

The European Statistical System's Enterprise Architecture Reference Framework and Capability Model

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Abstract

A business capability model is key to framing the implementation of the modernization program of statistical production in Europe. It is part of the European Statistical System (ESS) Enterprise Architecture Framework that was set up to guide the ESS Vision 2020 project design and collaborative solution building. The capability concept is well suited to address strategic planning and portfolio management. It allows integrating human, technological, business, methodological and standardization perspectives. It is therefore a good basis to manage competence needs in a statistical organization that is undergoing a change management program. The paper presents the ESS capability model and its principal uses cases.

Keywords: Enterprise Architecture, ESS Vision 2020, Business Capability.

1. Introduction

1.1. ESS Vision 2020 and Enterprise Architecture

The ESS Vision 2020 was established in May 2014 as a common strategic response of the ESS (Eurostat, EU Member States and EFTA countries) to the challenges that official statistics is facing. Among others, the advent of the data revolution calls for a new generation of more flexible and more interconnected statistical production systems in the ESS and requires adequate capabilities and competences in statistical organisations. The ESS Vision 2020 highlights the need to intensify the collaboration through the sharing of methodologies, data and statistical services. In particular, it aims at establishing common IT platforms and developing reusable tools for data storage, processing and analysis to render production

processes more efficient at the European scale. In this context, it calls for a common ESS Enterprise Architecture (ESS EA) to act as an enabler for the collaboration.

Hence, Enterprise Architecture, as a holistic approach, aims at generating economies of scale by setting up the conditions for reuse, creating opportunities for joint developments of statistical systems and striving for successful business implementation.

In this context a ESS Task Force bringing together architects from EU National Statistical Offices and Eurostat was established and produced a ESS Enterprise Architecture Reference Framework (EARF)¹.

The ESS EARF aims to support a wide range of stakeholders involved in change management programme. In particular it should help project managers and solution architects to design and implement the transformational projects in an “architected way” striving for the reuse of statistical software, avoiding redundant work and delivering sustainable business outcomes. As standardization is key to the ESS EARF, its use will contribute to the quality and the comparability of European statistics.

1.2. The ESS Enterprise Architecture Framework.

The ESS EA RF draws on a well-established generic framework for Official Statistics (GSBPM, GSIM, GAMS0, CSPA²) that were designed to support both standardization and collaboration. It seeks to make these frameworks operational in the ESS closing the gap between these general models and the design and implementation of change projects that implement the ESS Vision 2020 objectives. The framework provides a common set of terms, methods, visualisations and standards which form a starter set for the points that should be

¹ https://ec.europa.eu/eurostat/cros/content/ess-ea-rf_en

² <http://www1.unece.org/stat/platform/display/hlgbas/High-Level+Group+for+the+Modernisation+of+Official+Statistics>

addressed in projects as well as in the overall strategic governance of the realisation of the ESS Vision 2020.

The framework does not prescribe what needs to be done, but instead promotes the development of flexible architectures which can adapt to the variety of conditions in the ESS. It aims at providing guidance on how to define, document and use the architecture or selected elements thereof in the context of the ESS. It benefits project managers that do not have to start from scratch in doing their contextual analysis and guiding them through a comprehensive and complementary set of business and IT focus areas.

The ESS EA RF components are:

- The **ESS Business Capabilities Model** describes "what is needed", the capabilities, for producing official statistics. It uses a non-technical language and is therefore particularly accessible to various stakeholders, in particular managers without an IT background.
- The **Architecture Building Blocks** provide a list and definition of (potentially re-usable) functional components that are required to deliver the information systems needed in the ESS. Using the Architecture Building Blocks list as a reference ensures that ESS projects can jointly put in place all required elements for modernising statistics. It is also an appropriate basis to identify the deployment models for sharing and reuse.
- The **ESS EA Principles** give guidance to the decisions in projects involved in realising the Vision 2020. The ESS EA RF contains 19 principles whose scopes cover both project and solution design. Principles foster a shared understanding among project stakeholders i.e. the owners, the business implementers, the enterprise architects and the IT solution providers. Adherence to these principles ensures that ESS projects are selected, designed and implemented in line with the value underpinning the ESS Vision 2020. They give assurance that solutions get integrated into the bigger picture of the ESS in general.
- The **Statistical Production Reference Architecture** provides more details on the organisation of statistical production broken down by GSBPM phases. In the current version of the document, it contains a list of about 70 business services linked to the ESS

Architecture Building Blocks, together with generic models for their ESS deployment and integrations.

