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Topic (i): Governance and management of statistical information systems

NEW IT STRATEGY FOR STATISTICS NORWAY

Invited Paper

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I. INTRODUCTION

1. IT operations in Statistics Norway (SSB) shall deliver services and infrastructure that support, improve and make more efficient SSB's data collection, statistics production and dissemination of statistical products. In addition, IT operations are a part of SSB's total expertise that should be utilised in order to create new and improved business solutions.

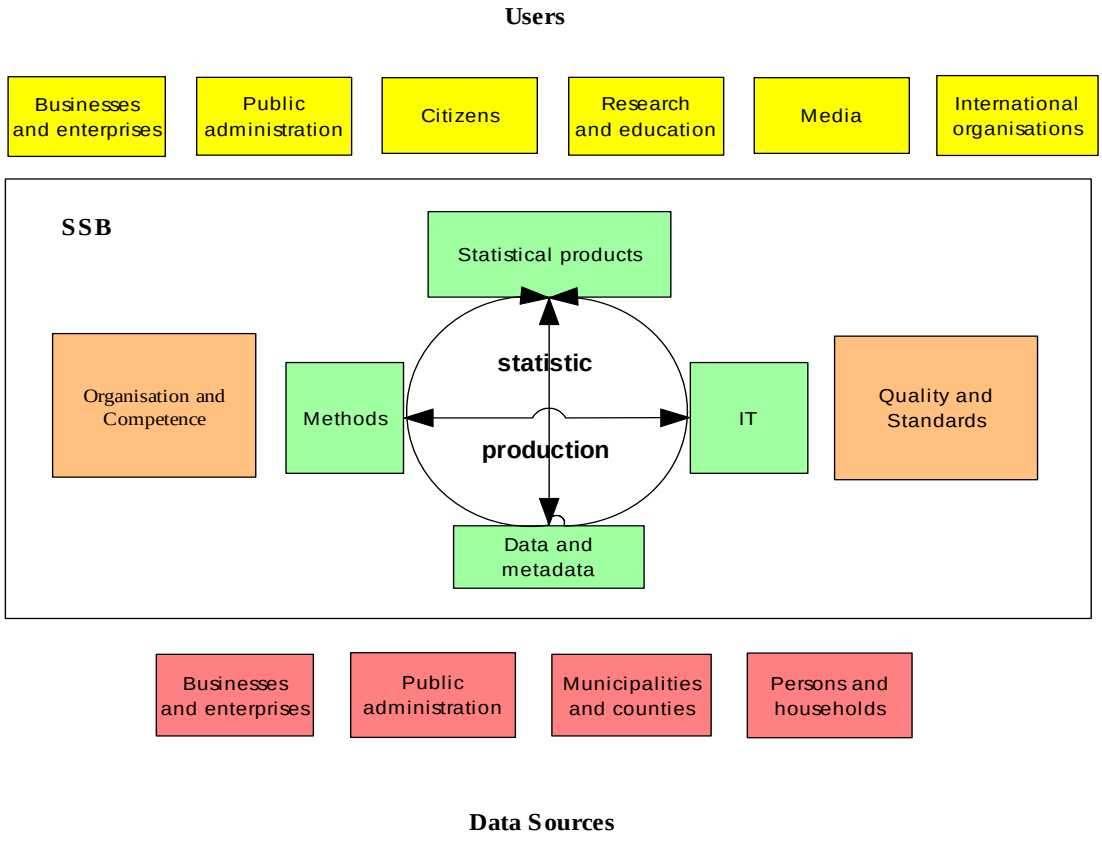
2. It is the responsibility of management to ensure that the development of new solutions is aligned with this IT strategy. This implies that decisions made regarding information architecture, choice of technology, infrastructure and IT competence must be in accordance with the objectives of the IT strategy.

