Republic of Serbia
Ministry of Health

TERMS OF REFERENCE
for Software Architect

PP SSHP item 3.1.3.1

Introduction

Republic of Serbia has received a loan from the International Bank for Reconstruction and Development (IBRD) in the amount of EUR 29.1 million equivalent toward the cost of the Second Serbia Health Project (SSHP), Loan No.: 8338-YF, and EUR 25 million equivalent toward the cost of the Additional Financing for the Second Serbia Health Project (AF-SSHP), Loan No.: 8830-YF.

The Project Development Objective (PDO) is to contribute to improving the efficiency and quality of the public health system through the strengthening of: (i) health financing, purchasing, and maintenance systems; (ii) quality improvement systems and management of selected priority non-communicable diseases.

The project includes the following components:

1- Improvement of Health Financing

This component aims to strengthen the performance of the health financing system by supporting introduction of incentives to improve quality and efficiency at the primary care and hospital levels.

2- Improve Access to Quality Health Care

This component is organized around the following main areas: improve access to medicines; strengthening of Health Technology Assessment (HTA); and improving systems for medical equipment maintenance.

3- Strengthening Quality of Service Delivery

This component aims to improve standards of quality and efficiency of care in the Serbian health sector through: (i) strengthening quality improvement systems, (ii) modernizing cancer treatment at selected tertiary facilities.

4- Project management

This component supports the day-to-day Project management, including fiduciary tasks, monitoring and evaluation, audits of Project financial statements. Monitoring the implementation of the proposed reforms, including potential unintended consequences, will be a key function that will be supported under this component.

Through Component 3 of the SSHP, “Strengthening Quality of Service Delivery”, it is envisaged to improve standards of quality and efficiency of care in the Serbian health sector through

strengthening quality improvement systems and through modernizing cancer management at selected tertiary facilities. This component will strengthen cross-cutting systems of performance management and information technology by supporting key institutions of the public health sector through, among others, inter-related actions aiming at improving health information management systems. Activities encompass but are not limited to, "improving capacity for reporting and use of information on service quality and efficiency at key institutes involved in these functions. This should contribute towards the development of performance "dashboards" including quality of care benchmarks and balanced scorecards to enable managers and public health professionals to monitor performance and provide feedback to facilities.

Objectives and Responsibilities

The specific action of upgrading the information system of the Institute of Public Health of Serbia "dr Milan Jovanovic Batut" (in the following text referred to as "IPH") related to this ToR is aimed at:

- Providing **General Scheme of IPH's Health Information Systems (IPH-IS)[1] and written recommendations on investments** in the IPH-IS.

- Providing **detailed technical specifications for the procurement of ICT systems and solutions** (to serve as an integral component of the IPH-IS) **for monitoring, reporting, benchmarking and/or comparing performance against agreed set of quality of indicators of quality of health care, including those related to the cancer management through cancer registry system (in the following text referred to as " Quality Indicators Information System" or "QI-IS")[2]** which will be interoperable both with the central components and with local information systems in health organizations in the Republic of Serbia;

Key relevant legislative framework that is necessary to be taken in consideration in achieving this ToR's objectives includes the Rulebook on Indicators of Quality of Health Care[3], the Rulebook on Templates and Data Content for Records, Statutory Records Reports, Registers and Electronic Health Record, the Law on Health Records and Statutory Records in the Field of Health Care and the Law on protection of personal data.

In order to use the existing capabilities of IPH-IS as well as information systems in other medical institutions, it is necessary to include in the design and technical specification the needs for compatibility and integration with these systems in order to easier exchange the data and automate their transfer/flow.

Taking in consideration the afore-mentioned, the Software Architect will have technical responsibility for the process of:

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[1] IPH-IS – Institute of Public Health Information Systems – the overall information management system that supports all business functions of the IPH. It consists of several systems and modules.
[2] QI-IS – Quality Indicators Information System – the system that manages the indicators of the quality of health care. This system will be one of the components of the IPH-IS.
[3] The translation of the Rulebook can be accessed at http://www.batut.org.rs/download/uputstva/Pravilnik%20o%20pokazateljima%20kvaliteta%20zdravstvene%20zastite.pdf

- Identifying the needs including the outline of technical requirements for necessary infrastructural resources, human resources ICT equipment (hardware and software) for further development of an effective and efficient IPH's operational functioning and contribute to the overall IPH-IS;
- Development of technical documents to serve as a basis for the procurement and tendering for the development of the QI-IS;
- Facilitation of knowledge transfer to the QI-IS developers;
- Technical consultations throughout the process of QI-IS development and implementation.

