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**ORGANISATION FOR ECONOMIC COOPERATION
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CHALLENGES IN MANAGING INFORMATION SYSTEMS IN STATISTICAL ORGANIZATIONS

Paper prepared by the Steering Group on Management of Statistical Information Systems (MSIS), and originally presented at the February 2009 meeting of the Bureau of the Conference of European Statisticians.

I. INTRODUCTION

1. At its meeting in Washington on 20-21 October 2008, the Bureau of the Conference of European Statisticians asked the MSIS Steering Group to prepare a paper on challenges in managing IT in statistical organizations. This paper was presented at the February 2009 meeting of the Bureau. The current version has been prepared for the 2009 MSIS Work Session, incorporating minor revisions based on the comments received during and after the Bureau meeting.
2. The basic objective for the delegates to MSIS is to share experiences and to take stock of each others IT related developments in order to contribute to the development of statistical business processes, statistical products and knowledge. The contributions aim for both improved efficiency and quality, though it should be noted that in some cases the issues raised may be specific to national circumstances, reducing the scope for benefiting from exchanges of experiences. This paper is intended as an input to discussions on the future priorities for the work of MSIS.
3. The MSIS Steering Group has identified and focused its work on four areas of the management of statistical information system that are of common interest to national statistical offices:
 - Governance of information systems within national and international statistical organizations;
 - Architecture of information systems for official statistics;

- Collaboration and sharing of solutions between statistical organizations;
- Considerations of statistical information systems from the users' viewpoint.

II. CHALLENGES IN MANAGING INFORMATION SYSTEMS IN STATISTICAL ORGANIZATIONS

(a) Governance

4. The MSIS Steering Group pays particular attention to governance issues. The basic challenge in IT governance is to meet business demand by managing a professional delivery structure. This combines the professionalism of IT managers, involvement of the top managers and satisfying the needs of statistical subject-matter experts. The work in this area should address the following challenges:

[G1] **Linking IT with statistics**

A quick survey at one of the regular MSIS meetings showed that in the majority of member countries the IT manager is part of the top management team of the statistical organization. The mutual awareness between IT and statistical managers of core business issues and the possibilities offered by IT, is important. This implies the need for a wide variety of skills related to various aspects of IT, statistical methodologies and statistical subject-matter areas. A related issue is training and the necessity of keeping pace with rapid technological developments.

[G2] **Sourcing strategies**

Outsourcing may offer cost-efficiencies especially for specific IT skills needed for a limited time period. A majority of the MSIS group regard outsourcing to be useful for infrastructure related tasks, while tasks related to the core business should be kept inside statistical organizations. However, the distinction between the two is relative, and some statistical organizations believe that it is possible to outsource the core tasks under the condition that the organization retains the control. A specific case of outsourcing is when the IT is provided by another government institution. The challenge in this area is to keep and to maintain the expertise specific to the statistical process, in terms of both methodological IT-related knowledge (specific algorithms etc.) as well as production logistical IT-related knowledge.

[G3] **Change management**

Complex managerial and cultural issues have to be addressed in connection with all changes in statistical processes. Change is inherent to the work being done in statistical agencies, statistical organizations are completely dependent on the data that a fast changing society is delivering to them.

A common challenge between all statistical organizations is the need to move from the "stove-pipe" approach to corporate systems supporting more standardised statistical business processes. This is not a simple IT issue. From the technical viewpoint a corporate system can promote synergies and offer efficient IT services, whereas "stove-pipes" relate to traditions and a perceived ownership by individual subject-matter areas.

Moving from applications built to order by the IT department to generic configurable tools used by statisticians includes a profound organisational change. Not only will the role of the IT department change accordingly, also the statistical departments will

have to grow accustomed to develop the statistical products according to needs AND the tools at hand. The IT department will evolve into a central function providing generic solutions.

[G4] **Statistics and e-Government**

Statistical organizations are affected by, but should also influence developments of common public sector architecture and standards for information systems. There is a clear need for better cooperation between public administrations in order to improve public services. Common themes are the decrease of response burden (both statistical and administrative) through electronic reporting and the creation and use of new data sources through electronic linking of data holdings. On the output side there may be opportunities for new and improved methods of data sharing between organizations within a national statistical system, as well as improvements in dissemination. Use of public networks necessitates better protection of statistical information. E-Government can be regarded as a driving force at the national level, which coincides with the objectives and needs for electronic interaction between statistical organisations at international level. However e-government policies may also be a constraint for statistical organizations when developing their own systems or seeking to adopt tools or systems developed by others.