3. IT in general, has a different and larger influence on business processes today than for a while back. This is also the case in SSB. IT workers are included at an earlier phase in development projects and contribute in an advisory capacity when business processes are to be changed or expanded. SSB's management expects IT operations to contribute to the continued development of SSB as a modern and attractive working place.

4. It is important that IT is closely linked to the rest of SSB's operations. This demands even closer cooperation between IT and the rest of SSB. The more knowledge that each has of the other's processes, the greater the benefits. Understanding SSB's vision and strategy will become even more important in the years to come. It will be more and more essential for IT workers to increase their competence in areas that are not purely IT.

5. Cooperation on solving the challenges that the organisation is facing must be built upon a common use of methods and models that describe, as precisely as possible, the demands and expectations for new solutions. It is therefore important to describe the organisation through enterprise models and, the work flow and data flow through process models. In the same way, it is vital that we steer development work through well established best practices, e.g. within project management and systems development methodology.

6. SSB's enterprise model can be expressed through key business areas and competence connected to data collection, statistic production and dissemination. The following figure is an example of what an enterprise model for SSB could look like.



II. STRATEGIC OBJECTIVES FOR IT OPERATIONS IN SSB

7. The IT strategy builds upon three strategic objectives that IT operations shall work towards in order to contribute to the strengthening of prioritised areas for SSB:

(a) Simplify, improve and increase the use of common working processes;
(b) Strengthen information and knowledge management;
(c) Make new roles and statistical products possible for SSB.

8. In order to reach these strategic objectives the IT strategy highlights actions within the following areas:

(a) Information architecture;
(b) Choice of technology;
(c) IT infrastructure;
(d) Competence.

9. The next four chapters of the strategy describe changes, challenges and trends within these areas in more detail. In the rest of this chapter, we summarise prioritised actions connected to each of the strategic objectives.

A. Contribute to the simplification, improvement and increased use of common working processes

(a) Continue developing and improving IT solutions that support SSB's efforts to reduce the perceived and actual response burden.
(b) Organise master systems for metadata to support and improve cross-cutting processes.
(c) The use of metadata systems to support electronic exchange both between internal and external systems is a necessary condition for the development of efficient data collection solutions as laid out in SSB's data collection strategy.

(d) The best data editing and analysis solutions should be developed as self-service systems to be used in more subject matter areas and for more statistics.
(e) The principals of service oriented architecture should be followed in order to ensure the greatest possible reuse and most effective interaction between systems, both inside and outside SSB.

B. Contribute to the strengthening of information and knowledge management

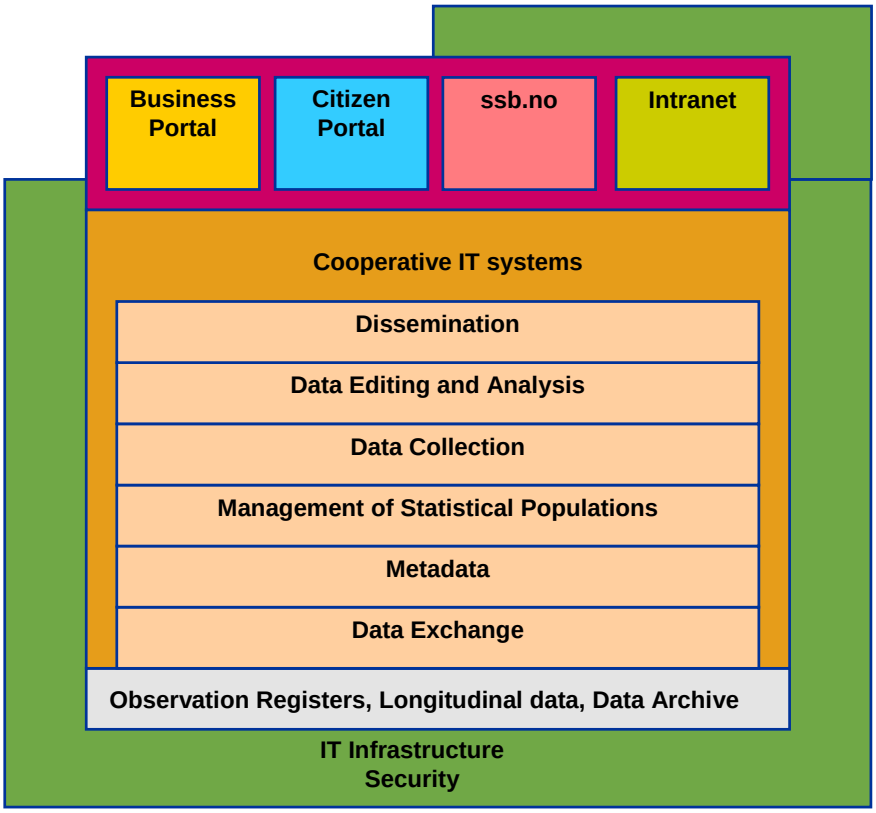
(a) Intranet will be developed further to include more shared information and give access to even more standardised solutions e.g. data editing and analysis solutions.
(b) Exchange of information and competence are important elements in the development of robust systems based upon open standards. Exchange of competence and information across organisational boundaries will be encouraged.
(c) We shall participate in national forums in order to get feedback and strengthen our contact with collaborators and customers.
(d) Participation in international forums shall contribute to network building and increase the possibility of finding new areas for collaboration (technical, statistical and methodological).