The Software Architect will work closely with:

- The Team of the IPH's Sector for Bioinformatics and Healthcare Statistics;
- Other relevant specialists in the IPH and other stakeholders (e.g. Health Insurance Fund of Serbia, Ministry of Health);
- Managers, coordinators and consultants of the Second Serbia Health Project, on behalf of the Ministry of Health of Serbia.

Scope of Work

The Software Architect will perform the following tasks:

- Comprehensive consultations with all relevant partners, stakeholders and interested parties;
- Comprehensive consultations with healthcare organizations and all relevant vendors of health information systems in healthcare organizations in order to ensure the necessary level of interoperability;

- Development of a General Scheme of the improved IPH-IS and written recommendations on investments in ICT resources of IPH, for incremental development of integration and interoperability of IPH-IS;
- Definition of a logical design of data synchronization between health information systems in healthcare organizations and database(s) of the IPH-IS;

- Mapping the existing information flows, identifying existing gaps, deficiencies and areas for improvement regarding the QI-IS;
- Analysis of data models in existing IPH-IS (based on technical documentation that will be provided), relevant to the reporting on indicators of the quality of health care;
- Definition of QI-IS logical design of required database(s) (architecture determinants, such as type of database(s), entity relationship diagrams on conceptual level, etc.);
- Defining the business level reporting requirements related to reporting on indicators of the quality of health care, registers and data sets analyses;
- Review of existing and further development of a logical design (including parameters) of static reports on indicators of the quality of health care;
- Review of existing and further development of a logical design of dynamic data analysis that will provide the flexible, analytic data collections and reporting on indicators of the quality of health care;

- Analysis and modeling (use cases/flow charts) of business processes required to support reporting and monitoring of indicators of the quality of health care in line with the above;
- Development of technical specification of the QI-IS and other necessary ICT resources, according to guidelines provided in Annex 1.

The Software Architect will also:

- Conduct regular technical consultations with the IPH of Serbia throughout the process of development and implementation of the QI-IS
- Conduct regular technical consultations with other components of the SSHP;
- Conduct regular technical consultations with principal project stakeholders;
- Share relevant substantive and operational experiences with responsible representatives of the IPH of Serbia and the SSHP.

Deliverables and Timeframe

The Software Architect will provide the following:

- General Scheme with business processes of IPH-IS and written recommendations on investments in ICT resources of IPH, for incremental development of integration and interoperability of IPH-IS (by September 30, 2019);
- Technical specifications for the procurement of the QI-IS – the Software for monitoring, reporting, benchmarking and/or comparing indicators of the quality of health care (including those related to the cancer management) to be developed for and implemented in the Institute of Public Health of Serbia "Dr Milan Jovanovic Batut" (December 20, 2019);
- Description of business processes to be supported by the QI-IS (December 20, 2019);

Reporting and Communications Requirements

The Software Architect is expected to provide short Monthly Progress reports and Final Report that includes the Deliverables.

The Software Architect shall report to and take guidance from the appointed IT specialists of the IPH of Serbia and the Head of the Sector for Bioinformatics and Medical Statistics of the IPH of Serbia.

Qualification Requirements

- At least a University Degree in Information and Communication Technologies or similar. M.Sc. or higher educational level will be taken as an advantage;
- At least 10 years of professional experience in information systems development and/or implementation;
- Experience with the use of various systems analysis methods and techniques (information systems development methodologies, fact finding techniques, visual modeling languages, etc.);
- Experience in information systems design using various software architectures and database systems. Applicants should provide at least 2 authored/coauthored reference documents that illustrate this experience;

- Good understanding of the architecture of data warehouse and business intelligence systems. The applicants should kindly provide at least 1 authored/coauthored reference document that illustrate this experience/knowledge;
- Good speaking and writing ability in Serbian and English language.

Duration of the assignment

The consultancy will be required for the period of six (6) months

Annex 1: Guidelines for technical specifications

Based on the results of more detailed design and all previous deliverables, the Consultant will produce full set of **Functional and Technical Specifications** for the QI-IS that can be directly used in tender dossier, without the need for additional modifications.

