Distr.
GENERAL

WP.2
26 March 2010

ENGLISH ONLY

UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE (UNECE)
CONFERENCE OF EUROPEAN STATISTICIANS

EUROPEAN COMMISSION
STATISTICAL OFFICE OF THE EUROPEAN UNION (EUROSTAT)

ORGANISATION FOR ECONOMIC COOPERATION AND DEVELOPMENT (OECD)
STATISTICS DIRECTORATE

Meeting on the Management of Statistical Information Systems (MSIS 2010)
(Daejeon, Republic of Korea, 26-29 April 2010)

Topic (i): Developing common high-level architectures

How Business Architecture Renewal is Changing IT at Statistics Canada

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I. Introduction

1. Statistics Canada is recognized as a world-leading national statistical office that provides a unique, high quality service to Canadians. To maintain this position Statistics Canada must deliver three things to Canadians:

   - information that is relevant to the current, highest priority information needs;
   - information that is of a quality that is sufficient for the uses to which it will be put; and
   - information that is produced at the lowest possible cost.

2. Relevance and quality tend to deteriorate over time in the absence of proactive intervention. The Agency is being asked to be more flexible and agile so that it can focus more effectively on changes in the economy and the priority information needs of Canadians. We need mechanisms for achieving this and for remaining aligned over time.

3. Statistics Canada faces numerous challenges in maintaining the quality of its information. The economy and society we are attempting to measure is changing at an unprecedented pace. Household and business respondents are less and less willing to participate in surveys, while their life styles and technology make it increasingly difficult to contact them. Critical tools and computer systems must be maintained, and, where it is important to our clients, international standards must be met and international comparability of information maintained.

4. With the downturn in the global economy over the past year, Canadian government departments, including Statistics Canada, are facing program cuts and budget freezes across the board. The methods that Statistics Canada traditionally uses to maintain the quality of its programs are not sustainable in the current environment of repeated program cuts.

5. The challenge of remaining relevant and continuing to publish high quality outputs while reducing the costs of programs means that a significant change in business processes is required.

II. The corporate business architecture

A. Business objectives

6. To address the challenges discussed above, the Agency embarked in January 2009 on a complete redesign of the Agency's Corporate Business Architecture (CBA). The objective was to question how we conduct our business, including challenging our long standing subject matter business processes, the way we use information technology and the support services used to deliver our business and manage our assets and employees.

7. The initiative had three major objectives:

- **Cost**: A harvestable efficiency on ongoing operating costs of 5% within 5 years to meet corporate down-sizing commitments with minimal cuts to statistical and analytical programs.
- **Quality**: Enhanced quality assurance through the streamlining of business processes and the implementation of a reduced, unduplicated set of robust systems that are properly maintained and documented.
- **Responsiveness**: Improved responsiveness in delivery of new statistical programs through the streamlining of Statistics Canada's core business process.

B. Business architecture process

8. The Agency initiated three separate reviews of our current business processes as a means of identifying potential savings:

- A business architect from Statistics Netherlands was asked to conduct a comparison of Statistics Canada's processes to those at Statistics Netherlands. The Netherlands was chosen for this exercise because they had recently conducted a business architecture renewal exercise themselves. This review resulted in a report, in presentation deck form, which was presented to Statistics Canada's Policy (Executive) Committee.
- A consulting firm specializing in business architecture was hired to perform a review of our processes and formulate a set of recommended changes aimed at achieving the objectives of the CBA initiative. The consultants produced a report and delivered a presentation describing their findings and recommendations to the Policy Committee.
- An internal CBA task force was created by Policy Committee to consider what measures could be taken in the short term in order to advance the objectives of the Corporate Business Architecture initiative while generating efficiencies in the short to medium term. Members of the task force were chosen to ensure that both the subject matter areas and the service areas such as IT and collections well properly represented.