C. Contribute to make new statistical products and new roles possible for SSB

(a) SSB's IT infrastructure should be flexible and able to cope with steadily changing conditions and demands.
(b) IT solutions should support increased use of registers, particularly our three basis registers (person, property and business), and improve direct reporting from business and administrative systems within the production of statistics
(c) Automatic data collection from the Internet can be an important supplement to data collection from respondents and could give a real reduction in the response burden, as well as providing new or supplementary data for production of statistics.
(d) Improved data collection and data editing systems will free-up resources within those parts of the organisation directly involved in the production of statistics.
(e) Systems for management of statistical populations and sample administration shall be improved so that these systems can be integrated in the remaining data collection and statistics production.

III. INFORMATION ARCHITECTURE

10. It is both desirable and necessary that IT operations agree upon information architecture as a mutual reference ground for discussions about services and technology. In order to support the enterprise model of the first chapter, one has arrived at the following organisation of IT operations:



11. The figure describes how SSB's collaborative IT solutions can also be made available for external users through three public access points in eNorway: Business Portal, Citizen Portal and ssb.no. Our Intranet should be developed further as an internal point of access to SSB's services and tools.

12. Work within the different areas mentioned in the model should be supported by a framework that to a greater degree enables SSB employees to be self-sufficient when planning, operating and adjusting their work processes. We have focused on internal routines that can be simplified and made electronically available for internal users within the areas of data collection, data editing and analysis, management of statistical populations, dissemination and metadata.

13. Changes, challenges and trends in each of these areas are described in more detail in the rest of this chapter. All of these areas rely upon the data store that SSB manages. In order to make our collaborative systems more effective there must also be simple and secure access to our data storage.

A. Electronic data collection

14. We shall further develop and improve our data collection solutions, which build upon an expert foundation of survey methodological principals, well grounded and well tried open standards, as well as cooperation with other government institutions and shared public solutions.

15. IT solutions shall support SSBs efforts to reduce the actual and perceived response burden. This will be achieved through further development and improvement of our electronic questionnaires, as well as development of IT solutions and processes connected to other data collection methods (e.g. use of registers and direct reporting from administrative systems).

16. Surveys by questionnaire and interview will continue to be important sources of information. Use of electronic questionnaires on the Internet will increase at the cost of paper questionnaires. SSB will to a greater extent receive revised data before the individual statistic producer starts their editing. Use of electronic questionnaires requires skills in questionnaire design and in the making of automatic controls.