The specifications will follow the World Bank standards for bidding documents for information systems, and shall include at least:

- Background information and business objectives to be achieved
- Functional requirements
  - Description of business processes to be computerized
  - Logical architecture of the system, including the functional description of the components of the system
  - Use cases for functional domains
  - Use cases for actors
  - Logical database structure
  - Reporting requirements
  - Functional description of software modules to be implemented (including technical specification of subsystem(s) for data exchange with external systems)
- Technical Requirements
  - Performance and reliability requirements
  - Software technical requirements with required software architecture (e.g. SOA), communication protocols (e.g. REST API), integration requirements, data layer requirements, ergonomic standards, user interface requirements, web user-interface responsiveness, clinical data encryption, openness and scalability, etc.)
  - General technical requirements (language support, web browser specification on client side, concurrent users, etc.)
  - Dual mode operations – description of requirements for parallel paper and electronic work based on principle “computer-before-paper”, meaning – if dual operations is required, the original data will be electronic which will be printed, and not vice versa – first filled in to paper forms and then re-typed to computer
  - System management requirements (roles and responsibilities definition, user administration, security requirements, etc.)
  - Data requirements (type of DBMS and other DBMS requirements, data modeling requirements, data export/import requirements, etc.)

- Technical reporting requirements (e.g. flexible reporting, formats, media)
- Interoperability requirements (use of classification systems (e.g. ICD), connection to state registries, standard health registries, etc)
- Technical integration requirements (e.g. JSON format, communication protocol, etc.)
- General-purpose software requirements (to be purchased and/or to be compatible with)
- Requirements for Operations (e.g. ICT operations management, help desk, incident management, problem management, change management, release management, IT service continuity management, etc.)
- Description of the system platform. (The system platform may be contracted together with the application software. If not, this part of specification describes the minimal platform on which the software should efficiently work.)
- Consumables and other recurrent costs
- Other non-IT goods

▪ Service Specifications

- System integration services
- Development process requirements
- Initial system configuration
- Deployment and data migration requirements
- Training services and training materials (user training, technical training)
- Support (warranty support, user support/hot line, technical assistance, post-warranty maintenance services, etc.)

▪ Documentation Requirements

- End-user documentation requirements
- Technical documentation requirements

▪ Testing and Quality Assurance

- Inspections (inspection at the supplier premises, inspections following delivery)
- Pre-commissioning tests
- Operational acceptance tests

▪ Project Plan (description of implementation process, phases, cooperation between purchaser and supplier, reporting requirements)

▪ Locations and quantity requirements

- Implementation Schedule

Based on the agreed conceptualization of the system, the Consultant may be asked to deliver the **Technical Specifications for System Platform**. The specifications should define the architectural, functional and logical design of the system platform in sufficient detail for the contract with one or more information technology companies to implement the platform components (hardware, system software and communication components).

The Technical Specifications should be provided separately per package (for example, separately for servers at the central location, separately for other hardware, separately for WAN, separately for LAN's, etc.). The number of packages will be decided during the conceptual design of the system.

Each of the Technical Specifications should include at least (depending on the type of the component, some of the requirements do not make sense, this list is provided as generic template for the specifications):

- Background information and business objectives to be achieved
- Functional requirements
  - Overall architectural design with description of functions to be performed by the system platform components
  - Performance requirements (number of users, relevant throughput, response times, data transfer capacity, etc.)
  - Technical design of the central location (LAN, WAN connection(s), server configurations, number of servers, functional requirements for servers, for example, web server, database server, application server, …, other equipment, such as UPS's, physical design of central location, including power supply, air-conditioning, cabling, etc.)
  - Technical design of standardized local installations for possibly several types of locations (workstations, LAN, WAN connection, other devices, standard system software configuration(s), etc.)
- General Technical Requirements
  - Electric power
  - Language requirements
  - Environmental requirements
  - Safety requirements
- Hardware specifications
  - Servers
  - Storage
  - Workstations
  - Shared Output and Input Devices
  - Other tests required by the IPH of Serbia
- Local Area Network(s) requirements

- Wide-Area Network requirements
- System Software and System-Management Utilities
  - For each processing unit: operating system, back-up, optimization, anti-virus, systems administration, maintenance, and troubleshooting tools, etc.)
  - Networking and communications software (protocols, media and equipment to be supported, network services, management and administration features, security and failure management features, etc.)
  - Virtualization services
- System Management, Administration, and Security Specifications
  - General Requirements
  - Technical management and troubleshooting
  - User and usage administration
  - Security
- Service Specifications
  - System integration services
  - Training services and training materials (user training, technical training)
  - Technical Support (warranty support, user support/hot line, technical assistance, post-warranty maintenance services, etc.)
- Documentation Requirements
  - End-user documentation requirements
  - Technical documentation requirements
- Testing and Quality Assurance
  - Inspections (factory inspection, inspections following delivery)
  - Pre-commissioning tests
  - Operational acceptance tests
- Project Plan (description of implementation process, phases, cooperation between purchaser and supplier, reporting requirements)
- Locations and quantity requirements
- Implementation Schedule