C. Architectural principles

9. To guide its analysis, the task force identified a number of principles that it believed represented the keys to a more efficient, robust and responsive business architecture for Statistics Canada. These principles can only be fully achieved in the long-term. In the short-term, they act as a guide for decision-making:

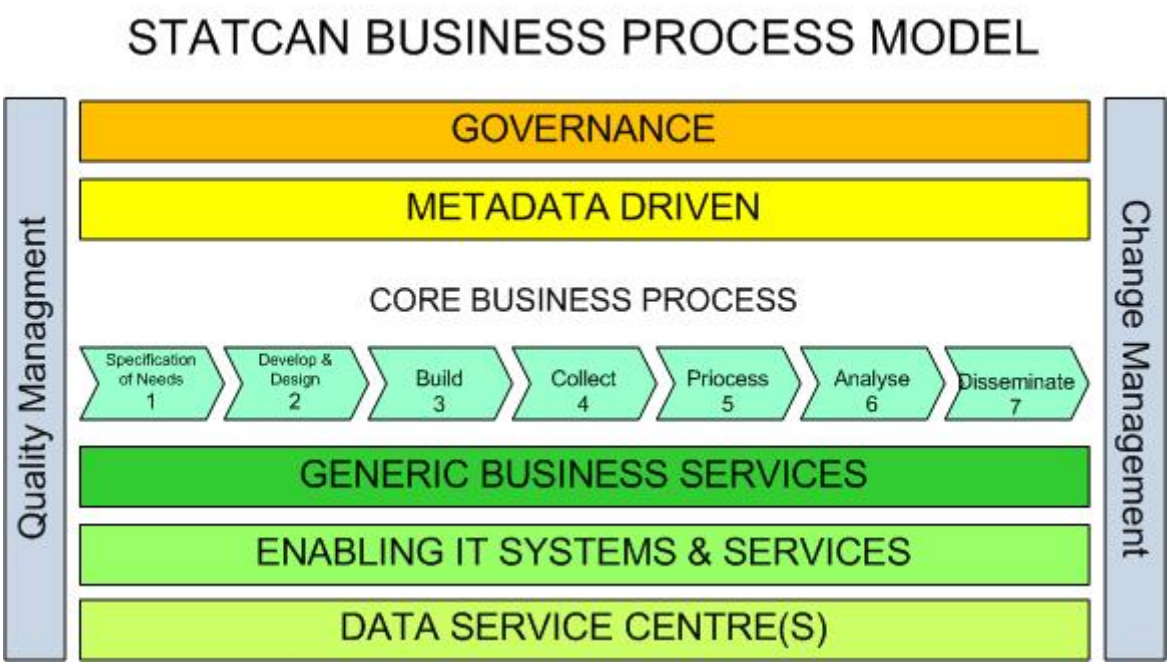
- **Corporately optimal decision making**: The Agency needs to shift to an emphasis on corporately optimal decision making, rather than locally optimal decision making. Corporate optimization requires that the centralization of informatics, statistical processing, methodology support and frame infrastructure be viewed as the corporate default option. Local delivery of these services is to be permitted only where a clear, corporately accepted benefit-cost case can be made for the variant.

- **Meta data driven**: Metadata should be integral to the statistical process and, indeed, drive the process. Metadata should precede data.
- **Optimized use of corporate services**: The use of existing corporate services such as collections and dissemination should be expanded. New generic corporate services should be created wherever there are potential gains from economies of scale or pooling of expertise. Use of corporate services (e.g. collection, dissemination, data capture, imaging) must be mandatory.
- **Maximize re-use**: This general principle has two particularly important fields of application:
  - Smallest possible number of distinct business processes: Maximizing the re-use of business processes will result in a reduction in the number of distinct business processes. Cost-benefit principles should be used to determine when the benefit of adding a business process to accommodate a program specific need is justified.
  - Smallest possible number of enabling computer systems: Maximizing re-use and developing corporate systems will also result in a reduction in the diversity of computer systems and applications the Agency is required to support.
- **Minimize tool kits**: The Agency should minimize the number of software and productivity tools it deploys.
- **Proficiency in corporate business applications and tools**: Employees should be trained to use generic corporate business applications and tools in an autonomous fashion so as to minimize the need for expert support for operational and analytical activities.
- **Statistical information management**: A strong, corporate statistical information management framework is required and should include development of a data service centre.
- **Eliminate rework**: We need to identify and remove instances of rework. For example, micro-editing at collection, before processing, after processing, during estimation and prior to dissemination should be eliminated. Selective editing processes like the ones developed by the Australian Bureau of Statistics should be encouraged.
- **Focus on the core business**: In order to focus our energies and resources on the core business of Statistics Canada (the process of developing, producing and disseminating statistical information and analysis), we would look very seriously at opportunities to outsource support processes.
- **Separate development from ongoing operations**: Teams responsible for the development, or for the substantial redesign, of statistical programs should be separated from those responsible for ongoing operations.
- **Electronic data collection**: Surveys should be designed with a view to make electronic data reporting the preferred mode of collection. This will likely have an impact on the way we design surveys, leading, for example, to the need to shorten or split up questionnaires. It does not mean that electronic data reporting will operate in a silo mode, but rather as the first step of contact in a sequential multi-mode environment.
- **Remove structural obstacles to efficient operations**: Organizational structure should be aligned to facilitate process flows and any overlapping or unclear mandates should be resolved.

