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PROCESS REENGINEERING AT STATISTICS SWEDEN

Supporting Paper

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I. INTRODUCTION

1. This paper describes a major process reengineering effort going on at Statistics Sweden. It was started about a year ago, and the first phase should be finalised by the end of 2007. The effort concerns governance and management issues as well as reengineering of business processes and information systems architecture.

II. THE REENGINEERING PROJECT

2. About a year ago the new Director General of Statistics Sweden initiated a major process reengineering effort. Four key-words were highlighted:

- customer focus
- efficiency
- standardisation
- quality control

The new Director General had earlier been a customer of Statistics Sweden, and from these experiences, and from discussions with other customers, he drew the conclusion that the operations of Statistics Sweden were not as cost-effective as they should be, and not sufficiently focused on the demands of the customers. One of his first actions was to make a quick survey of methods and tools used in statistics production, and the result was striking: although some standard methods and tools were in use, most statistical surveys/products used a lot of home-made solutions. The diversity in methods and tools was overwhelming. It seemed obvious that a standardisation of the processes in statistics production, accompanied by a wise selection/acquirement of standardised methods and tools supporting the standardised processes, would have the potential of saving a lot of money for Statistics Sweden and its customers. Data editing operations alone account for at least 30% of the total costs, and personal interviews are another cost driver. At the same time noone was able to say very much about the quality effects of performing different types of data collection operations in different ways. For some

process steps that have major effects on cost and quality, Statistics Sweden does not have any quality control systems in place.

3. Thus it was confirmed that the demands of customers[1], including their justified requests for lower costs and higher efficiency, definitely deserved more attention by Statistics Sweden. Standardisation of processes, methods, and tools, coupled with a system for systematic quality control seemed to be important parts of a solution to the problems. A project called LOTTA was started to deal with these matters.

4. In parallel with the LOTTA project there are some other important tasks, given by the Government, that Statistics Sweden has to tackle. One is to improve economic statistics. Statistics Sweden has been given some extra money for this work, organised in another major project called EMMA.

5. Another task given by the Government to all government agencies is to reduce the respondent burden of companies by 25%.

6. The LOTTA project is an initiative by Statistics Sweden itself, and we have not received any extra money for this from the Government. The budget for LOTTA for 2007 is in the order of 7 M€, and the financing of this budget has been created by re-prioritising all development work originally planned for 2007. Highest priority is given to development projects belonging to the LOTTA project, or at least being in line with the goals of the LOTTA project. Projects which are regarded as contra-productive in view of the LOTTA goals have been stopped. Examples of such projects are local developments of systems that are unique for individual products, and which are not in line with anticipated LOTTA standards. In between the top priority projects and the projects that have been stopped, there is a group of development projects that are allowed to continue, provided that resources are available, when LOTTA has got what it needs. In order to ensure that prioritised projects really get the (personnel) resources that they need, LOTTA projects have the right to demand that any person in the line organisation should leave his/her present tasks to the extent that he/she is needed for a LOTTA project. If the line manager concerned has any objections to such a request, he/she must turn to the Director General for a final decision. Up to now there have only been two such cases, and both have been determined in favour of the LOTTA project.

7. In principle, the reengineering work, of which the LOTTA project is a major part, needs to look at all processes of Statistics Sweden:

- communication processes
- production processes
- maintenance and development processes
- control processes
- administration processes

8. The review of processes concerns both the architecture of whole process chains, or process systems, and the components of individual processes or systems, and the reviews take place both on the business level and on or more technical level. On the business level of the statistical production system, we use the input-throughput-output structuring and break down each one of these three major phases another few levels. On a technical level we aim at a Service Oriented Architecture (SOA) and standardised XML messages for exchange of data and metadata. A Service Oriented Architecture will also ensure that the IT-services that will be developed are aligned with the business processes.

9. Figure 1 shows the typical steps in the interlinked product development and product production processes of a statistical agency. Figure 2 shows the statistical production process in its real world environment with customers in the form of (a) users of statistics; and (b) respondents and data providers. Figure 3 shows major data/metadata and control flows between (a) the design process; (b) the monitoring process; and (c) the production/operation/execution process. Figure 4 shows in greater detail how the monitoring process interacts

[1] Including both users of statistics and respondents or data providers.

with the execution operations by means of process data and control signals, and how the execution operations interacts with a common data/metadata infrastructure. Figure 5 shows more details on the same themes as the previous figures.

