of health services through telemedicine.

Papua New Guinea

Government of Papua New Guinea implements a strategy for the introduction of the Integrated Government Information System (IGIS), which aims to build health infrastructure that will help to integrate the system and to facilitate the exchange of information. Information and communication technology is one of the six pillars of the National Health Care Plan for 2011-2020.

Outline strategy includes mastering and active use of innovative, developing solutions, and provision of accurate and timely information.

Review and strengthening of the integration of management information systems are the certain aspects of this strategy, as well as creation of the integrated information system for the hospitals and provinces and capacity building of health information in the province and offices.

Papua New Guinea plan for the health system network introduction:

1. **National Department of Health Head Quarters ICT Infrastructure Upgrade (2012)**
• Server Room Refurbishment and hardware/software Platforms, Network & Data communication backbone, Data Security and Backup Strategies, DBMS, VOIP and Video Conferencing. National Health System Radio Network Upgrade.

2. **Procurement and Implementation (2013)**
• Medical Supply System (mSupply), Integrated Hospital Information System, Clinical Decision Support System, Clinical Coding Applications, Administrative DBS/Software Applications and Web Applications and Services.

3. **Building of PHA & Hospitals ICT Infrastructure (2013-2015)**
• Building Data communication networks (LAN & WAN).
• Deployment of Databases and Software Applications to all provincial sites.
• Capacity building of End-users.
4. **Complete Building of PHA & Hospitals ICT Infrastructure (2016)**
• Complete building of Data communication networks (LAN & WAN).
• Complete the deployment of Databases and Software Applications to all provincial sites.
• Capacity building of End-users from the National/Provincial/District.

Recommendations for APEC economies are the following:

Papua New Guinea is currently on the path of modernization and introduction of the Integrated Public Health Information System. The development and implementation of technologies is provided by the National Health Plan for 2011-2020. Recommendations are not available.

The Russian Federation

Integrated Government Information System in health care has been actively created in the Russian Federation since 2011. Ministry of Health of the Russian Federation completed the stage of basic computerization of medical organizations in 2012.

Computer fleet doubled in size in health facilities. The final stage of the implementation of integrated electronic health record of the patient is underway along with the self-service appointment to a doctor. Today, the citizen does not have to come to the institution to make an appointment, this service, available remotely, actually enabled the possibility of a clearer and more effective planning of various resources that exist in the entire health care system in the Russian Federation. Initially, patient makes an appointment and visits physician who further referrers him to a narrow specialist, if necessary, for the provision of highly specialized care. As the doctor sees the available resources and units' workload, he can offer a more optimal time to receive medical care for the patient.

A complex of applied information systems within the approved multi-year public health programs is created in the regions. Existing and developing applied information systems of health organizations and agencies are divided into transactional, management and referral. Transactional systems provide primary information on the activities of health care organizations. Electronic health record is created within this system.

Management systems provide information support to the activities of governmental authorities, including statistics based on the primary information.

Referral systems provide information support to the population, medical stuff as they include electronic medical library, expert systems that enable analyzing the possibilities of simultaneous use of certain drugs, etc.

In particular, the service of medical licensing or assignment of medical qualifications is available in the electronic form now in Krasnoyarsk region (Siberia). To enable this service an automated licensing system was placed in operation on the portal of public services of Krasnoyarsk region, however, this system is integrated with the existing Krasnoyarsk information system and the federal system of electronic inter-agency cooperation, operating throughout the Russian Federation. On the same portal there is an option to make an electronic appointment with the doctor in the municipal and state hospitals. To solve the problem of providing state and municipal services in remote areas of the Krasnoyarsk region the service of "E-Government of the Krasnoyarsk region" was introduced. It is available in the self-contained terminal, designed to be used with the Universal e-card as an identifier for a patient, and may be stationed in any convenient for the population place (with the Internet access).

Discussed experience in the development and implementation of the "Comprehensive medical information system" on the basis of a multi-field the Russian Federation Federation healthcare facilities points to the need to create a powerful tool for medical staff to enable:
• On-line access to the electronic health records from any networked computer;
• Record creation with the use of special templates, best adapted to the profile of each expert;
• Test orders (medication, laboratory and instrumental);
• Bar-coding technology for laboratory and instrumental tests, precluding the loss of biological material samples and test results;
• Appointment made by the doctor to visit other specialists;
• Efficient test and consultation results monitoring;
• Automated generation of medical records (e.g. discharge, case history, etc.) based on previously entered data about the patient.