D. The Business Process Model

10. To create structure for the new Corporate Business Architecture, the Agency has adopted the generic statistical business process model under joint development by the United Nations Economic Commission for Europe, Eurostat and the Organization for Economic Cooperation and Development. The business process model provides the core StatCan Business Process model illustrated in the diagram below.

11. A vision of how business at Statistics Canada will function in the future has been documented to explain the long term view to employees.



12. The new model is designed to support the core business processes through reliance on corporate services including common data repositories (Data Service Centres), corporate IT services (infrastructure and applications), and generic business services. The business processes are driven by metatdata from beginning to end to ensure consistency within and across programs and to reduce duplication of effort. The model requires strong governance structures to ensure that the corporate good is paramount while still meeting local program needs. And finally, the whole model must be supported by sound quality guidelines and effective change management processes to ensure that the focus continues to be placed on the production on high quality outputs and the highest priority projects.

13. The data service centre, whether there be one, two, or more, uses a common set of technologies and tools, to store, organize and provide access to statistical information to support processing, dissemination and analysis. The data service centre develops and applies an information management model for statistical information holdings.

E. Governance

14. Statistics Canada's current mode of operation is characterized by vesting authority and resources in individual program managers. Services and support are acquired in the internal and external market places in a very decentralized manner. Decision-making emphasizes the needs of the project or program over those of the corporation as a whole. Service suppliers are led to adopt locally optimal solutions by the need to reach an agreement with the program manager.

15. There has been some movement away from the extreme degree of decentralization that characterized the 1990s. There are initiatives to centralize activities at the Field level, though this remains simply a higher level of local optimization. The Systems Architecture Review Board, the Business Register Redesign and the Collection Business Architecture initiatives are three examples of a shift to corporate level thinking, but all three have had a limited impact on behaviour and costs due to the need to service a myriad of local needs without the appropriate decision-making power.

16. Under CBA the subject matter divisions continue to lead the statistical process but must now operate within the constraints imposed by the Business Process Model. They must maintain the critical liaison with policy departments and the data user community needed to monitor evolving information and

service needs. Subject matter divisions interpret this information to the corporation to propose new programs and cost-recovered projects. Within corporately agreed constraints of policy, and business and systems architecture, subject-matter divisions lead the development of new programs and projects, providing requirements to service areas that conduct the work on their behalf. Experts in their respective domains, subject matter divisions certify, integrate and analyze statistical data. Subject matter are responsible for identifying key findings from statistical programs and conveying them effectively to the public through release articles and studies.

III. Impact on information technology services

A. Overview

17. The Corporate Business Architecture initiative has three major impacts on the delivery of IT services at Statistics Canada.

- The most obvious impact on IT is the consolidation of IT resources into the Informatics Branch. This will result in a corporate IT service provider of about 1000 IT staff delivering a full suite of IT infrastructure services and software applications development, maintenance and production support services including IT architecture and technology centres of expertise. The CBA initiative is mainly aimed at finding efficiencies and the IT Branch has agreed to a reduction of 10% of the IT workforce (100 IT resources) by 2015 on condition that the subject matter areas fully adopt the new Business Model.
- The initiative will also significantly change what IT resources work on. Decisions on what work gets done and when it gets done will no longer rest with the individual program area divisions but will, to a large extent, be made for the good of the Agency as a whole through a corporate prioritization process and rigorous change management controls. This impact will be felt equally by the program areas who lose much of their control on IT investments and by IT staff who must adjust to a very different definition of client service.
- Finally the initiative will change how IT procurement is managed and how applications get developed. The emphasis will move increasingly toward less equipment and fewer applications. The number of generic and shared applications will increase substantially and IT choices on what technologies to use, and standards and methods to adopt, will become the business of the IT Branch.