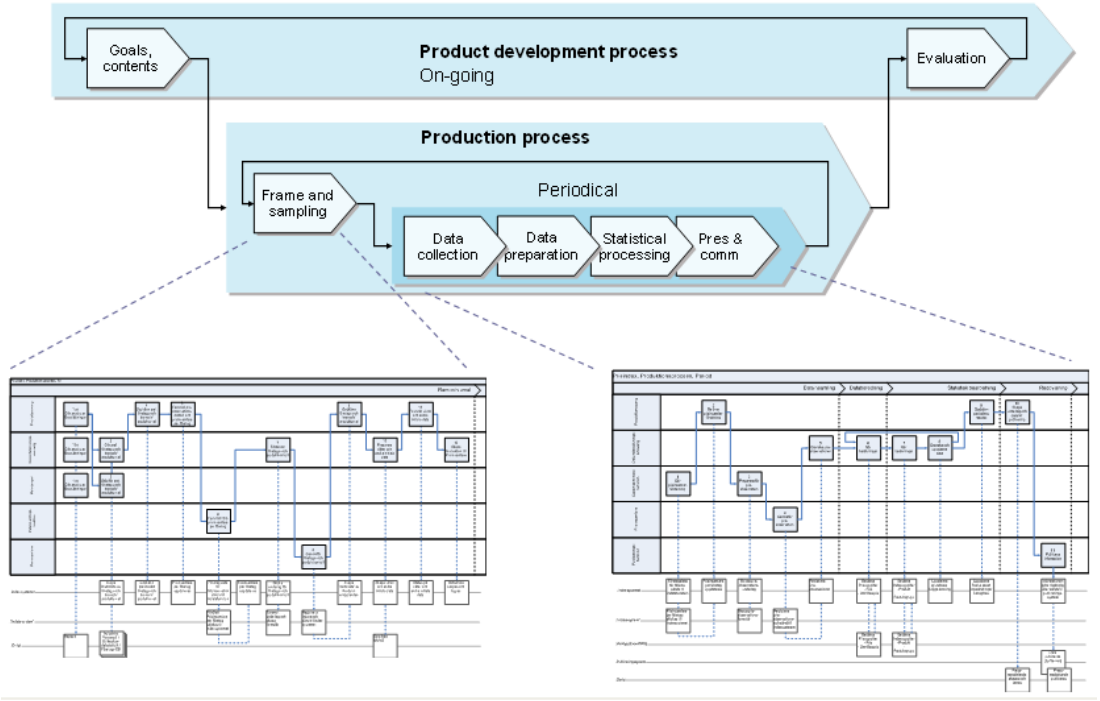

Figure 1. *Statistics production: product development process and production process.*