17. The use of administrative registers will increase in the production of statistics. We will see solutions that to a greater extent are tailored to different groups of respondents, e.g. by mixed-mode. Larger organisations will be able to report data for several purposes in the same operation and by a combination of modes e.g. reporting from administrative systems combined with electronic questionnaires. Reporting from other types of sources will occur e.g. from geographical information systems (GIS), where instead of reporting geographical information in a questionnaire, geographical information can be exported from the respondents own GIS.

18. Automatic data collection from the Internet can be an important supplement to collection from respondents and it can give a real reduction in response burden. This type of automatic solution is rather complicated from a methodological point of view because of demands on sampling and non-response handling. Internet today, with the disadvantages it has regarding semantic content, makes technological solutions vulnerable to changes in content, domain etc. It is important that we follow the technological development in this area, in particular the semantic web and initiatives to increase interoperability between systems. Semantic web is an extension of the current web where information has a better defined content that makes it easier for machines and humans to exchange information. Interoperability is the possibility for two or more systems to exchange information and make further use of the information that is exchanged.

19. Use of metadata systems and electronic interchange between internal and external systems will be a necessary condition for the development of efficient data collection solutions as outlined in SSB's data collection strategy.

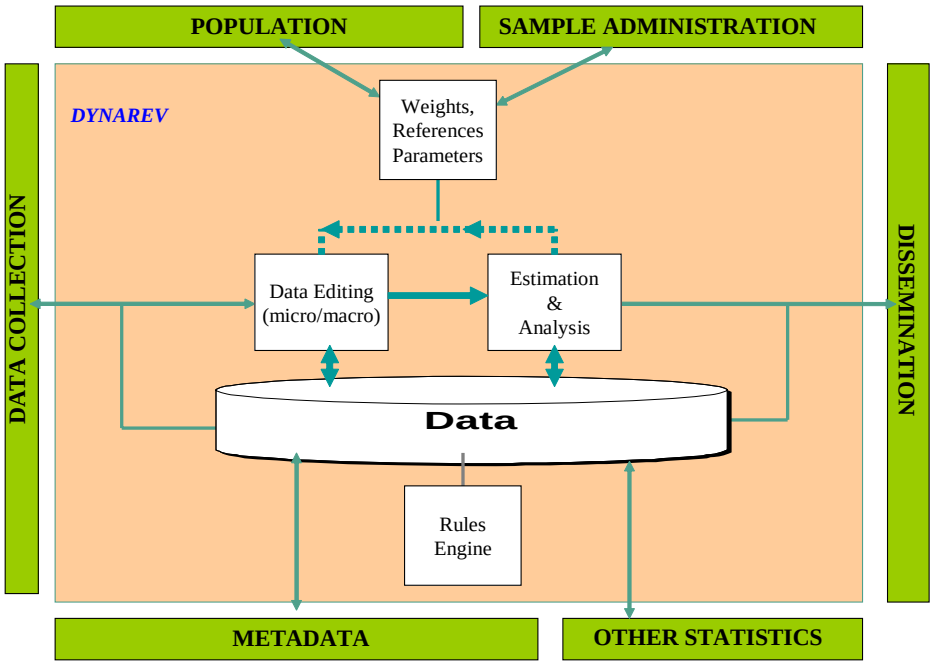
20. To develop good electronic solutions for data capture also affects systems for management of statistical populations and samples. We have good solutions in several statistical areas, but we should explore whether these can also be used in other areas. Systems for management of statistical populations and sample administration shall be improved so that these systems can be integrated in the remaining data collection and statistics production.