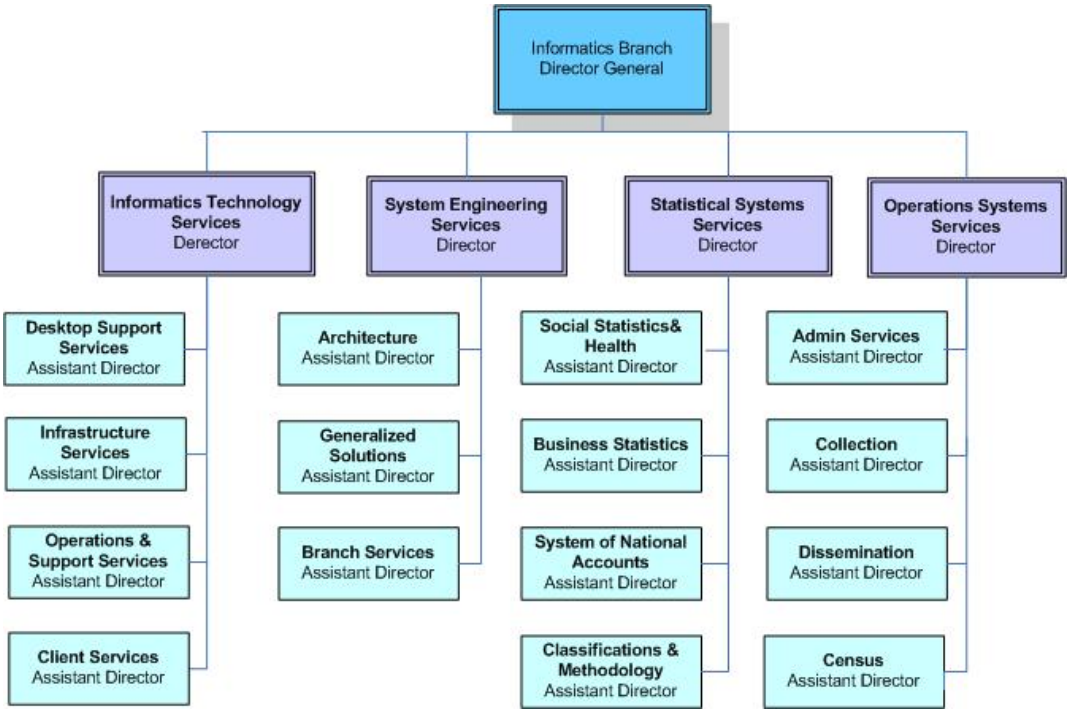
18. The rest of this paper concentrates on each of these three impacts in turn and describes how Statistics Canada is planning to manage the transition and govern IT investments in the future.

B. Consolidation of IT

19. When the decision to adopt the new CBA vision was made in April 2009, Statistics Canada had 1000 IT resources, 550 in the Informatics Branch and the remaining 450 scattered across the program areas in teams ranging in size from 3 to 25 resources. Until April 1, 2010, the Informatics Branch was comprised of two divisions of more or less equal size, the IT Services Division (ITSD) responsible for the provision of infrastructure services across the Agency and the System Development Division (SDD) which provided application development, maintenance and architecture services to program areas. Both ITSD and SDD provided their services on a cost recovery basis. The local teams in program areas mainly provided maintenance and production support services to their program. Depending on the size of the team and their preferred technology they also managed small to medium size application development projects either alone or larger projects in partnership with SDD development teams.

20. The official announcement regarding the consolidation of IT resources was made in early November 2009 and planning activities started immediately. The consolidation exercise is designed to proceed in three waves: April 1, 2010, October 1, 2010 and April 1, 2011. The consolidation, once completed, will result in the corporate IT organization shown in the organization chart below. The new Systems Engineering Division (SED) was created on April 1, 2010 by first splitting SDD in half, then moving in

about 250 employees from subject matter divisions into SDD and SEC. The fourth division, the foundation of which already exists as an IT division reporting to the Operations Field, will join the Informatics Branch in the Fall of 2010 after which the teams of IT resources still reporting to subject area divisions will join the IT Branch and the resulting capacity will be balanced across the three divisions to ensure that each division is more or less of equal size.