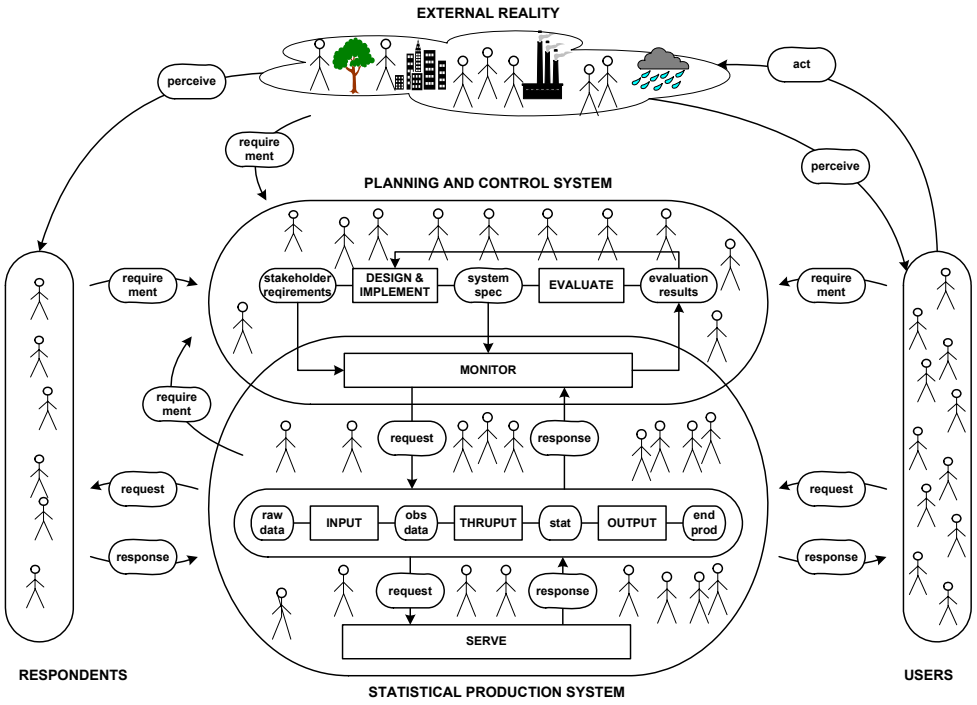

Figure 2. *A statistical system in its environment. The statistical production process and its customers (users of statistics and respondents and data providers).*

