Component 3 - ICT System upgrade
Activity 3.3 Consultation on feasibility study results conducted. Recommendations for
upgrading the ICT system elaborated. New ICT strategy elaborated.

SORS's ICT Strategy

1.   Introduction

The most important tasks for official statistics are to offer an objective picture of social and economic
changes in the country and to provide a reliable basis for policy making and decision making at the
levels of public administration, private sector and the general public.

The Statistical Office of the Republic of Serbia (SORS) is in charge of preparing the legal acts and
institutional frame that provide the conditions for: obtaining the most significant statistical indicators;
the development of methodologies, classifications, nomenclatures and harmonization of national
statistics with internationally accepted standards to ensure comparability of Serbian official statistics
with statistics of other countries and international organizations. Further, in promoting the role and
importance of official statistics in the society. This foundation for the work is based on Law on Official
Statistics, Development Strategy of the Official Statistics, the Semi- and annual Program of Statistical
Surveys and the internal system and work systematization.

The production of statistical data includes data collecting, processing and analyzing according to
appropriate statistical methodologies and in applying statistical standards (definitions, classifications,
nomenclatures, identifications etc.).

ICT is playing an increasingly important role at SORS and the dependence on ICT is growing.
According to the new organisation, statistics will be divided into three main areas: national accounts
and macroeconomic statistics, business and social statistics.

SORS enterprise model (Figure 1) shows the key business areas and the competence connected to
data collection, statistics production and dissemination.

Presently, statistical data are processed using two platforms (IBM Mainframe and PC platform). A
Feasibility study on the possible upgrading ICT system was conducted in 2009. The results are
reflected in the Feasibility Study Report and it clearly shows the advantages of the Open System
environment against the two-platform system.

Therefore, the main objective of the new ICT Strategy is to set forth the directions for a rapid and
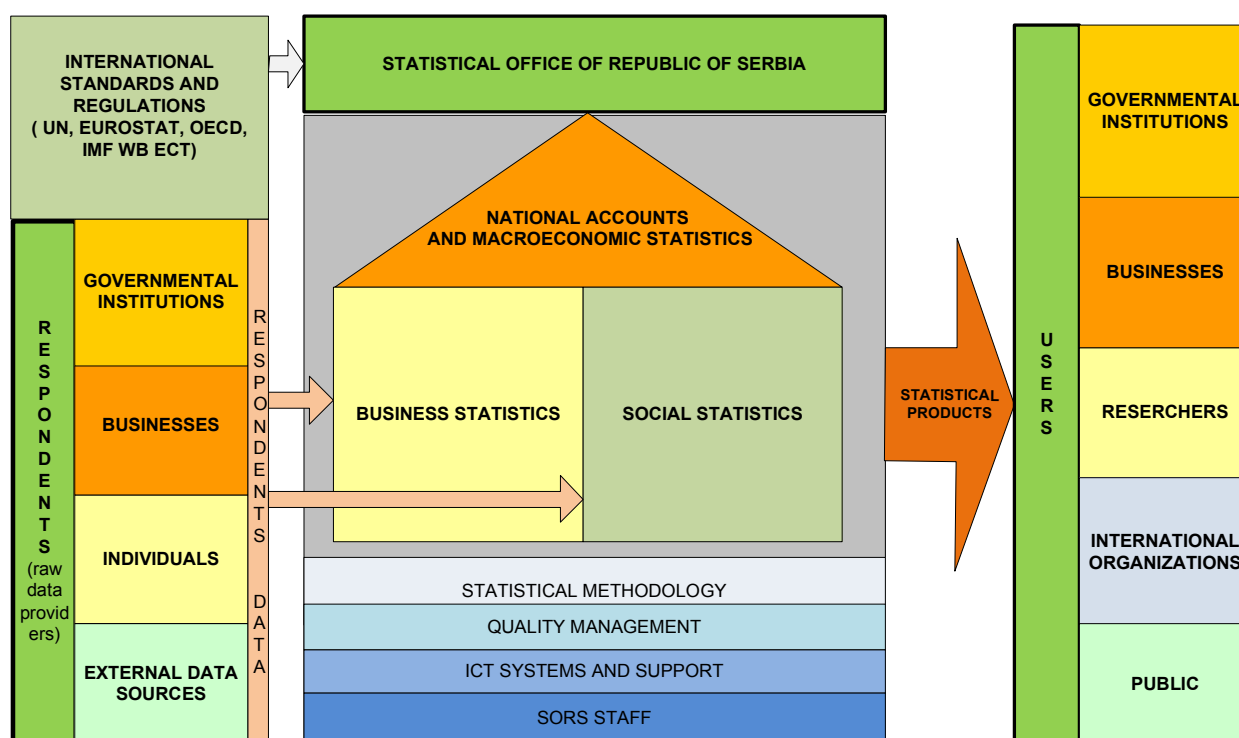efficient transition from the existing system to a homogeneous Open System environment.