21. Although this exercise appears to be a simple reorganization of resources, in fact it was seen as the first test of how ready subject matter areas are to accept the notions espoused by the CBA. This was the first tangible example of program managers losing direct control over key "service" personnel, a process that is likely to be repeated, albeit on a smaller scale, as staff move to existing and new corporate service areas under the CBA workplan.

C. Changing what IT works on

22. The fundamental principle of the CBA initiative is to make decisions based on what is best for StatCan as a whole rather than what is best for individual programs. For IT this means that IT work will be itemized and a corporate prioritization process will be used to determine what gets done in any given year.

23. Infrastructure services at StatCan were already centralized before the CBA principles were endorsed however there were still a few program areas that maintained their own servers. As part of the consolidation of IT, all remaining infrastructure-related activity outside ITSD had to move to ITSD by April 1, 2010. This included procurement and provisioning of desktop computers, laptops, printers, etc.

24. Each business area has categorized their IT application support work as follows:

- **Maintenance and Production Support**: This is defined as the minimum IT capacity needed to keep delivering the program with no changes to business or IT specifications. This includes management and IT planning activities.
- **Adaptive Maintenance**: This category includes changes to existing systems needed to adjust to external factors (such as admin data file changes) or to update the technology to conform to the changing Enterprise Architecture standards (such as updates needed for Vista/Windows 7).
- **Enhancements**: Enhancements include changes to existing systems to improve the quality or relevance of business outputs.

- **Development**: Development is defined as the creation of new systems or major enhancements to existing systems that deliver substantive new business functions or that are required due to system rust-out.

25. The program of work for maintenance and production support will be defined at the beginning of the year and documented in a Service Level Agreement between each program area and the IT Branch. The funding amounts are included in the SLA and this funding will be transferred to the IT Branch at the beginning of the year. The SLAs may initially include a budget for Adaptive Maintenance and Enhancement work. This budget will be allocated by change management boards in each of the Agency's business areas, or "Fields" in StatCan parlance (Social Statistics, Business Statistics, System of National Accounts, Operations, Informatics, Methodology and Classifications, and Administrative Services). Initiatives that receive approval by the boards will be managed on a project or task basis depending on size.

26. Work falling under the definition of Development will be funded from an IT Systems Capital Fund. The Fund constitutes a fixed amount of funding (i.e. capacity) each year allocated on a priority basis to development and major enhancement projects. Most of these projects are supposed to result in reductions in the costs associated with Maintenance and Production Support either through replacement of multiple systems by generic systems or through improved system design and standardization resulting in lower support costs and/or more automation. Therefore, as development projects are delivered, the expectation is that the funds allocated to maintenance and production support, and probably also to adaptive maintenance and minor enhancements, will decrease.

27. For this strategy to work two conditions must be met:

- **Program areas and Senior Management must be willing to prioritize.** Program areas and the Executive level decision committee must find a way to prioritize within the main program Fields and across Fields. This means that they must be willing to live with what doesn't get approved.
- **Change management boards must take a strong stand on reducing the number of change requests coming from work groups within the program areas.** The Change Management Boards must be able to say NO to minor changes and the program areas must accept to live with the consequences of freezing the functionality of a system and/or moving to generalized and/or shared solutions.

28. The IT community also has a role in ensuring that program areas can make the business decisions described above. In particular, the IT teams must provide program areas with accurate estimates of the effort required to complete the systems work that is being presented for funding approval and be able to identify the resources available to do the work should funding be approved. This is not an insignificant task given the size of the IT community (about 1000 employees) and the mix of technical and analytical skills that might be required by any given project. The IT Branch has always had to manage this challenge due to the nature of the internal cost recovery funding model, however, with twice the number of resources to manage, the Branch will have to become even more proficient in moving resources around to meet corporate priorities without unduly disrupting on-going projects and program operations, while still delivering the promised 10% reduction in IT capacity over 5 years.

D. Changing how IT work is done

29. The new IT delivery model will change how the IT community goes about the business of IT. Traditionally local programs, and hence local IT teams, had a lot of flexibility in the way they developed and maintained their systems. Some areas worked collaboratively with the IT Branch or with other program areas to develop and support their systems, whereas others tended to build everything in house. The creation of the Systems Architecture Review Board (SARB) had some effect on the use of more standardized tools and frameworks but the SARB had difficulty enforcing its decisions. The adoption of best practices and standard development tools and approaches, depended to a large extent on how much the program area IT team worked in collaboration with others, used the architects in the Centre for Architecture and Software Engineering, or came under review by the SARB.