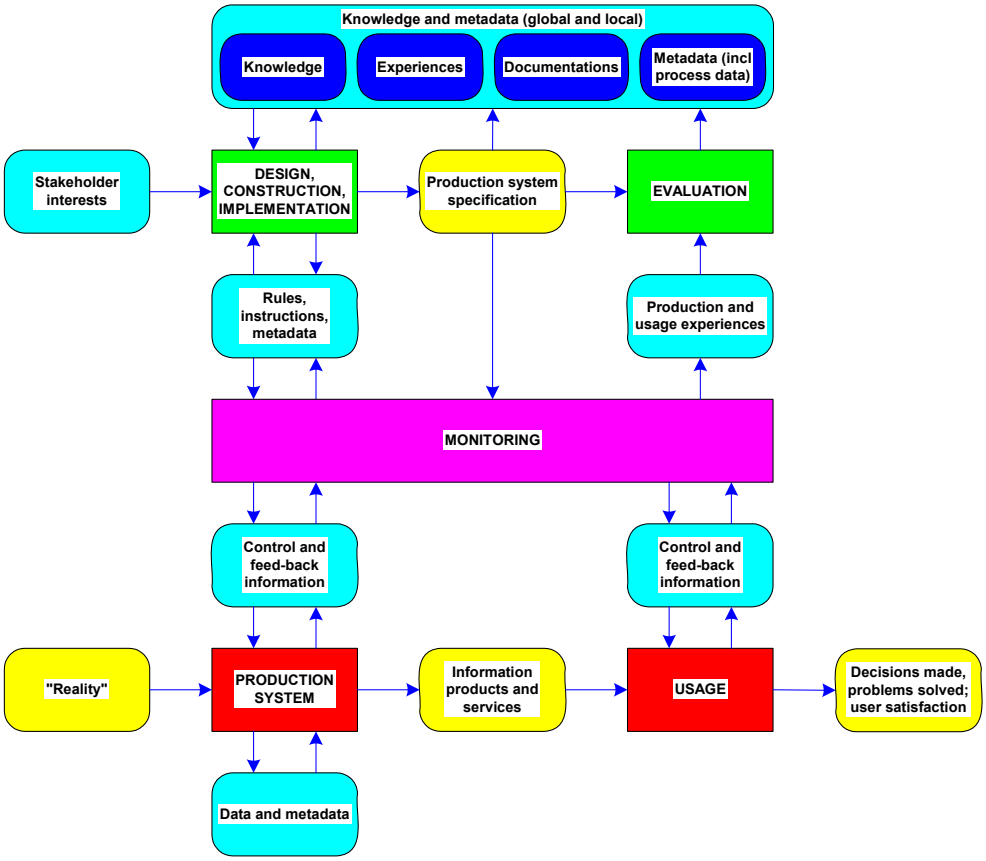

Figure 3. *Control and execution of a statistical production system.*

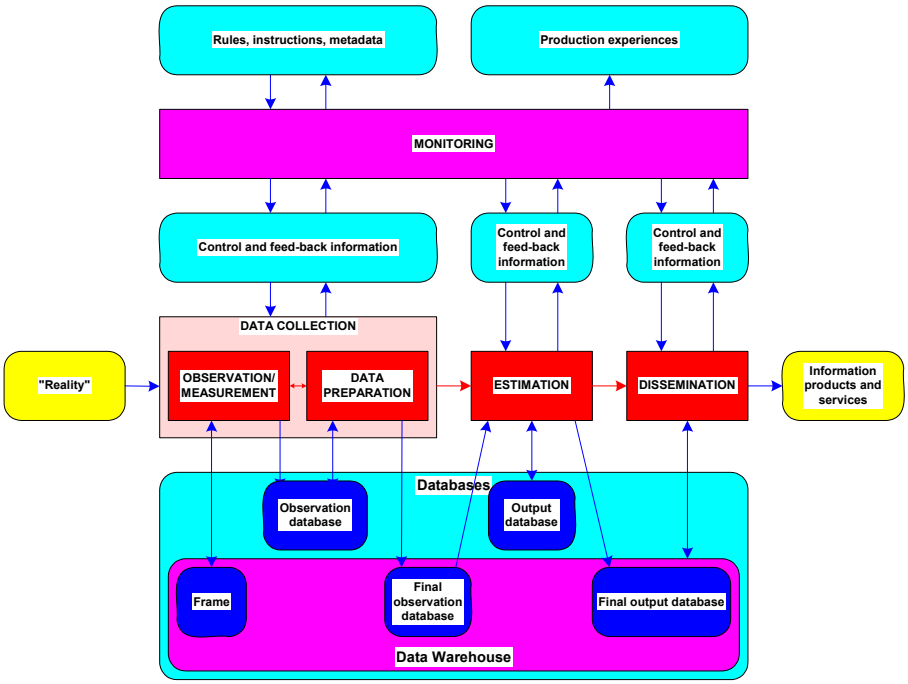

Figure 4. *Basic operations in a database-oriented statistical production system.*

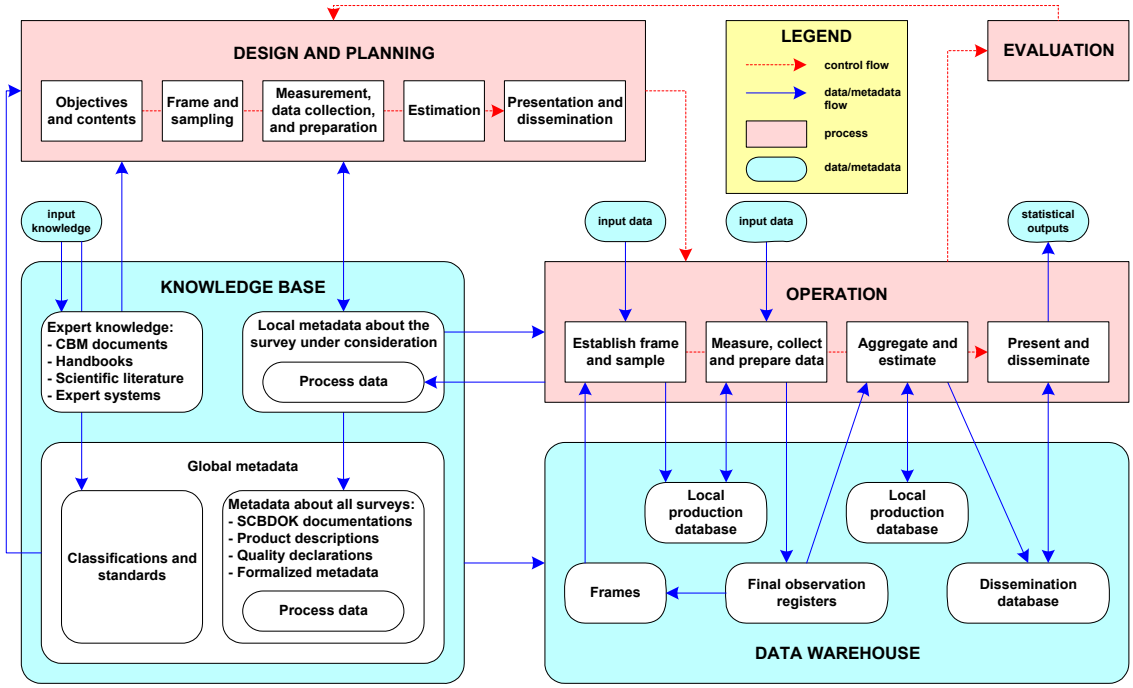

Figure 5. *Statistics production with integrated data and metadata management.*

10. As illustrated by the figures above we may distinguish between a control flow and an execution flow in the statistical production system. The control flow consists of a planning-monitoring-evaluation loop, which is on-going as long as the production system is alive. In the planning phase the different subprocesses and components that make up the statistical system as a whole are designed (as regards contents, statistical methods, and technical solutions), constructed and implemented. The design process should generate documentation that can be used for monitoring and execution of the production process.