The following sections of this paper focus on the Business Capability Model and its main use cases in the context of ESS Vision 2020 implementation.

2. The ESS Business Capability Model

2.1. Definition

A **Business Capability** can be defined as "an ability that an organization, person, or system possesses. Capabilities are typically expressed in general and high-level terms and typically require a combination of organisation, people, processes, and technology."³

Business Capabilities Modeling is a technique for representing an organization's business, independent of organisation structure, processes, people or business functions⁴.

Business Capabilities form an anchor model for further developing a Business Architecture. They represent *what* the business does (or needs to do). They are the starting point for the subsequent detailing of *how* the business should do what it does to achieve business outcomes. The "how" is frequently expressed in term of business processes, activities, methodologies, IT systems and the required competence.

A Business Capability is thus engineered/generated taking into consideration different assets: People, Methods, Process, Application/Technology, Standard and Framework. Competences

³ TOGAF: <http://www.opengroup.org/architecture/togaf/>

⁴ GARTNER: <http://www.gartner.com/it-glossary/business-capability-modeling/>

are the glue that holds these assets together. The following table provides a description of the foundational elements of a capability.

| Capability elements | Interpretation |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| People | What are the human resources required for the capability to deliver business outcomes What are the skills or knowledge required to realize the capability? What are the relevant professional profiles to realize the capability? |
| Methods | What are the methods, algorithms or systematic procedures for the capability to deliver ? |
| Process | What is the set of co-ordinated steps, procedures and business rules for the capability to deliver business outcome? |
| Application/Technology | What are the IT applications and infrastructure required for the capability to deliver? |
| Standards and Frameworks | What standards, frameworks, policies and principles are used by the capability? |

Table 1 Description of the Capabilities elements⁵

Business Capabilities are linked to Business Functions as defined in GSIM or CSPA. The difference between the two concepts lies in their orientation and level of detail. As an indication, Business Capabilities tend to be more strategy-driven and strategy-oriented as they serve to decide on investments, whilst Business Functions are process/activity-oriented and

⁵ See also CSPA Catalogue Guidelines

applicable in an operational context. Further, Business Capabilities are typically expressed at higher levels of granularity and Business Functions are more fine-grained.

There is a many-to-many relationship between Business Capabilities and Activities. A capability can support different activities and on the opposite an activity can require different capabilities. Business Capabilities have an intrinsic cross domain and organization feature. Business capabilities tend to privilege a horizontal description of the organization in contrast with the vertical ones based on activities. They capture the reusable elements of the organisation fostering efficiency of investments.

Business capabilities open the way to a pro-active management of skills and competence across the organizations maintaining tight link with business objectives.

2.2. The model

The model describes standard sets of Business Capabilities required in a statistical authority for statistical production management within the ESS.

The ESS Business Capabilities model is broken down into 3 levels (Level 0, Level 1 and 2) and each capability is provided with a description.

The figure below visualises the most relevant Level 0 and 1 Business Capabilities identified for statistical authorities within the ESS