[G5] **Technology push**

Creating statistics means harvesting information in all forms from society. As technology and its use moves forward around us, statistical organizations are forced to use more advanced technologies and increase their processing capabilities. The need for more user-friendly and at the same time more sophisticated tools, adds complexity to systems development and to the environment of the statistical user. Aside from the management of this increasing complexity, the IT department also has to think about educating the statistical users with respect to this ever increasing complexity.

[G6] **Human resource development**

The rapid change in technology creates a formidable challenge in keeping up with the IT competences needed, especially within the IT function but also in other areas of statistical organisations. This includes covering of new roles and specializations through retraining, recruitment and retention of specialist staff, and dealing with resistance to change. Ways to develop good project management skills amongst staff should also be considered.

[G7] **Data security**

Data security is critical to statistical organizations. Data security risks can take many forms, and protecting confidential information of survey respondents is essential to continued operations. Apart from unauthorized access to systems, risks can range from mailing the wrong paper survey to respondents, to losing electronic devices (particularly if they contain unencrypted data). Some data are not made available to the public until an agreed upon time. The process to ensure on-time data releases and protect against early releases can be critical, particularly for market-sensitive economic data. Collaboration among statistical organizations on methods and lessons learned regarding data security could be very beneficial.

(b) **Architecture**

5. The predecessor of the MSIS Steering Group (Working Party No. 9 on Electronic Data Processing) has prepared and published guidelines on the Common Architecture for National Statistical Offices. These comprise the general principles formulated in the 1990s, but which are now due for an update. The development of corporate IT strategies implies a clear need for well defined and described architectures based on analysis of business processes, metadata and information flows etc. in order to develop more coherent IT systems that are both modular and adaptable to change. The present discussions focus on services that information systems provide to core statistical business:

[A1] **Harmonising architectures**

Ideally, if national and international statistical organizations would adopt a common architecture, this would facilitate international cooperation. However, there are fundamental differences due to technological infrastructure, regulatory and budgetary processes. While it is unlikely to achieve an internationally common architecture, there is scope for adopting common models. The Generic Statistical Business Process Model may serve as a lead. However, even when harmonisation succeeds (partially), a long and challenging transition period will follow. Models for harmonization should not be so prescriptive that they constrain development, so a layered approach with harmonization at the more conceptual levels, but more freedom at the practical implementation levels may be appropriate.

[A2] **Metadata strategies**

The growing central role of metadata in the management of statistical processes, creates a need for more distributed tasks and responsibilities with respect to metadata maintenance throughout the business process. There is an important link between the metadata architecture and the architecture of the overall statistical information system. The term metadata has a broad meaning, and it is necessary to have a good model for the required metadata.

[A3] **Service oriented IT Architecture (SOA)**

IT systems should be built modular, reflecting business processes and be flexible enough to adapt to changes. Emerging IT tools should fit more easily within the architecture of statistical information systems. New tools and services are growing very fast. Some of them later disappear. Others prove their usefulness and become an integral part of our everyday life, for example wikis that fulfil communication and documentation roles within statistical organizations.

Although the creation of an enterprise architecture is a strategic activity with a payoff that lies far in the future, it is quite possible to also achieve short term successes using a modular approach. The key here is the reduction of complexity for which there are several methods.

[A4] **The need for standards**

Exchange of information and interaction between systems should be based on common accepted standards. The exchange format SDMX can act as an example. The SDMX implementation requires that metadata for Data Structure Definitions (DSDs) are mapped with metadata actually stored in the databases of statistical organizations. DSDs are currently available for download on web services of international organizations – recipients of data from national statistical organizations. The target solution is to develop a centralised registry/hub that would let users access all data and metadata from a single point. An intermediary measure would be to make data and metadata accessible through a single web service linked to distributed databases.

In a long-term perspective, not only dissemination in SDMX format, but also SDMX data and metadata import should be addressed.

The point here is that standards are very much needed and their conception is a difficult process. The implementation of standards is an even bigger challenge and requires big efforts and careful decisions. Standards are meant to be followed and are effective only when they are. There lies the challenge for quite a number of emerging standards.

[A5] **Distributed data systems**

Moves towards the creation of virtual databases that extract data from multiple sources and present combined outputs to users in real time stimulate greater re-use of data, and may impact on systems architecture.