Statistical Office of the Republic of Serbia   European Profiles S.A. and consortium

Figure 1 SORS's Enterprise model

The system of statistical processes supported by statistical methodology and quality management make up the basis for the statistical business architecture. The statistical business architecture in turn makes up the basis for the ICT System infrastructure and ICT production system architecture. Changes in the statistical business architecture requires in most cases structural changes within the entire organization

In the strategy implementation process, much attention should be paid to the establishing of a connection between the statistical business architecture and the ICT architecture which is under development.

The strategy development and implementation processes value chain can be found in Figure 2.

The IT operations shall deliver services and an infrastructure that support, improve and make the statistical production processes more efficient and effective. This refers to data collection, data analysis, output preparation and dissemination of statistical products.

In addition, the IT operations and the infrastructure were subject to a detailed assessment and analysis within the Feasibility study. The results and recommendations obtained should be utilized in order to create a new and improved business environment based on the implementation of modern IT solutions.
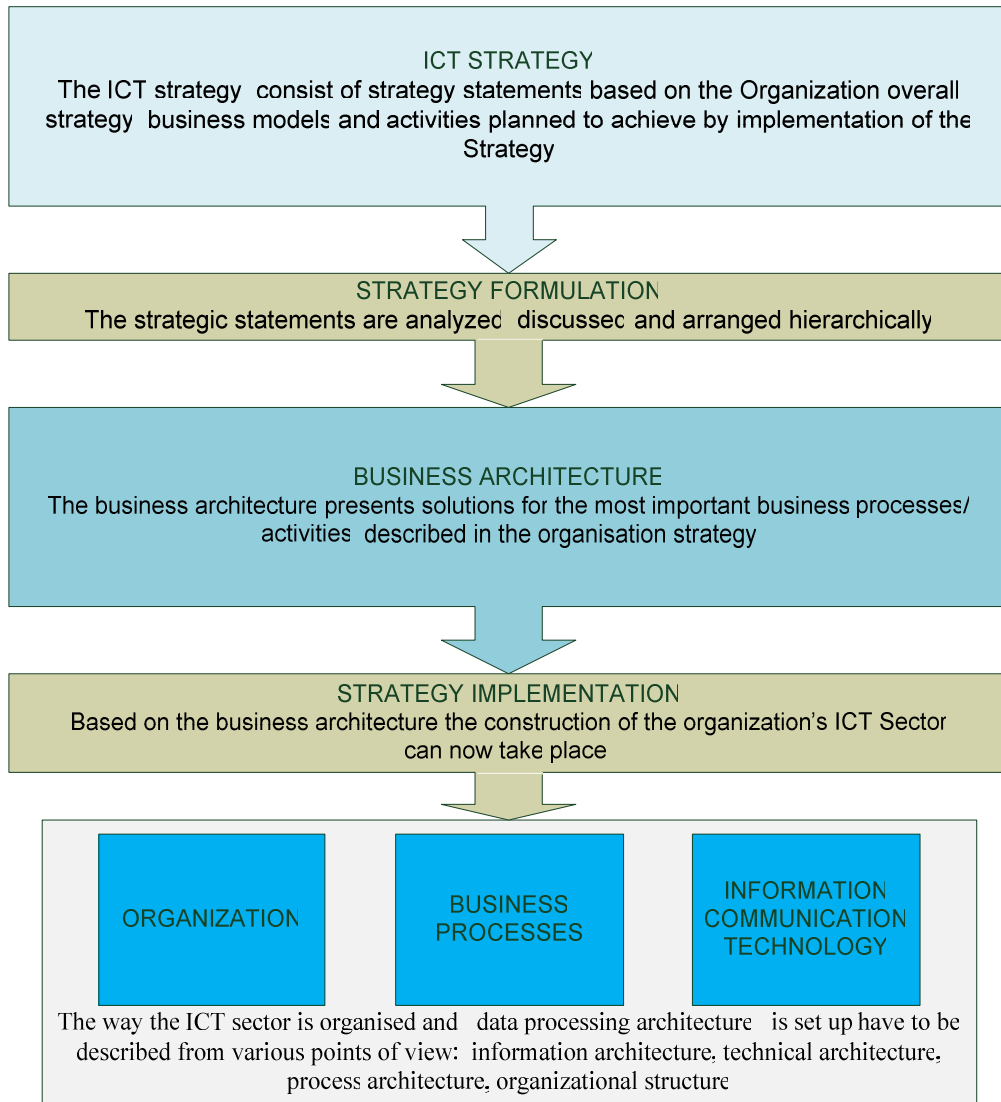
2.   SORS's ICT improvement goals in accordance with the ICT System upgrade