11. The statistical production system of a statistical agency is often viewed and organised as large number of more or less independent process occurrences, so-called stovepipe systems. One may choose to see the similarities or the differences between the process occurrences. In the LOTTA project the very clearly outspoken goal is to focus on the similarities. This means that all process occurrences (corresponding to traditional “surveys” or “products”) should be not only viewed but also very concretely designed and constructed as systematic variations of one standard solution, following one standard architecture and using a common set of prescribed methods and tools in a prescribed ways. This should not be misunderstood. There will not be one rigid system that is able to take care of all input data collections and produce all statistical outputs. Instead the common system will consist of a limited number of methods, tools, and components that may be combined in a flexible way so as to meet a large variety of needs: it will be possible to vary the behaviour of the standard production system by manipulating a number of “buttons” and “wheels” (parameters) according to certain standard prescriptions and recommendations.

12. When the LOTTA project has been completed, it will still be possible to recognise the different statistical products and the corresponding production system occurrences, and each product will still have a product owner who is responsible for the design and production of the product from beginning to end, from customer order to output delivery and customer satisfaction, but the product owner will not be free to choose methods and tools for producing the product; methods and tools prescribed by those responsible for the standardised processes, the process owners, should be used.

The control process flow

Planning → Production system specification + Production system
- Design
  - Purposes, contents, and functionalities (specified in communication with customers)
  - Architecture and infrastructure (adaptation to standard)
    - Organisational, conceptual, methodological, and technical aspects
  - Detailed design of subprocesses and components (adaptation to standards)
- Construction
- Testing
- Implementation

Monitoring → (Possibly) Request for modifications of system and/or instructions
- Systematic collection and use of process data (feed-back) according to standard procedures

Evaluation → (Possibly) Request for replanning of the production system
- Evaluation of feed-back from the production system execution and monitoring
- Evaluation of feed-back from customers (users of statistics and providers of input data)

The execution process flow

Input processes: Data collection and data preparation
- Obtain input forms from the design process
- Establish an updated frame and draw a sample, if applicable
- Obtain a list of respondents and other data sources
- Obtain completed input forms from respondents and other data sources
- Add coded and derived data to the input forms
- Check the completed input forms for missing data and suspected errors
- Recontact respondents and other data sources, if necessary
- Impute new or modified data, if motivated
- Establish and organise final observation data according to standards

Throughput processes: Performing computations and producing statistical estimates
- Combine and transform data before aggregations
- Compute statistical estimates by means of aggregation processes
- Combine and transform data after aggregations
- Perform analyses
- Establish and organise final statistics and analytical results according to standards

Output processes
- Prepare statistical end-products tailored to different needs
- Protect statistical confidentiality according to standard procedures
- Publish statistical
- Make statistical end-products available to customers
- Communicate with customers requesting and using statistical end-products

Infrastructure processes supporting the statistical system as a whole
- Management of corporate data, metadata, and process data resources
  - Management of statistical registers (frames)
  - Management of standard classifications
  - Management of an archive of questionnaires and questions
- Management of libraries of methods and tools

Figure 6. *A list of control level and execution level processes and subprocesses in a statistical system.*

13. Figure 6 shows a simplified version of a process map of the statistical production process that has been developed by the LOTTA project. The original version is in the form of a graph, and it requires several pages,

but the condensed hierarchy shown here, containing only the names of the processes and subprocesses should give a rather good idea of the contents of the process map. It contains both the control flow (planning-monitoring-evaluation) and the execution flow (input-thruput-output, supported by infrastructure).