21. The strategic objectives for the technical data collection solutions must support SSB's data collection strategy.

B. Data editing and analysis

22. Today's IT solutions for data editing and analysis are to a large extent tailored to individual statistics. These are efficient and function well at a local level. The total cost for maintenance of all these solutions is however extremely high, for both IT and the producers of statistics. The challenge is to try to reduce the number of IT solutions. This must be done by creating common solutions that can be used for several statistics. By using new methods and approaches for data editing it will be possible to improve the data editing process and make this more efficient for the producers of statistics. This must be done in a collaborative effort between IT, statistic producers and methodologists. At the same time it should be a goal to develop solutions that the statistic producers can maintain at least partly by themselves. In this way it will be possible to free-up resources, both within the production of statistics and within IT, to carry out other tasks. Establishment of common solutions must be done without reduction in the functionality and efficiency of the current solutions. Demands must be met for up time and backup. Work on common solutions has started and must be prioritised.

Framework – Data Editing and Analysis



23. The current data editing systems must be described carefully in order to find common features. Based on this work, the systems must be harmonised where this is appropriate. Calculations for age, date, control of identification numbers and logical controls must be available in one place. This is also true for lookup procedures in catalogues of post numbers, municipality numbers and other standards and definitions used in statistical production. Routines and solutions for extreme values, imputation and aggregation must also be considered. Common features must be identified and standardised. It is possible to have more efficient routines for seasonal adjustment, sample supplements and accrual.

24. We shall investigate possibilities for a greater degree of coordination and improvement of the current analysis systems so that producers of statistics can more quickly and easily obtain an overview of the data. This will contribute to the improvement of existing statistics and make new products possible. Increased international cooperation will increase demands on SSB to produce statistics that are more comparable with statistics from Eurostat and OECD.

25. In accordance with the data collection strategy, increased use of data from registers and administrative systems will be made in the data editing and analysis phase. IT solutions must be developed in such a way that use of the solutions is made easier and access for statistic producers is increased.

26. Work on simplifying and automating procedures and systems for loading data into our dissemination database (StatBank) have been ongoing for some time. This work must continue. In addition, procedures for making tables to be used in the daily statistics must be simplified.

27. Use of metadata in all processes must increase. Robust and effective communication between metadata systems and statistic systems must be developed.

C. Management of statistical populations

28. SSB has at present three statistical population registers (basis registers) for the following units: person and household, business, enterprise and corporation as well as address, building and dwelling. Important challenges in this field are:

(a) Harmonise development work across the three basis registers.
(b) Aim for a common data model with efficient and secure links between units in the basis registers.
(c) More efficient transaction mechanisms for update and extract..
(d) Establish solutions that give good administration of digital property maps.
(e) Focus on the collaboration between statistical population management, metadata, data collection and statistic production systems. The systems must be developed so that traditionally resource intensive activities, such as the transition to a new NACE, can be made with the least possible use of resources.

D. Dissemination

29. From the start of ssb.no in 1995, we have concentrated our efforts on the web towards maximum content and best possible structure in order that users can easily find what they need. In the future, Internet will to a greater extent be a place for collaboration. Information will be available in different contexts. Where the information was originally made available will be less interesting for many of our users. We will have to change our dissemination perspective in order to reach out to where are users are rather than expecting them to come to us. Obviously, this must be combined with the continued publication of official Norwegian statistics on ssb.no. A strong focus on customisation for users and interaction with users will drive the further development of ssb.no.

30. We must be able to organise our digital services based upon our users needs. Because these needs vary, our dissemination services must be built up in such a way that we can dynamically adapt to the increasing variety of communication channels e.g. mobile phones, line capacity and screen size. At the same time we must enable users with disabilities to access and use the information on our web.

31. We cannot assume that the way in which we decide to present content is suitable for everyone. We must allow users to select the information they consider relevant and to do so in such a way that they can reuse this for example by establishing self-service systems and personalised services. We will need to make increasing use of syndication technologies like RSS to communicate our statistics.

32. The burden on respondents can also be reduced by the application of solutions better adapted to the respondent's technology and information sources.

33. The web has been our traditional medium for one-way communication i.e. SSB informs and our users receive. In SSB, official statistics are seen as a common good for society that should be available to everyone. We must give our users the possibility to structure our information themselves by establishing their own categories. These categories can be used by others, at the same time as we give the individual users the possibility to present our information in their own way.