Based on the work undertaken by SORS's ICT Working Group and external consultants, the main business and information technology improvement objectives that SORS intends to achieve as a result of the ICT System Upgrade were identified as follows:

I.   **Increase the efficiency of the main processes at SORS** - production of statistical information - through the use of information technology;

II.   **Increase the quality of the source data** used to produce statistical information, giving to statisticians new generation IT tools better suited for statistics production;

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III. **Increase the quality of the statistical information produced** via the development of a metadata driven integrated statistical data management system

IV. **Reduce the expenses necessary for statistics production** via harmonization of the overall IT infrastructure

Figure 2 Strategy development and implementation processes value chain

ICT STRATEGY
The ICT strategy consist of strategy statements based on the Organization overall strategy business models and activities planned to achieve by implementation of the Strategy

STRATEGY FORMULATION
The strategic statements are analyzed discussed and arranged hierarchically

BUSINESS ARCHITECTURE
The business architecture presents solutions for the most important business processes/ activities described in the organisation strategy

STRATEGY IMPLEMENTATION
Based on the business architecture the construction of the organization's ICT Sector can now take place

ORGANIZATION

BUSINESS PROCESSES

INFORMATION COMMUNICATION TECHNOLOGY

The way the ICT sector is organised and data processing architecture is set up have to be described from various points of view: information architecture, technical architecture, process architecture, organizational structure

A detailed description of the goals set forth is given in the Feasibility Study Report.

The overall goal of SORS's ICT development is to achieve the **Vision** as follows:

In implementing the entire strategy, SORS's ICT Sector will become a modern, efficiently and effectively working IT infrastructure which will provide convenient tools for the fast and safe collection, processing, storage, analysis and dissemination of statistical data taking into account the requirements of the Information Society.

In order to reach these strategic objectives and realize the vision, the IT strategy highlights actions within the following **Operation Control Areas**:
   a) IT infrastructure and services provision;
   b) Business technology approach, architecture and business systems;
   c) Metadata management
   d) Organizational aspects and competence building.

The priorities within the process of implementation the Strategy will be as follows:
   a) The transition from existing two-platform environment to a homogeneous Open System environment
   b) Develop and implement an integrated metadata driven Statistical Information System
   c) Strengthen information[1] and knowledge management;
   d) Develop and implement administrative support systems.

The next chapters of the strategy will describe principles, changes, challenges and trends within these areas in more detail.

3.   Basic strategic principles

The fist principle - before starting any changes or new development, a concept for its fulfilment shall be elaborated.

Figure 3 below shows the concept of the ICT System upgrade at SORS.

The concept is built on a three-level approach from top to down:
   - The Management and Competence building The Business Technology ensures efficient and effective solutions for statistical business processes realization
   - The ICT Infrastructure   ensures further development and maintenance of the ICT infrastructure

The implementation of the concept will comprise both "top to down" and "bottom to up" approaches making the process interactive to achieve the best possible results.

The overall concept for the future ICT sector organization is based on four pillars
   - Security as the highest priority requirement
   - Standards ensure ICT services stability and high quality
   - Principles will determine the common approach for the building of the harmonized system consisting of several subsystems
   - Models will minimize the risk for development failures

To achieve the goals stated, some general principles will be laid down in regard to the strategic development of the ICT System

   - Developing an Open system infrastructure comprising common standards as the basis for fast, efficient and effective transition from the existing two-platform IT environment
   - Implementation of the newest technologies (virtualization, cloud computing etc.) with the aim to make the ICT infrastructure technologically more efficient and effective, easier maintainable and cost efficient.
   - Data format transfer from Mainframe to Open system readable (platform independent) format to be done on the basis of a careful inventory.
   - Adaptation of systems and products elaborated and tested in statistical institutions of other countries will become essential, i.e. to reuse established experience – the principle of following Best Practices.