14. On lower levels in the process/subprocess hierarchy, one will encounter components that are common for several branches in the tree. Two examples, both in connection with data editing:

1. Certain types of data editing operations could occur either in a process, where respondents fill in fields in an electronic questionnaire, *or* in a process, where an interviewer is collecting data from a respondent, *or* in a process, where filled in paper questionnaires are checked.
2. So-called selective editing (also called "macro editing", not to be mixed up with "output editing") implies "quick looks ahead", where certain throughput operations (aggregation and estimation) are carried out as a part of an input operation (data editing).

15. A standardised process structure is a prerequisite for a standardised statistics production process. The next condition is to prescribe standard methods, supported by standard tools in a standardised way for each one of the subprocesses. As was already mentioned earlier in this paper, the selected methods and tools should not be rigid, but instead possible to calibrate in such a way that desirable flexibility in solutions for individual survey applications can be achieved in a systematic way.

16. Well documented, standardised solutions, based on well documented, standardised methods and tools, will be easy to maintain and will facilitate introduction of new staff members. It will be easier for staff members to move between different products (different instances of the same standardised process). It will also be easier to explain and implement new or improved methods and tools, and the impact of such improvement will be much bigger. An improvement in one standardised method or tool will have an impact on all process instances, where this method or tool is used.

17. At present a large number of project activities are ongoing within the LOTTA project. A standard architecture is being prepared, including the specification of standardised data/metadata exchange messages. All processes and subprocesses in the process map are being investigated for the existence of prescribable current best methods, tools, and practices. In some cases needs for new developments have been identified, which have lead to new development activities.

18. Some examples of ongoing projects:

- Development of a standardised tool for construction of questionnaires. A study undertaken early in the LOTTA project revealed that Statistics Sweden used two incompatible tools, with partially overlapping functionalities, for different surveys: WinDATI (mainly for telephone interviews in household surveys) and ELIS (mainly for business web surveys). Moreover, many surveys used none of these standard tools, and the international de facto standard BLAISE was not used at all. WinDATI and ELIS are now being redesigned and integrated into one standard tool (SIV), based on common modules, as indicated by Figure 7. This tool is going to be used for all kinds of surveys, household surveys and business surveys, regardless of data collection mode: face-to-face or telephone interviews, web surveys, mail questionnaires, PDA-based surveys (e.g. CPI), etc.
- Development of an XBRL-based data collection process for tapping input data from accounting systems based on the accounting system standard BAS, used by Swedish companies.
- Establishment of a strategy for optimisation of the number of respondent call attempts. (Cf Figure 8.) Currently in interview surveys the decision on when to make a call attempt, and how many call attempts to make, is left to the interviewer (one exception to this is the Swedish Labour Force Survey (LFS) where twelve call attempts are made before the sampling unit is classified as a non-contact.) Analysis of for example call record data and register data show that there is a huge potential for improvement both in terms of quality and efficiency if we standardise the call attempt process in telephone surveys. We have microdata available from registers for variables such as age, gender, and nationality, and this information can be used to identify efficient call attempt strategies. Figure 8 shows the results from an

evaluation study of the impact of call attempts on non-response bias in the Swedish LFS. The results show that for some subpopulation groups the non-response bias is in fact increased with the current strategy and that cost reductions of around 15 000-20 000 Euros per month can be achieved if more efficient strategies are used.

- Development and implementation of systematic procedures for monitoring interviewers.
- Development of a standardised process for coding and a system for systematic quality control of the coding process.
- Establishment and implementation of an optimal strategy for data editing based upon standard methods and tools for selective editing. An analysis based on 9 case studies indicate that cost reductions in the order of 30-50% are within reach. The surveys that were selected to compose case studies are the top nine surveys at Statistics Sweden in terms of resources spent on the editing process. Since the data editing process accounts for at least 30% of the operation costs of Statistics Sweden, substantial savings can be expected as the result of a more efficient data editing process. In addition, more systematic generation and use of process data should lead to improved measurement methods and instruments, eliminating sources of errors, so that errors will not occur in the first place. In order to achieve these goals templates and guidelines for establishment survey questionnaires have been developed and will be tested on the same 9 surveys included in the editing case studies. Also debriefings with editing staff (same 9 surveys) have revealed some problems in the questionnaires that can be fixed rather easily and reduce the amount of editing needed. A standardized procedure for debriefings with editing staff has been developed.
- Systematisation and streamlining of the throughput processes for complex products like Price Indexes and the National Accounts, where processes have been run in an ad hoc way, resulting in ever growing masses of undocumented Excel sheets, making the systems extremely vulnerable, error-prone, intransparent, and untraceable
- Selection of a limited number of estimation and tabulation tools to be used by all surveys.
- Improvements of the standard tool for variance estimation (CLAN) and estimation of order statistics (EOS)
- Streamlining and implementation of a standard process for publishing and communication of statistics, based on the standard system for output databases (SSD), including the PC-AXIS tool and MetaPlus for metadata management.
- Development of a standardised system for generation/collection, management, and use of process data.
- A maintenance model will be put in place to ensure the quality and reliability of the tools and services in operation.