34. Active use of technology can contribute to increased participation by more people and create new opportunities. Establishment of communication areas for researchers, statistical advisers and users can be one of several ways to realise this e.g. by creation of digital diaries (blogs).

35. Increased demands for standardisation of interfaces, IT systems and formats for documents increase the possibility to collaborate with others. Data to be communicated and exchanged must, in addition to being in an agreed upon format, have rich enough metadata to provide meaning for the data that are exchanged.

36. Through increased collaboration with other actors we can improve the quality of the content we produce. Since we have the responsibility to communicate official Norwegian statistics we also have the unique opportunity to compile and communicate these statistics in a variety of contexts.

E. Metadata

37. In order to contribute to an efficient production of statistics and dissemination of these, as well as improved quality of the statistics, we need an improved collaboration between systems that document production processes and the statistical products. This can be achieved through use of metadata systems that are

easily available for all users. Metadata should be created and updated in just one place. Solutions across systems and organisational boundaries require harmonisation and standardisation of definitions and concepts, as well as use of national and international standards.

38. Data and metadata flow to a larger degree between machines without human intervention. In order for machine-machine communication to be possible, metadata must have a structure that is machine readable. Metadata must be defined and stored according to standard models and structures. Work on machine readable structure and exchange standards is important. Search technologies improve the possibilities to find data and metadata as well as indicating which structures are appropriate to achieve this. Our Intranet will function as a portal for our metadata and as a communication channel for administrative and organisational information.

39. Clear roles and responsibilities for metadata systems need to be defined and there must be a stepwise development in the content and functionality of these. Master systems must hold the 'right answer' for each metadata type. Work on standards must systematically contribute to the establishment of a framework for statistical systems with standardisation of metadata, templates and databases for standards.

40. SSB has master systems for the following types of metadata: definitions of variables, classifications, file descriptions for archive data and longitudinal data. Master systems for questionnaires, rules and administrative information on statistical products are under development. These systems will communicate with all phases of statistic production, from data collection to dissemination of statistical products, via metadata services.

41. The maintenance of master systems for metadata requires attention to be paid to:
(a) Cultivation of the contents to avoid duplication
(b) Identification of sources and contacts
(c) Guidelines and routines for the master systems and their interactions with other systems.
(d) Development of quality indicators for the content and functionality of the master systems that should be a natural part of the development process.
(e) Regular status reporting and follow-up of the quality indicators (for different organisational levels and groupings) to help ensure that the master systems are filled up with a sufficient amount of good quality metadata.

42. Development of new metadata systems in line with SSB's metadata strategy will continue, with focus on a closer integration with statistic production systems. The comprehensive vision includes
(a) Systems with administrative information (e.g. statistical products)
(b) Data collection systems
(c) Metadata for registers (particularly basis registers) and databases
(d) Better connections to national systems.

F. Administrative systems

43. SSB's IT expertise will be focused on statistics production. SSB's administrative systems, *with the exception of the administrative system that contains statistical product information*, require a competence and technology that harmonises little with the remaining IT strategy. We wish to outsource the development and maintenance of such systems. However, SSB must ensure that we have sufficient competence in-house to purchase and manage administrative IT solutions, so that we can fill our system ownership role, particularly with regard to needs for modernisation and further development.

IV. CHOICE OF TECHNOLOGY

44. The choice of technology must support the strategic objectives of the IT strategy and must be taken into consideration when decisions are made regarding new or further development of applications and infrastructure. In addition, there should be guidelines that hinder the establishment of technological islands that offer short sighted technical solutions that prove inflexible in the long run (costly in the lifecycle of the

product). The choices we make in technology must be weighed against these perspectives. New technology can give many benefits but it can also be resource intensive establish. The benefits of new technology must be weighed up against the establishment costs. Our portfolio of tools must be reduced. An evaluation of some other important aspects relevant to the choice of technology follows.