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[1] Information means data + metadata

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Figure 3 Concept of ICT System upgrade at SORS
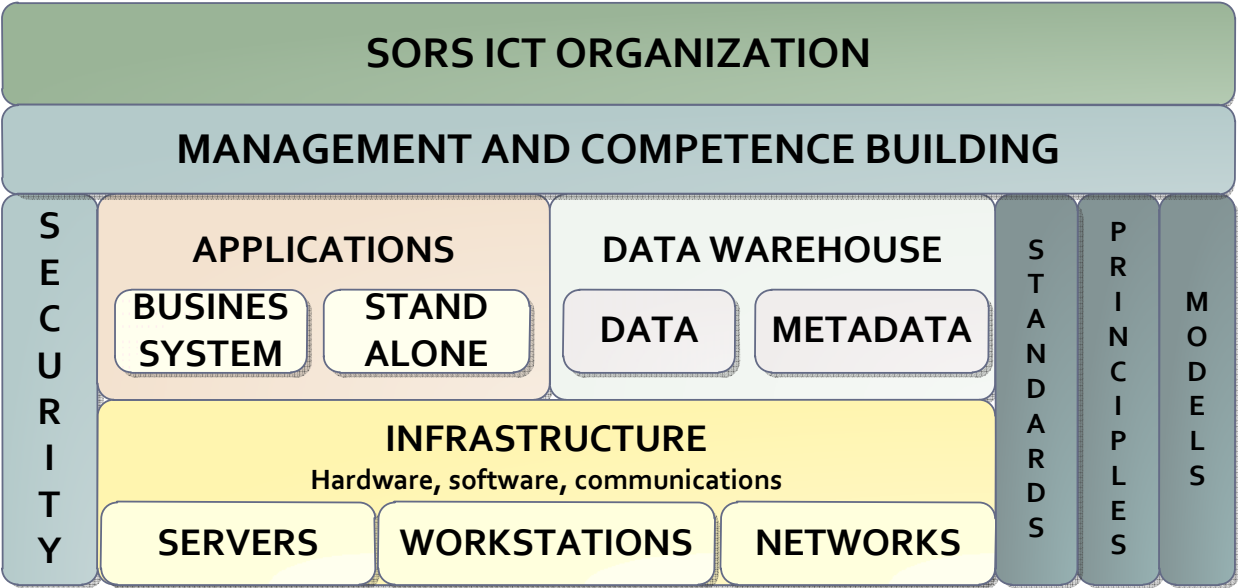
- Decisions on functional solutions for statistics production will be taken together after substantial discussions by leading statistical and ICT experts.
- Cooperation between ICT Sector experts and statistical personnel will be strengthened on all stages from project initiation until implementation, maintenance and services provision.
- Developing new data processing environment contributes to the simplification, improvement and increased use of common working processes by implementing the joint UNECE/Eurostat/OECD Generic Statistical Business Process Model.
- Use of common standards[2] and methods for system development and projects management should become an everyday practice. Models will be elaborated and analyzed before development.
- Common access to data will be ensured – all information of relevance of SORS will be directly available to SORS's staff in accordance with the rules stated in the data security policy.
- Easy access will be provided to common repositories of documentation (metadata basis) on the systems, products and tools in use.
- Usage of programs and tools which are different from the common approach will be strongly limited.
- Stand alone systems will be designed only in exceptional cases when the usage of common standards and tools will not be possible due to business specifics.
- Only internationally tested and proved standard commercial and/or open source software and products can be implemented for use.
- Special attention will be devoted to contribute for strengthening of information and knowledge management.
- Provision of a kind of leadership that will motivate SORS's ICT personnel to do their job in a superior way.
- Help end-users to use ICT products and services in the best possible way.
- Continuously improve the level of commitment to achieve a data quality culture.
- Promote end-to-end team awareness and interdepartmental cooperation.
- Provide interoperability with modern web-base systems.
- Offer a full business continuity solution by combining the best attributes of data protection, high availability and disaster recovery.

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[2] In cases of open source software usage apply to Open standards

4. IT infrastructure and services provision

4.1 Infrastructure development and maintenance

The main task of the ICT infrastructure is to ensure a secure and stable working infrastructure enabling high performance functionality of the whole production and supporting systems at SORS.

- Continue to expand and develop Open System Environment by acquiring necessary hardware and software for statistics production and all supporting activities thus ensuring a fast, efficient and effective transition from the mainframe platform and the usage of outdated software applications.
- SORS's IT infrastructure should be flexible and able to cope with steadily changing conditions and demands.
- Continue to standardize platforms and products for the development and maintenance of IT infrastructure taking into account functionality, price/performance criteria as well as acquired knowledge and experience of the ICT staff i.e. OS[3] for both servers and PC workstations; SQL[4] relational DBMS[5], programming tools. Thus, creating a homogenous software environment and an overall IT infrastructure.
- Special software will be acquired installed and used only for statistical technological needs or for IT processes and activities that have to be ensured and that are not covered by the implemented platform of standard software tools.
- Open source software will be introduced gradually especially for cases where it would be more efficient and effective than commercial software tools.
- Elaboration and implement of internal standards will be an important task necessary to improve development, maintenance and exploitation of the ICT infrastructure. These standards will describe procedures of users set up and the deletion and allocation of data access rights etc.
- Ensure efficiency and effectiveness and secure the work of LAN through the viable use of the implemented software and its technological features and in introducing unified users' account system.
- Introduce a common homogenous system of SORS WAN on the basis of the newest and most efficient and effective communication technologies at SORS thus making SORS WAN as an extension of LAN.
- Continuously improve functionality and content of the Intranet system. Standardize the e-mail usage and establish rules for the use of the Internet.
- To ensure data and processes security, the following Security Policy documents will be elaborated, adopted and implemented
  - Information Systems Security Regulations
  - Business Continuity Plan
  - Disaster Recovery Plan