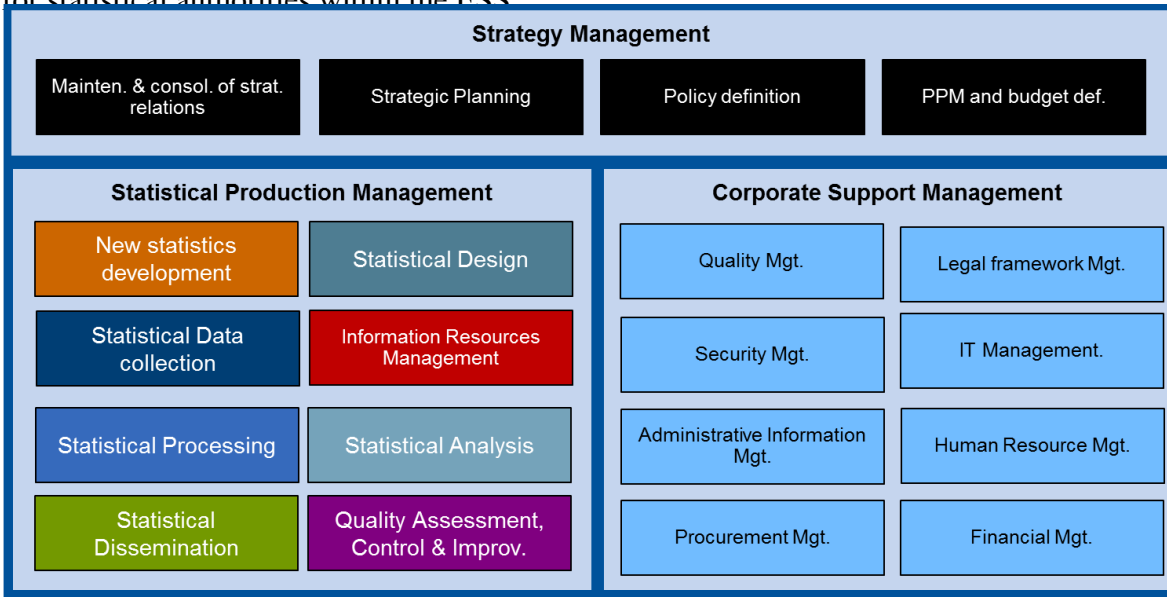


Figure 1 ESS Business Capabilities model – Levels 0 & 1

The statistical production management capabilities is zoomed in at Level 2 providing the relevant Business Capabilities in greater detail as pictured in the next figure.

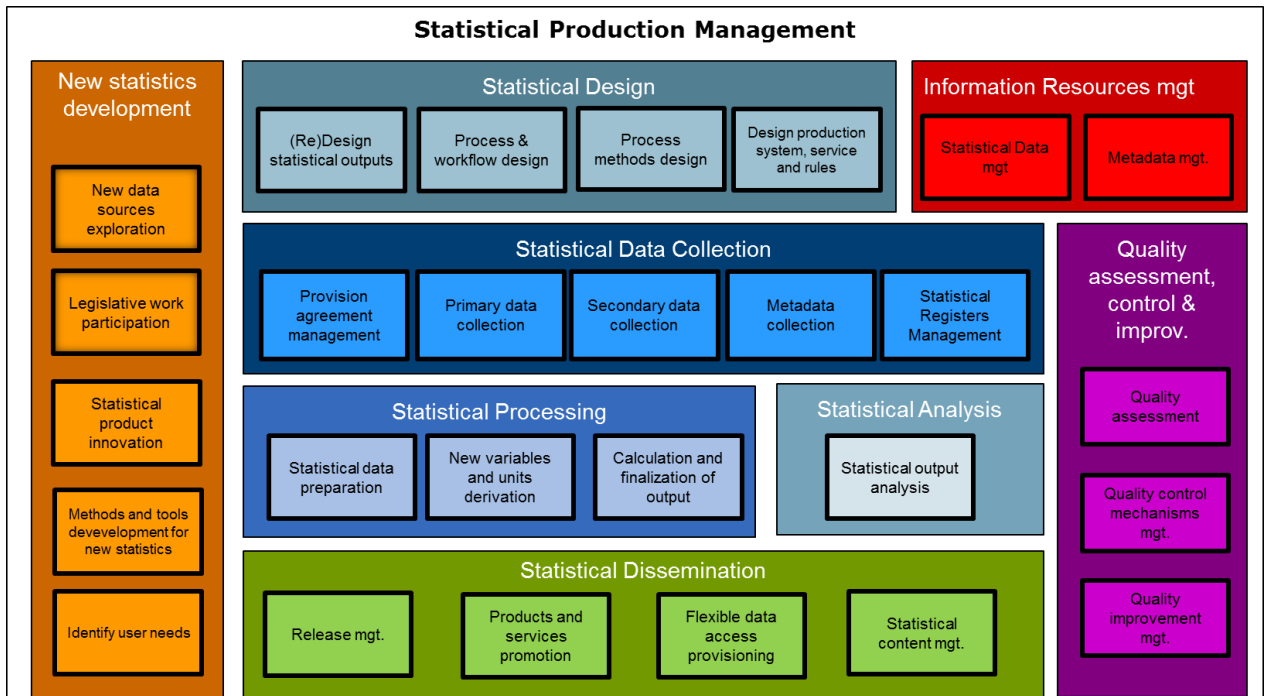


Figure 2: ESS Business Capabilities model for statistical production management Level 2

The description of these capabilities is provided in the annex.

2.3. Link with the ESS Vision 2020

The capabilities have been derived from an analysis of the ESS Vision 2020 goals. In the vision, these goals are regrouped in five key areas: Users, Quality, New Data Source, Statistical Production, Dissemination and Communication. The following figure establishes a link between these key areas and the capabilities at stake to realise their specific objectives. It therefore shows the most relevant Business Capabilities that are in scope for the ESS collaboration and which Business Capabilities are left to the individual members. It provides the starting point for a gap analysis identifying what capabilities are sufficiently present in the ESS and of those for which development effort.