It is proved that the "Integrated Medical Information System" reduces the load on the staff of the medical institutions by 25 percent, which ultimately affects the quality of treatment and allows the organizer of the treatment process to obtain objective information about the activities of all units as soon as possible, as well as to monitor the institution operation in general.

Creation and maintenance of the passport of the medical organization is available in every region in the Russian Federation, this also refers to the medical equipment and medical devices register, medical and pharmaceutical personnel registers, monitoring of the health care modernization programs implementation, provision of the personalized accounting for medical care and medicine, management of the medical assistance mutual settlements for the institutions involved in the compulsory health insurance system.

Storage of the large amounts of data, its protection against loss and unauthorized access, information interactions between applied components of the information system in health care is provided by the centralized system-wide components segment.

This segment includes the following components:
• Integration of applied systems;
• Cataloging of system users;
• Maintaining of reference data register, medical terminology dictionaries and electronic documents register;
• Maintaining of e-mail and other information technology services for general use.

It is supposed to unite all the resources available with the federal services of the Ministry of Health on one of the next stages of development of the integrated government information systems in health care in the Russian Federation.

Recommendations for APEC economies are the following:

1. Develop the concept of integrated government information systems in health care. The system should provide solutions to the complex tasks, such as higher management efficiency in health care through information technology support, better forecasting and planning of costs for medical care, as well as monitoring compliance with state guarantees on the amount and quality of medical care provision.

2. Improve information technology support of the medical and pharmaceutical organizations and their staff, as well as medical students.

3. Improve medical stuff computer skills through the organization of training courses;

4. Create a single electronic health record format. Implement a unified electronic health records in health facilities.

5. Create a self-service electronic appointment with the doctor.

6. Introduce comprehensive health information systems in health facilities.

7. Create applied information system of health organizations and agencies including transactional, management and referral subsystems.

8. Ensure collection of primary data on the health facility level and its further transmission to the federal level.

Viet Nam

Viet Nam has grown from the developing country with the low GNI per capita to middle income country very fast. Today a wide range of medical services in health sector is available. Viet Nam is one of the APEC economies adopting the implementation of IT technologies as well.

E-health in Viet Nam is under development. All in all Viet Nam experiences difficulties with weak health systems and infrastructure, shortage of health workers, incomplete legal and regulatory framework.

Limited use of clinical applications such as EHRs, order entry systems, decision support, pharmacy systems, etc. are among the current issues as well, which creates the difficulty in the consistency of diagnoses, tests, treatment, and pharmaceutical aspects. Viet Nam encounters little integration inside the hospitals, between hospitals and government, between hospitals and social insurance.

The researches defined the basic success factors of e-health: government commitment, financial support, infrastructure, e-health standards, national medical database, and education in e-health, international cooperation.

The Government of Viet Nam adopted plan for ICT, which established specific goals on different levels for the period of 2011-2015:
• WAN, LAN and website development;
• Internet access in health service offices;
• E-learning in medical universities;

- Standards adoption: ICD-10-CM, HL-7, DICOM etc.;
- E-healthcare, HIS etc.;
- Improvement of public health databases.

Approaches to challenges of e-health development and application in health care in Viet Nam:
1. Policy initiatives
- Create more legal policies regarding IT development in health.
- Develop a master plan for e-health development
- Develop an investment policy for e- health development
2. Organizational initiatives
- Build up a network of health information management using IT from national to grassroots level.
- Employ more IT health workers to take professional responsibility.
3. IT development initiatives
- Develop specific system requirements, criteria, and standards for software applications for the health system.
- Standardize hardware and infrastructure for health informatics
- Construct an e-health database for the whole health system.
4. Capacity building initiatives
- Strengthen training activities both locally and internationally to increase expertise
- Conduct outreach and education to raise awareness of health professionals on IT application to health sector.
- Organize workshops/conferences to raise capacity building and disseminate new knowledge.
- Visit or study overseas to learn from the experiences of others.
5. Resources mobilization initiatives
- Call for the Government for funding
- Mobilize resources and contributions from community and organizations
- Develop international cooperation for funding.