4.2 ICT services provision

Increase the quality of the ICT services in terms of delivery and user support by introducing ITIL[6] elements.

- The ICT Service Support will be focused on the user (of SORS Information Systems - internal as well as external) and will be primarily concerned with ensuring that staff has access to appropriate services to support business functions and/or information.
  Business customers, statistical producers and users of statistics are considered as a part of the statistical production process model. Therefore, the ICT Sector will support them in:
  - Requesting improvements and/or new developments
  - Requesting external information sources for data exchange and updates
  - Resolving problems that arise from the use of the IT systems.

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[3] Operating System
[4] Structured Query Language
[5] Data Base Management System
[6] Information Technology Infrastructure Library - a set of concepts and practices for Information Technology Services Management elaborated and adopted as the standard for Governmental institutions in UK

- The service desk will be organized and maintained by the ICT Sector and will play the role of the single contact point for the users to record their problems or when the demand for assistance occur.
- If a problem occurs, the ICT Sector will try to resolve it internally. If the problem is connected with a standard hardware or software failure, it will be resolved through outsourcing.
- All problems will be registered in a helpdesk data base.

5. Direction for Business technology solutions development and corresponding services provision

5.1 Statistics production system development approach

- A metadata driven process oriented approach will be used for data production systems development.
- The production systems will be designed on modular basis thus allowing gradual implementation of the functionality.
- The system will cover the full statistical data and metadata life cycle
- The user interfaces will be friendly allowing the start-up of the work after a short introduction with the system instead. This measure will make special introductory courses obsolete.

5.2 Corporative data warehouse

- A common data warehouse will be elaborated and implemented for storing of statistical information at all stages of its production, e.g. raw data, microdata, macrodata, output data, metadata etc.)
- The common data warehouse will be linked with the application system that will allow collecting information, storing information at all levels, retrieving information at all levels, realizing information management functions etc.

5.3 Application system
- The system will support automatically generated data entering and editing on the basis of metadata descriptions stored in the Data warehouse
- The system will support automatic aggregation procedures based on metadata descriptions stored in the Data warehouse
- The system will support metadata driven preparation of the output tables ensuring automatic confidentiality checks
- A powerful system allowing information import/export will be designed thus allowing the use of special software tools, e.g. seasonal adjustment programs, imputation software etc. and data import from administrative data sources.
- Special stand alone applications will be developed for specific statistical surveys and/or processes that do not allow for complete standardization. These applications will be standardized and will use the common system elements as much as possible.

5.4 Data collection and processing

All data collection methods will be standardized in accordance with survey specifics. They will be supported by the following measures:
- e-Survey subsystem based on a common interface and functionality for all the surveys described in the metadata base.
- CAPI[7], CATI[8], CAWI[9] subsystems based on common principles ensuring simultaneous data collection and editing supported with case management tools. Thus, simplifying interviewer work and increasing information quality.
- FTP server will be in use for data interchange with outside data sources.

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[7] Computer Assisted Personal Interviewing
[8] Computer Assisted Telephone Interviewing
[9] Computer Assisted Web Interviewing

- Paper questionnaires will be supported by key board data entering and/or Optical Character Recognition (OCR) technology.
- IT solutions should support the increased use of administrative data sources (registers) and improve direct reporting from business and administrative systems for the benefit of statistical production.

5.5 Data analysis

The new data production environment will provide statisticians with powerful data analysis facilities such as:
- Online Analytical Processing software (OLAP tools).
- Other analytical software tools like SPSS, SAS etc. on the basis of import/export facilities.

5.6 Data dissemination

- The data dissemination system will be based on SDMX standard for both national and international data and metadata interchange and dissemination.
- A new powerful, high level information capacity Web page will be developed.
- All means of media e.g. Web page, CD, DVD, printed publications etc. will be used for data dissemination.
- A database for the registering of user inquiries will be implemented and maintained by the Dissemination Department.