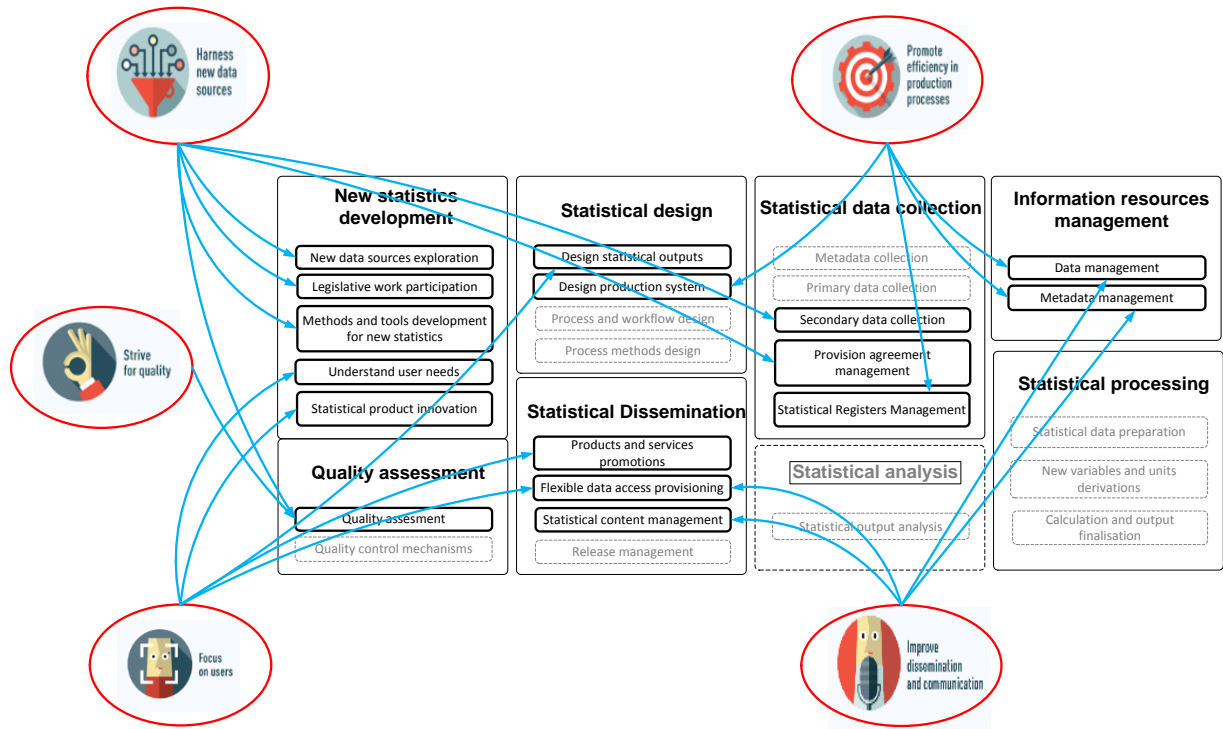


Figure 3: Main ESS capabilities at stake in the ESS Vision

3. Principal use cases and benefits

Distinguishing the different roles in the ESS, the key use cases for the ESS Business

Capabilities model are:

ESS governance

- Define the scope of ESS collaboration and what is left to the individual members avoiding redundancy.
- Manage coordination with other modernization programs in NSIs and at international level.
- Manage the longer term development and management of Business Capabilities that underpin the ESS' ability to conduct business in the future.
- Decide on the scope of specific collaboration mechanism like centers of excellence.

ESS Enterprise architects

- Support statistical service identification, specification and design (linking to Service-Oriented-Architecture).
- Encourage stakeholders to think about the strategic business requirements when developing architectures and information systems.

ESS Business Leaders

- Use the Business Capability model to engage discussions with IT and to formulate their business needs.
- Break down silos between business units/organizations by identifying common Business Capabilities and solutions.

ESS project managers

- Translate project outcome and objectives into tangible business outputs.
- Establish project roadmap integrating the different component necessary to operate the change.
- Align project outputs with global ESS Vision objectives.

ESS IT Leaders

- Define long term plans and management of IT assets in support to ESS vision objectives realisation.
- Provide a consistent view of what the ESS Information systems (will) do.