A. Service Oriented Architecture

45. SSB's technical solutions shall be built mainly upon the principals of service oriented architecture. Guidelines on this are presented in Norway's eGovernment plan. All solutions for external users and most solutions for internal users shall:

(a) Support open standards
(b) Be platform independent
(c) Be component based
(d) Support the packing in of data and functions as services (webservices).

46. These are central principals in service oriented architecture. Applying these principals, application and services can reuse existing functionality/components completely independently of the system they were developed in. In addition, by use of this technique, we can extend the lifetime of older applications, which have important functionality we wish to expose, just by creating a service layer on top. This increases the possibilities for interaction between new and old applications in a completely new way that gives benefits in the form of shorter development time, increased reuse and more consistent systems. This enables us to replace the systems behind the scenes, because users are not directly exposed to communication with these.

47. By following the principals of service oriented architecture, one has a good starting point for collaborative systems inside SSB, but also for collaboration with external systems, nationally and internationally.

B. Open source code

48. Software given out as open source code can be found in almost all categories of software (also hard ware) from operative systems, to databases, to development tools. For SSB this means that we can choose software in several categories. We thereby achieve greater flexibility with regard to adjusting the system to meet our requirements either by doing it by ourselves or by paying a third party to do so instead of being dependent upon one software supplier. Use of open source code in SSB will give us greater flexibility and lower costs, but it also requires more of us in the form of leadership and competence. It is important that we choose products appropriately and that we consider whether these will give us long term benefits both economically and with regard to resources. SSB requires IT operations to have the following in mind when they consider using open source code:

(a) IT management and project leaders are expected to have
    a. Insight into the balanced cost principle: Costly upgrades by commercial suppliers compared with maintenance costs of having a large and varied IT portfolio.
    b. Insight into security and reliability requirements: Easily available code inspection makes open source code more reliable when used in the support of vulnerable and business critical processes.
(b) IT developers are expected to
    a. Have knowledge of and support from formal methods
    b. Be able to plough back best practise from cooperative development within international and national projects (e.g. the Nordic StatBank cooperation).

C. Scalability

49. SSB's technical solutions (both hardware and software) must be scaleable. This implies that they must function in a production environment and handle the expected volume with an acceptable response time. The volume can be measured in the amount of data, the number of transactions or the number of simultaneous users. It should also be easy to set in more resources if this should be necessary.

D. Tools

50. Technology choices imply tool choices but there is little point to name specific tools that will commit IT resources over a five year period. We have a goal to reduce the number of tools to the minimum possible. This goal requires a continuous and qualified evaluation of existing and new tools.

V. IT INFRASTRUCTURE

51. IT infrastructure must support SSB as a business. The IT infrastructure must ensure access to necessary IT resources and must have sufficient capacity at all times.

52. IT infrastructure in SSB must be of sufficient quality and sufficiently flexible to meet expectations and demands that change continuously. Such changes also require that IT workers are flexible.

53. SSB shall choose software that provides sufficient functionality for an acceptable cost. See also use of open standards and source code under Choice of technology.

A. Security

54. The infrastructure in SSB must always maintain security at an acceptable level. Data that require protection must be securely transported to or from SSB and be stored in a secure manner. Only authorised access should be possible. The level of security should not however exceed the requirements for internal and external use.

B. Availablity, scalability and capacity

55. The availability of IT services shall be in accordance with contractual agreements. Good follow-up with system owners is important in order to predict needs for increased capacity and the infrastructure must be quickly scaled to meet the demands agreed upon.

C. Simplifying and increasing efficiency

56. The IT infrastructure will be simplified and made more efficient through comprehensive planning. Consolidation will be an important method to reach a clearly set out and well organised IT infrastructure in which resources are utilised to the maximum. Consolidation of servers via virtualisation can be seen as a first step on the way to consolidation in one data centre in SSB. This can be achieved on several levels: machines, operative systems, applications, user interfaces, storage and networks. Virtualisation will be one of several important actions to simplify access to resources and the administration of these.