5.7 Statistical registers

IT solutions should support the increased use of registers; particularly three basic registers (business, agriculture and person & household) for the management of statistical populations and sample administration.

The system of statistical registers will be elaborated and maintained in accordance with EU requirements concerning contents and functionality and implemented to ensure high quality sample preparation in regards to:

- Business register,
- Agricultural register,
- Households & persons register,
- Address register,
- Intrastat[10] register.

SORS will develop statistical register system instead of standalone registers based on requirements as listed below:
- Harmonize development work across the registers.
- Aim for a common data model with efficient and secure links between units in the registers.
- High efficiency transaction mechanisms for update and extract.
- Focus on the collaboration between registers' content management, metadata, data collection and statistic production systems.

5.8 Scanning and OCR

Document scanning and Optical Character Recognition (OCR) system will create basis for digitalization and editing of, for example census data, agricultural structure and other large sample size surveys with data transferring to the database for further processing. It will be created as standalone subsystems because of the specifics of these statistical processes and the use of related technology.

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[10] Foreign trade statistics software introduced by Eurostat

5.9 Mainframe format data migration

Archived data transition to formats readable a new technical environment is a problem in all cases when the IT infrastructure is changed.
Concerning the task of transferring archived data formats it should be noted that there is at least two types of the data that can be distinguished from the points of usage and role: data having an analytical and a production value and data having historical value only.

To ensure a successful data transition process, a workgroup comprising both statistical and IT experts will be organized.

A careful inventory of the data under format migration will be conducted by the working group ensuring the setting up of a transition priority list with appropriate datasets.

5.10 Administrative support systems

Administrative support systems e.g. Personnel management system, Documents management system, Time use and finance management system will became a part of ICT sector developments with the aim to increase SORS's administration efficiency.

5.11 ICT Service Delivery at Functional level

The ITIL principles will form the basis of the service delivery management at the functional level. The process is primarily concerned with the proactive and forward-looking services that the business requires of its ICT provider in order to provide adequate support to the business users. It is focused on the business as the customer of the ICT services. The process consists of the following processes, explained in subsections below:
- Service Level Management
- Capacity Management
- Availability Management
- Financial Management.

6. Metadata System development and metadata management

SORS has developed a metadata driven production system. The further improvement and activities in the continuous[11] building and maintaining of the system will be based on the the experience accumulated through the conduct of metadata projects in national statistical offices that have developed and implemented a metadata driven approach under the umbrella of Statistical Information Systems development.

A Metadata System will be further developed through the following steps:
- The most time consuming and important task will be the elaboration and organization of a Metadata based work flow. For that purpose, a special working group will be organized involving leading statisticians and IT DBMS.
- Analysis and understanding of the metadata creating processes, usage of the appropriate standards as well as data flow analysis will allow for the design of a central element of the metadata system – Metadata repository/metadata base.
- Metadata will be captured all along the production process.
- It will be stored in the metadata repository for running the production system covering the full statistical data life cycle.
- The Metadata System implementation will include the most essential parts as follows:
  - Establishing the metadata base as the central information source for the management of the statistical production process, necessary knowledge contents (methodology, regulations, descriptions etc.), quality issues and the metadata.
  - Division of clear roles and responsibilities for all processes of metadata management from collection to dissemination.
  - Stepwise development of the contents and functionality of the entire metadata system.

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[11] SORS has a metadata system as a part of Integrated Survey Tool

- o Importing metadata from available internal/external sources in order to reuse it in the new environment.
  - o Providing metadata browsing, retrieval and analysis tools.
  - o Providing wizard applications for important production phases in order to support statisticians entering proper metadata.
  - o Transferring metadata to different production tools (data warehouse, data edit processes, questionnaires etc.).
  - o Providing tools for statisticians and management in order to run the production system properly.
- All above-mentioned parts will be developed in parallel in order to achieve usable results in a short period of time.

- Besides increasing the efficiency of statistical production, the quality of statistical information will increase because metadata provides more background information. But, also because statistical production speeds up, becomes more up-to-date and the quality of statistical data will increase.
- Organizational measures will be supported by SORS' stop management because introducing a central metadata system is not only a technical approach. It is a change in the traditional work approach and culture and requires training and adopting best practice methods according to the given internal conditions.
- The most important principle will be to demonstrate results achieved within the process of development. This will ensure that the statistical staff understand the solutions that will be implemented step by step, i.e. solutions that will significantly change the traditional manner of statistics production (stove pipe approach).

7. ICT Sector governance and competence building

7.1   ICT Governance

Governance is the process of overseeing **management**. It includes monitoring, co-ordination and the enforcing of the policy. It makes the organization accountable and maintains its intended direction.