(c) **Collaboration and cooperation**

6. International cooperation between IT managers of statistical organizations was the main purpose for establishing the MSIS Steering Group. The main concerns for the Steering Group are to increase the reuse of software by reducing the cost of implementing software developed elsewhere and discuss preconditions for more common developments. However, this issue is not limited to the IT area, but has an impact on cooperation in general between statistical organizations, statistics managers and subject-matter statisticians. The MSIS meeting has discussed:

[C1] **Sharing of software and components**

IT managers believe that statistical organizations could achieve significant savings through international cooperation. Several proposals and existing sharing models were discussed at MSIS meetings. The May 2008 MSIS meeting resulted in establishing a Task Force (a subset of the MSIS Steering Group) to prepare a proposal and governance structure for the sharing of software and components. This was discussed at the Eurostat IT Directors Group in October 2008, where a two-part solution was agreed, consisting of an ESSNet project to consider shorter-term tactical issues, and a Sharing Advisory Board under MSIS to provide longer-term strategic direction. Issues of a technical, methodological, legal and managerial character should be addressed. Sharing of information on systems development methodology could also be beneficial.

[C2] **Open Source Software (OSS)**

There are open source communities in various areas of IT application. Even though the collaborative mode of developing statistical software as open source has not yet reached momentum, interesting examples have surfaced. There are differences between countries, as some require the use of open source software from government agencies, while others opt for proprietary licensed software. While the need for adopting open standards is strategically crucial to improve electronic interaction, the adoption and development of open source software can still be regarded as a tactical choice.

[C3] **Sharing software licensed by statistical organisations**

Several statistical organisations have developed software which they provide under typical commercial licensing conditions, for instance PC-Axis from Statistics Sweden and Blaise from Statistics Netherlands. The development and maintenance of these types of software are usually carried out by the owner. Some are maintained by others, but under supervision of the owner. PC-Axis is being maintained by a

successfully working consortium of statistical organizations. However, occasionally the question rises within the statistical organisations whether they should take responsibility of being a software vendor or not. At the MSIS meeting in May 2009, a paper is planned to describe a possible way to organise development and maintenance of these types of software based upon open source licensing principles. In case of interest, the paper may be circulated to members of the Bureau¹.

[C4] **Use of collaborative tools**

Other than collaboration between IT managers and IT specialists of statistical organizations, IT offers also new on-line collaborative tools to statisticians and statistics managers. A major challenge will be to open up statistical organizations to collaborate in their daily work with internal and external partners (e.g. other statistical organizations), using tools that are located in other infrastructures. Security will be an important part of this challenge.

(d) User perspective

7. The IT department of a statistical organization serves different types of users. These include respondents and other data providers, managers and staff of the statistical organization and policy/decision makers and other users of official statistics. Satisfying end user needs is a main driving force for IT development, both in terms of reducing response burden and to provide easy access to statistical data and tools. Demonstrations of software ranging from promising prototypes to proven successes is also part of MSIS work:

[U1] **Internet data collection**

This opens interesting possibilities for statistical organizations. It is particularly advantageous for countries with low population density. In all cases this data collection mode decreases the costs (postage, enumerators, data entry staff, etc.). Quality can be improved through built-in edits, but respondent-side editing should stay within reasonable limits, so as not to have a dissuasive effect on respondents. The challenges include the need for increased security (using the PKI (Public/Private Key Infrastructure), etc.), maintaining the necessary bandwidth and capacity of servers, providing a helpline with a sufficient number of operators, and usability testing of electronic questionnaires. Experience shows a mode effect of Internet data collection on quality of data, and therefore, appropriate methods should be used in case of multi-mode collections.

[U2] **Expanding on-line dissemination**

Generalized data dissemination systems can provide a one-stop access for external users. Efficiency is achieved through the use of a common technological platform. On the other hand, this necessitates harmonizing statistical outputs, and particularly metadata (code lists and value lists, standardized dimensions, units, etc.). This standardization may be perceived as a radical change for some data owners.

[U3] **New data visualization methods**

There are many new data visualization tools, like Gapminder, Google Earth and Google Maps, Swivel, etc. These are attractive for users, and statistical organizations should keep up with these developments.

¹ The paper will be available on the webpage of the upcoming MSIS meeting:
<http://www.unece.org/stats/documents/2009.05.msis.htm>

[U4] **User friendliness and related issues**

Users expect the IT tools to behave in a standard way, so that they can get maximal benefits with minimal training. Advanced methods should be used for testing usability of IT products, whether on-line or off-line.

III. GENERAL COMMENTS FROM THE BUREAU

8. The Bureau was generally supportive of the work of the MSIS group, and suggested that “owners” of statistical business processes should be invited to contribute to MSIS Work Sessions. It gave support to proposals to establish a Sharing Advisory Board, subject to the submission of formal terms of reference to the October 2009 Bureau meeting.

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