57. Higher demands on network connections from the data centre to other locations will be a natural consequence of gathering resources in one data centre.

D. Mobility/Remote working

58. SSB has established a solution for remote working via the Internet. We expect to see an increase in use of this service as a consequence of changes in working patterns and demands for greater flexibility. Synchronisation with mobile phones, handheld devices etc. must be supported in accordance with user demands. However, it is also important that these are properly managed with regard to security requirements.

E. Integrated access to Internet on the desktop

59. Our current access to the Internet via a terminal server is suboptimal. Integrated access from the desktop will mean increased efficiency and a simplification of several working routines in SSB. Naturally, the security issues around such a seamless solution must be satisfactorily resolved first.

VI. COMPETENCE

60. Technological development and diversity are placing large demands on the competence of IT workers. There is a trend towards a greater degree of specialisation within methods, techniques and tools. It is therefore important that SSB be more specific regarding it's objectives for the development of IT competence.

61. SSB's IT competence must build upon insight and experience with SSBs key processes: data collection, data editing, management of statistical populations, metadata management and dissemination and the ability to see this in connection with the development of robust IT systems. Close connections with other national statistical institutes with regard to the development of common solutions and exchange of competence are desirable.

A. Key IT competence

62. Technological developments, based on open standards and platform independent systems, open for new electronic services and forms of cooperation nationally and internationally. SSB is in the middle of a methodological and technological increase in competence in order to make the best use of this development. Technology and development principals in this connection are described under Choice of technology and referred to as service oriented architecture.

63. The aim of IT operations to contribute to the simplification, improvement and increased use of common working processes is in agreement with our ambitions within electronic collaboration. In order to make these processes available electronically we will need to increase our competence on methods and tools to be used for enterprise modelling.

64. Increased and more efficient data exchange with external actors requires consistent data structures. IT operations need to strengthen their competence in the methods and tools used for information modelling.

65. In order to meet the objectives of this IT strategy, IT development projects must, to a greater degree than before, be organised across organisational boundaries in SSB. Thereafter there will be a need for competence associated with help and support systems for coordinating and collaborating across these boundaries. The IT strategy sets focus on efficient and robust systems for the management of documents and projects. Office support systems and media tools will be a sensible supplement.

B. Prioritised key competence

66. Based on the needs expressed under Key It. competence the IT strategy prioritises (further) development in the following areas of key competence:

(a) SAS and Oracle experience
(b) Modelling techniques including enterprise and information modelling
(c) Project leadership and control
(d) Service oriented architecture
(e) Development methods.

C. Actions for competence development

67. Based on the above, a competency plan must be developed that can describe SSB's current individual and collective IT competence. The plan must provide specific actions to develop the relevant competence required to reach the strategic goals of IT operations. It is a management responsibility to ensure that IT workers with prioritised key competence exist in the organisation.

68. Through cooperation and active participation in public forums we wish to contribute to the development of robust and efficient public administration solutions. The guidelines provided in Norway's eGoverment plans are key documents in our work. A central topic will be open standards as an important factor in the development of systems facilitating electronic collaboration.

69. Active participation in international projects is important as an arena not only for competence building but also to obtain feedback for the further development of internal systems (with regard to technology, statistics and methodology). For example, our participation in SOS (Statistics Open Standards), EU's framework programs and development aid have contributed to the establishment of contacts at the same time as they can reveal or create new areas with the possibility for international cooperation in technological, statistical and methodological areas.

VII. IT GOVERNANCE

70. The responsibility for coordination and competence within IT operations is laid down in the mandate for the IT Committee. The committee's activities within the planning and follow-up of IT development projects across organisational borders needs however to be strengthened.

71. System architects will be introduced for each of the areas in the information architecture. A mandate for this role will be made that will support the system architect's responsibility to ensure that IT development projects are in line with the IT strategy.