ICT governance is an important tool for the efficient management of information systems in the organization and in the implementation of the adopted ICT Strategy.

IT governance currently concentrates on several dimensions - investment, change/improvement projects, service delivery and overall quality. Governance coverage is shown in Figure 4.

Figure 4 Governance coverage
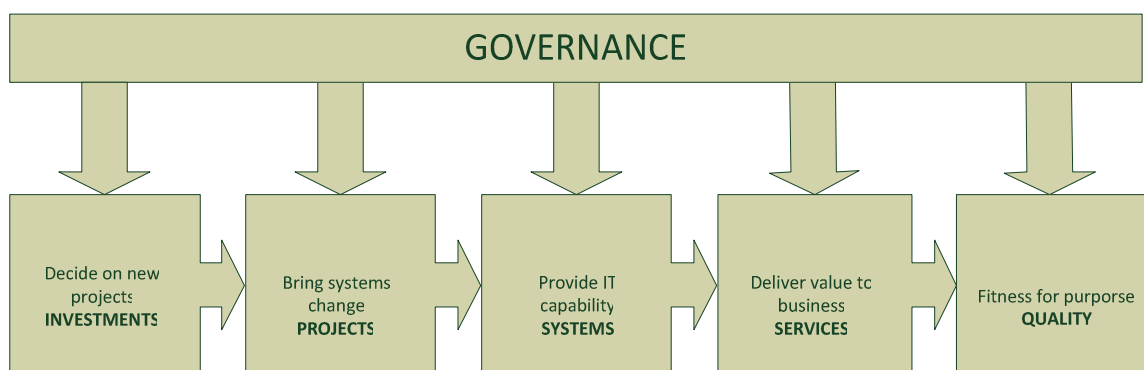
System quality is a very broad concept. It covers purpose, viability, supportability, risks, compliance to regulations, and compliance to technical standards.

Currently, SORS's system qualities are managed inconsistently, using the best efforts and disjointed procedures of a variety of specialists. Therefore the quality assessment and governance have to be strengthened.

System governance is a comprehensive framework for measuring and improving these system qualities. The benefits of implementation of the described approach will be as follows:

- Improved business and IT relationship because IT infrastructure requirements are translated to measurable goals.
- Improved return on investment on IT infrastructure because management can track and enforce the use of new infrastructure.
- Reduced project failures because technical and compliance issues are identified earlier.
- Reduced cost for compliance with regulations and internal standards because these are managed within an efficient framework.
- Reduced long-term risks and costs due to fragmentation of standards because the management has visibility of the degree of compliance.
- Improved measurement of IT systems' performance, which is particularly valuable for governing outsourced contracts.
- In outsourcing contracts, system governance can define and measure the service provider's stewardship of the systems. It can ensure that the systems are of high quality and up to date at the end of the contract period. It can even be used to ensure that systems improve under the care of the outsourcer.
- The responsibility for coordination and competence within ICT operations will be laid down in the mandate for the ICT Expert Committee of SORS.
- The committee will be created consisting of leading statisticians from different statistical units including the dissemination department and ICT Sector representatives.
- The Committee activities within the planning and follow-up of ICT development projects across organizational units will be strengthened by implementing the project management and governance methodology e.g. ITIL, ISO 9000, Prince 2 etc.