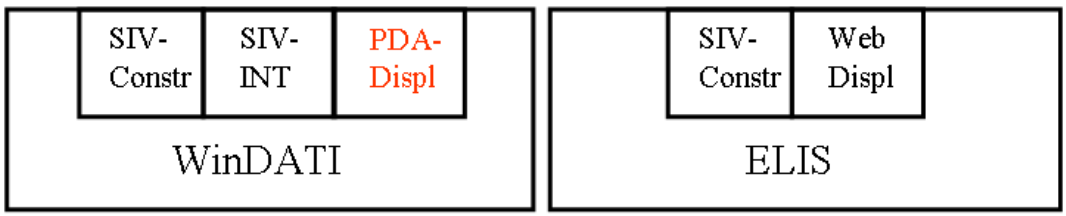

Figure 7. *Towards one standard tool for construction of measurement instruments.*

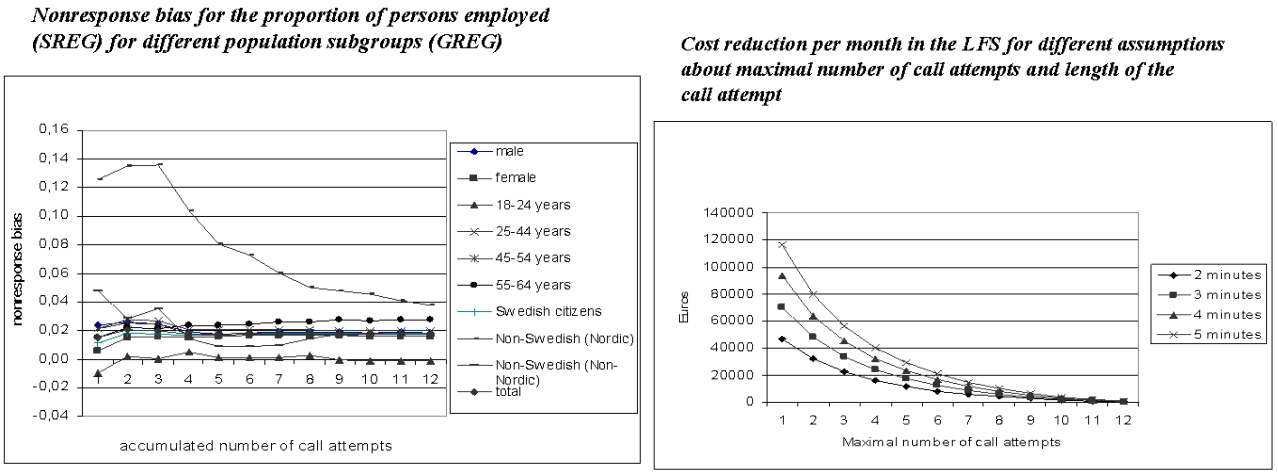

Figure 8. *Towards an optimal strategy for respondent contact attempts.*

19. In order to fully exploit the potential of process standardisation and systematic quality control in terms of higher efficiency and improved customer focus, as stated in the goals of the LOTTA project, some organisational changes will be needed. Figure 9 indicates how the functional and the product-oriented dimensions may be combined in a statistical agency based on standardised processes. It should be noted that statistical agencies have always, by tradition, been process-oriented in the sense that one and the same organisational unit has typically had the responsibility for the whole production chain for a certain product, from beginning to end. However, although the production chains and processes for different products are indeed very similar, they have typically not been standardised to any greater extent. This is something new in an organisation based on standardised processes, where process owners are appointed for different parts of the production chain, and where the product owners will still responsible for their products, and may even be responsible executors for certain parts of the whole process, but where they cannot deviate from the standardised processes as defined in terms of methods, tools, procedures, and solutions – prescribed by the process owners.