The main expected benefits of the ESS Business Capabilities model are the following:

- It sets a common language for the business to describe which portion is to be transformed.
- It supports the successful development and management of Business Capabilities in the ESS.
- It supports prioritisation and optimisation discussions, through defining which capabilities should be addressed first and by whom (and which project)
- It triggers and informs the identification, specification and design of IT services in the ESS.

Further , the ESS Business Capabilities model can be used to define at high level the ESS "to be" state and used as a reference at different stages of discussion (e.g. between business and IT) and in different stages of planning, design and implementation of the future information systems in the ESS. Using the ESS Business Capabilities model to identify competence and skills targets also helps to ensure a good alignment with ESS Vision needs beyond the specific needs of the projects.

4. Conclusion and possible way forward

Using the ESS Business Capabilities model across projects should ensure that all capabilities will be in place to realise the ESS Vision by 2020 and that these capabilities are developed coherently building on each other where relevant through an adequate set of competencies and instruments.

It has been used successfully to analyse and visualise the coherence of current ESS Vision 2020 Implementation Portfolio. It is a useful tool to communicate with ESS partners which project is developing what capability. At the mid-term evaluation of the implementation portfolio,, it can be used to identify these capabilities which are yet insufficiently developed and need further attention for ensuring the realisation of the ESS Vision 2020 objectives .

The ESS Business Capability Model has already been used beyond the scope of the ESS Vision 2020. It is, for instance, used by the CSPA investment catalogue⁶.

Building on an integrative concept combining People, Methodology, Processes, Standards and Technology, the Business Capabilities model is a key tool to document comprehensive architecture roadmaps, combining these different perspectives.

It entails certainly a potential for identifying competence gaps and putting in place a pro-active strategy for staff continuous training and targeted recruitments.

5. Annex

ESS Capabilities description

| Statistical Production Management | |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Business Capability</i> | <i>Description</i> |
| New statistics development | The ability to explore and innovate new statistics based on existing and new data sources. |
| Statistical Design | The ability to design the statistical outputs, concepts, methods, collection instruments and operational processes required to produce statistics. |
| Statistical Data Collection | The ability to gather data for official statistics. |
| Information Resources Management | The ability to manage custodianship and ownership of data and metadata. |
| Statistical Processing | The ability to check, clean, and transform the collected data and produce, examine and make it ready for dissemination. |
| Statistical Analysis | The ability to examine and make sense of data before dissemination. |

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<http://www1.unece.org/stat/platform/display/CSPA/User+Guide%3A+Investment+and+Capability+Catalogues>

| | |
|------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Statistical Dissemination | The ability to manage the release of the statistical products to users. |
| Quality Assessment, Control & Improvement | The ability to perform process quality assessments and put in place control mechanisms across the statistical value chain and operate quality improvement mechanisms. |
| Corporate Support Management | |
| <i>Business Capability</i> | <i>Description</i> |
| Legal Framework Management | The ability to develop, maintain and terminate legal frameworks and ensure compliance with the legal frameworks. |
| Administrative Information Management | The ability to manage the ownership or custody of records, documents, information and other intellectual assets held by the organisation |
| Human Resource Management | The ability to maintain the necessary human resources and optimize the value of human resources through hiring and development activities. |
| IT Management | The ability to manage tasks and decisions surrounding the ingestion, annotation, cataloguing, storage, retrieval and distribution of IT assets. |
| Security Management | The ability to ensure the confidentiality, integrity and availability of the ESS information, data and IT services through administering and deploying adequate security measures, managing risks and assuring and controlling how security policies have been implemented. |
| Procurement Management | The ability to effectively purchase goods and services from external suppliers for the operation of statistical authorities. |
| Financial Management | The ability to plan, direct, monitor, organize and control the monetary resources of the statistical authority. |
| Quality Management | The ability to plan, direct, monitor, organize and control quality arrangements and processes of the statistical authority as well as support continuous, organization-wide improvements to deliver high-quality statistics and statistical services. |
| Strategy Management | |
| <i>Business Capability</i> | <i>Description</i> |
| Maintenance and consolidation of strategic relations | The ability to maintain and consolidate strategic relations with external stakeholders. |

| | |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Strategic planning | The ability to set priorities, focus Business Capabilities and resources, strengthen operations, ensure that employees and other stakeholders are working toward common goals, establish agreement around intended outcomes/results, and assess and adjust the organization's direction in response to a changing environment. This includes the adoption of a total quality management model for the organisation and its strategic implementation i.e. the implementation of Enterprise Excellence models. |
| Policy Definition | The ability to contribute to policy development including the adoption of a total quality management model for the organization. |
| PPM (Project Portfolio Management) and budget definition | The ability to manage a portfolio of projects (and budgets thereof) including processes, methods, and technologies used by project managers and project management offices (PMOs) to analyze and collectively manage current or proposed projects. |