The place of governance in the system is showed in Figure 5 below.
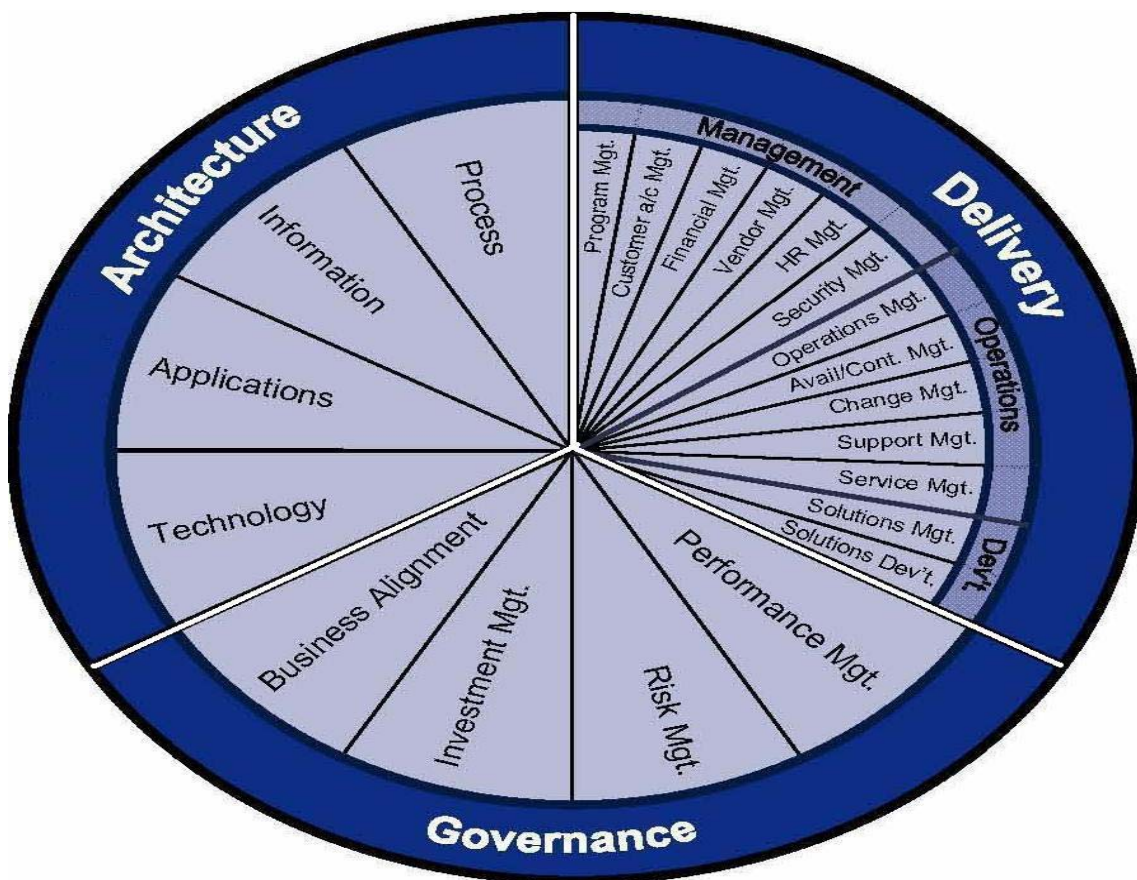
ICT sector governance will be flexible to structural changes within the sector thus supporting new developments and specialization of the existing staff to the tasks.

7.2 Competence building

Technological development and diversity are placing large demands on the competence of ICT staff. There is a trend towards a greater degree of specialization concerning methods, techniques and tools. Therefore, it is important that SORS becomes more specific regarding its objectives for the development of ICT competence.

SORS ICT competence must build on insight and experience of SORS key production processes, e.g. data collection and editing, management of statistical populations (statistical registers), metadata management, dissemination and the ability to see this in connection with the development of robust ICT systems.

Close connections with other national statistical institutes in regards to the development of common solutions and exchange of competence are desirable.

7.3 ICT key competences

Technological developments, based on metadata driven approach, open standards and platform independent systems, directing to new electronic services and forms of data and metadata collection, processing, dissemination and interchange nationally and internationally is a real working environment requiring a high competence level. SORS will increase its competence in order to make the best use of new developments.

The aim of the ICT operations are to contribute to the simplification, improvement and increased use of common working processes. Therefore, it will be necessary to increase the ICT staff's competence concerning methods and tools to be used for solution modelling and project management. Thus, the risk for projects failure can be avoided.

In order to meet the objectives of this ICT strategy, ICT development projects must to a greater degree than before be organized across the organisational structure of SORS. Therefore, there will be a need for competence associated with help and support systems for coordinating and collaborating across the boundaries of different structural units.

The ICT strategy sets focus on efficient and robust systems for the management of documents and projects. Office administrative support systems, wider usage of media tools will be a sensible supplement requiring additional competence.

Based on the needs expressed during the elaboration of the ICT Strategy, a list of topics concerning competence building is given below in order of priority:
* SQL RDBMS development and administration experience.
* Development methods and tools.
* New ICT methods and techniques, e.g. virtualization, cloud computing etc.
* Modelling techniques including enterprise and information modelling
* Project management.

7.4 Activities for competence development

Based on the above, a competence building plan will be developed. It will describe SORS's current individual and collective ICT competence and set up the actions for its improvement.

The plan will provide specific actions for developing relevant competence required to reach the strategic goals of the ICT operations.

The ICT Sector management as well as SORS's top management will be responsible for the allocation of ICT staff with prioritized key competences.

Through cooperation and active participation in local and international conferences, seminars and other expert forums, the ICT staff will be able to learn about best practices applied at other statistical institutions.

8. Further connected activities

The implementation of the strategy will be supported by the elaboration of an ICT Policy that will define how and when the strategy will be implemented.

SORS's top management as well as executives can use this document as the guide for their creative activities.

An update of the document should be done in connection with changed circumstances and actions completed.