20. Another feature of this new type of organisation is that changes in the processes can only be introduced in a controlled and uniform way – for all instances of the standardised process at the same time. This leads to easier and less expensive maintenance. Furthermore it makes it easier and more efficient to introduce improvements and innovations, and to move staff between different products and processes.

21. In order to reap the full benefits of standardised methods and tools, it is important that maintenance and improvements of processes are managed in a disciplined way. Figure 10 shows a proposal for a new organisation for the management of maintenance and development of processes at Statistics Sweden. For example, if the executor of a process instance discovers an error or an improvement possibility, the executor should report the finding to the process owner responsible for the standardised process concerned, and the process owner should make a decision what to do. Typically it is the standardised process that should be corrected or improved, not the individual instance directly. If a major improvement is proposed, a development project should be considered and decided upon by a central organisational unit responsible for such decisions; a development team may be appointed, involving the different kinds of competences necessary for successful development and implementation. To ensure that the improvement projects will lead in the direction of achieving Statistics Sweden's vision, the selection of projects should be carried out in a systematic way. The decision on whether to run an improvement project or not should be based on the potential impact that particular project will have on for example, Statistics Sweden's strategic goals, customer satisfaction and efficiency.

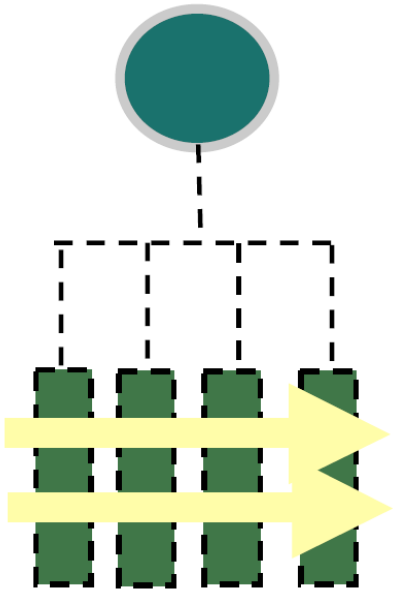

Figure 9. *Functions and processes in an organisation.*

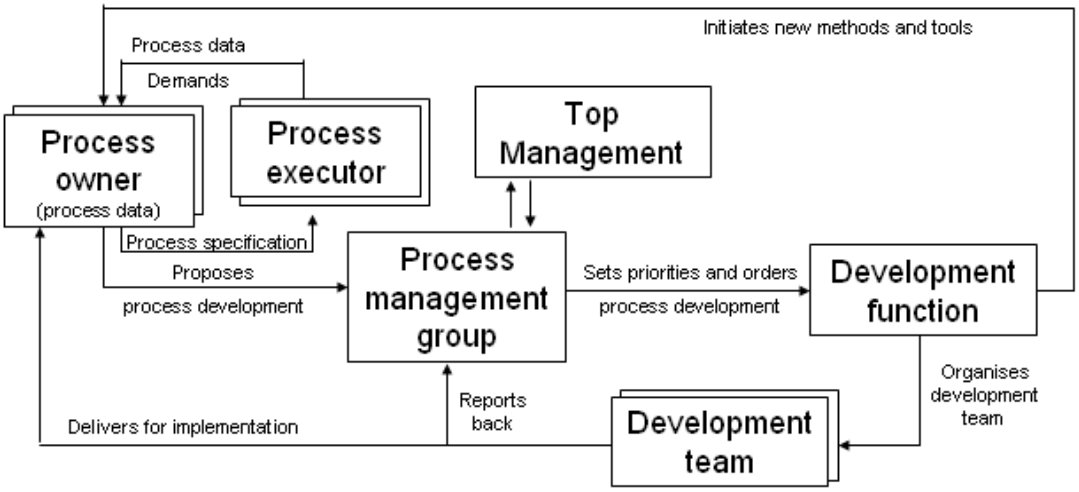

Figure 10. *Process maintenance and process development.*