Table 2 Description of the ESS Business Capabilities Levels 0 & 1

| New statistics development | |
|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Business Capability</i> | <i>Description</i> |
| New data sources exploration | The ability to explore the potential value of new data sources for improving existing statistics or innovating to obtain new statistics. |
| Legislative work participation | The ability to participate in and influence legislative work that forms the legislative basis of official statistical production in a way that will support decision makers and is regarded as useful and important. |
| Statistical product innovation | The ability to innovate i.e. create new statistical products based on existing data sources and the exploration of new data sources that are useful and important to users. |
| Methods and tools development for new statistics | The ability to effectively develop methods and tools to support the exploration and innovation of new statistical products. |
| Identify user needs | The ability to collect, assess and translate user needs into statistical outputs. |
| Statistical Design | |
| (Re) Design statistical outputs | The ability to design statistical output so that it is valid and useful for the user based on sound statistical methodologies. |

| | |
|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Process & Workflow design | The ability to design statistical production processes and workflows in an effective and flexible manner to ensure efficient production as well as an easy replication/reusability of the processes. This includes data collection, process & analysis, and dissemination. |
| Process methods design | The ability to develop, maintain and enhance methods to be delivered by statistical processing services supporting statistical production. |
| (Re) Design production system, statistical processing services and rules | The ability to design and implement the necessary systems to deliver and combine statistical processing services and related rules for the production of statistics. |
| Statistical Data collection | |
| Provision agreement management | The ability to conclude provision agreements with information providers (explicit or implicit) to provide data according to requirements (timeliness, confidentiality, quality, transmission protocol, authorship, ...). |
| Secondary Data Collection | The ability to manage the process of requesting, receiving and testing data from administrative sources as well as other data sources (big data, internet data, scanner data, ...). |
| Primary data collection | The ability to set up and manage surveys through to their finalization and transfer for processing and analysis. |
| Metadata collection | The ability to enrich the received data with metadata to support the further processing and analysis as well as the dissemination of the statistical output. |
| Statistical Registers Management | The ability to set up, maintain and provide "register" services supporting collection and integration of data. |
| Statistical Processing | |
| Statistical data preparation | The ability to efficiently integrate data from different sources, classify and code data, review and validate the data as well as edit the data and perform imputations to improve the information sets' quality. This requires shared methods, processes and workflows. |
| New variables and units derivation | The ability to derive new variables & units for statistical output according to harmonised methodologies and requirements. |
| Calculation and finalization of output | The ability to calculate the necessary weights and aggregates and prepare output data for analysis and dissemination using shared methodologies and processes. |
| Statistical Analysis | |

| | |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Statistical output analysis | The ability to validate outputs as well as interpret & explain statistical data and finalize output for dissemination using shared methodologies and processes. |
| Statistical Dissemination | |
| Release management. | The ability to manage the release of statistical output as well as accompanying content according to release schedules so that users have predictable and equal access to data. |
| Products and services promotion | The ability to promote the statistical output for potential users and notify the press and other stakeholders about statistical output. |
| Flexible data access provisioning | The ability to make statistical output data and metadata flexibly available for manual and machine-to-machine access through multiple channels. |
| Statistical content management. | The ability to author and manage the distribution of content related to the statistical output. This includes press releases, interpretations, and reports. |
| Quality management | |
| Quality assessment | The ability to assess the quality of statistical processes as well as output according to shared standards and practices. |
| Quality control mechanisms management | The ability to set up, execute, monitor, and evaluate control mechanisms in the production process to ensure a high quality of statistical output. |
| Quality improvement management | The ability to perform continual quality improvement of statistical outputs and processes and (measurably) increase customer satisfaction. |
| Information resources Management | |
| Data management | The ability to manage data (including personal and unit level data) efficiently and securely through the entire life cycle from data collection to dissemination. |
| Metadata Management | The ability to manage metadata throughout the production cycle. |

Table 3 Description of the ESS Business Capabilities Levels 2