Viet Nam is currently on the initial stage of health system modernization, including the creation of an integrated state information system in health care.

Recommendations for APEC economies are the following:
1. Develop the human resources required to move on the next level of development.
2. Develop the necessary legal framework.
3. Observe the necessary balance between the current workload and the introduction of e-health.
4. Develop the infrastructure including optical fiber installation and mobile trends.
5. Perform the integration of health information and coordination of health systems.
6. Define local needs: localization and performance of devices and Internet applications.
7. Include or/and integrate existing software in e-health on the level of hospitals and other health care institutions.
8. Develop healthcare standards in IT and integrated medical database.

Philippines

Health sector reform is currently undergoing in the Philippines. One of its strategic direction are the projects related to the financial risks management, health facilities strengthening and health services quality improvement as well as other projects that aims at management standardizing until 2020.

The reduction of maternal and newborn mortality constitutes one of the challenges of the Philippines.

The country has implemented a comprehensive information technology to provide an integrated strategy to support mothers, newborns and children. The system includes:
1. Watching Over Mothers and Babies (WOMB) System;
2. Maternal and Neonatal Death Reporting System (MNDRS).

WOMB is a maternal and neonatal health tracking system (MNHTS). It aims to help expectant mothers to schedule and record the provided services, and also monitor their progress for appropriate management. Same relates to childbirth, post-partum and post natal services and under-5 child services.

The objectives of enrollment, tracking and monitoring system of expectant mothers are initial notification and recording of maternal healthcare services. The system is based on a SMS sending service from a regular mobile phone or any other communication device with a SMS feature support. In short, starting with the registration procedure, all information about the mother is entered into the system and then transmitted via sms into integrated centralized database so all concerned medical stuff can send messages to a pregnant woman. It is assumed that in some way a woman reacts to these messages and, if necessary, corrective measures can be taken during the pregnancy.

WOMB features prompting system to remind mothers or any member of their household or community of the Integrated Maternal, Newborn, and Child Health and Nutrition (MNCHN) Strategy services that pregnant women and eventually her child needs.

At this stage teleconsultation system between mother and health service providers is available to the extent that is legally allowed and operationally feasible. WOMB provides support to the referral system from the primary health care facility to the next level facility with a basic emergency obstetric and newborn care (BEMONC) or comprehensive emergency obstetric and newborn care (CeMONC) when needed.

All data is collected and stored in a central database of the WOMB system. This system allows you to manage the data or generate reports for various levels of health care delivery system.

Thus, through the use of complex information technology named WOMB, Philippines forecast the decline in maternal mortality from 162 to 52 deaths per 100,000 live births and the neonatal mortality rate from 16 to 10 deaths per 1,000 live births.

Results of the WOMB implementation show that the system promotes communication with expectant mothers; they find it much easier to refer for the medical assistance. Also healthcare facilities efficiency increased due to reduction of the required time.

Recommendations for APEC economies are the following:

1. Facilitate the development of IT in health care.
2. Provide legal support to the development of comprehensive IT to provide an integrated support to the maternal, newborn and child healthcare strategy.
3. Direct the forces to facilitate the interaction between mothers and planning, monitoring and referral services.
4. Provide consolidated collection of data on expectant mothers and postpartum women in the Central Database for remote medical experts' timely response to the observed deviations of pregnancy or child's development after birth.

Conclusion

Symposium on "Promoting Human Security in APEC: Development of e-Health Systems as a Tool for Management in the Health Area of APEC Economies" has been very useful. All the objectives of the project were met.

During the event, representatives of the various APEC economies shared experiences on the implementation of various e-health systems and discussed the principles of e-health systems in accordance with the level of economic and technological development of the various regions; participants discussed the experience of data sharing between different health facilities and regions, exchanged experiences and best practices in the creation, use and management of human health monitoring systems, considered and discussed other issues in the implementation of e-health systems.

At the close of the symposium, DVD with symposium materials was given to all the participants. Additional symposium materials were sent by e-mail to APEC economies representatives. The final results of the symposium were also published.