30. The impact of CBA on IT will be significant and will affect all aspects of how IT is delivered:

- The existing generalized systems will be defined as mandatory and new mandatory generalized systems will be developed over time to replace the plethora of local systems doing similar functions.
- The emphasis on shared and generalized systems means that system development teams must look at system design differently. Systems will have to be designed in a more service oriented way using reusable modules and strongly architected designs. Based on our experience with generalized systems to-date, these systems take more effort to build since they must allow some customization through parameterization and be more robust and user friendly than a customized local system doing the same business function.
- System development teams will need to rely more on strong architecture principles which will result in a rising demand for architects, a scarce commodity today.
- The Systems Architecture Review Board will pass over some of its mandate to the CBA Management Committee but will have more authority over the parts of its mandate that it retains. In particular it will have more power to impose the standards and methods defined in the IT Enterprise Architecture and to manage exceptions to these standards.
- The IT staff will adopt a standard suite of tools and methods for the development and support of systems. The toolkit will be reduced to what is specified in the IT Enterprise Architecture and purchases outside this set will be strictly governed.
- Functionality currently imbedded in systems or scattered across different areas will move to a suite of shared IT services. Some of these services already exist on an optional basis but services such as the corporate database administration service, as well as hosting services which supply not only the software services but also the underlying infrastructure, will become cornerstones of the IT delivery model.
- Decisions on when to upgrade to new releases of software such as MS SQLServer or Oracle will be made as part of the planning process and reviewed annually to ensure that they are practical and cost effective rather than being based solely on the vendor's road map and the system owner's ability to pay.
- Systems will be treated as assets, in the same manner as is already done for IT infrastructure components, and evergreening/replacement strategies will be identified up front and reviewed annually. IT must work with the business areas to determine how best, and when, to replace a system which is nearing its end of life to ensure that the best decision is made as to its replacement. This could mean migration to an existing generalized solution or replacing the system if its functionality is very specific to a single program area.
- Comprehensive change management processes will be established by the business areas to decide, with input from IT, which tasks should be undertaken by the IT resources.
- IT will have to adopt release management practices to reduce the effort associated with testing and moving to new releases. In particular, as the ownership of systems shifts more and more to service areas and the number of generalized systems increases, system releases will have to be scheduled and implementation plans developed to ensure that client areas migrate successfully to new versions of a system.
- With StatCan also moving to a single network, system development and testing teams will have to follow strong security measures to ensure that data continues to be protected appropriately.
- Training programs must be adopted to ensure that IT staff members are aware of the established Enterprise Architecture, IT security, testing, release management and governance processes.
- New funding models and approaches will be required to properly fund the mix of systems maintenance and development work, architecture and methods research, and new IT services that will be delivered over the next few years.

31. All of these changes will cause stress on IT resources and will undoubtedly result in program area managers being worried about the ability of the IT Branch to deliver robust systems and to maintain the level of support provided by IT to program operations. The challenge for IT managers going forward will be to manage this transition and the expectations of the program areas to the benefit of Statistics Canada as a whole.

IV. Observations

32. No transition is without problems and challenges and the transition facing Statistics Canada is no exception. Program managers are sceptical about the benefit of the new business model and about the ability of service areas to deliver the level of service needed to maintain operations without impacting significantly on the quality of the data or on release dates.

33. The observations that can be drawn from the CBA experience and IT transformation so far are similar to those that result from any large transformation agenda. These include:

    1. Take the time to really understand the implications of the changes being proposed. StatCan took a year to analyse the proposals and the ramifications of these proposals so the CBA management team had a fairly deep understanding of the implications. The IT Branch in particular made an effort to identify potential issues that may surface related to the IT consolidation exercise and to develop informed and practical answers.

    2. Strong governance and decision making processes are required throughout the process. The most senior management levels must be wholeheartedly behind the initiative and be seen to be supportive at all times.

    3. One of the hardest parts of the IT consolidation exercise so far has been the development of a funding framework for IT. Fields had differing service standards and different perspectives on how much they spent on IT before consolidation. To resolve the issues senor managers had to be willing to compromise and to find ways to redistribute funds in cases where a Field is a significant loser financially.

    4. There can never be enough communications and many techniques are needed to successfully communicate to a diverse community in a large organization. It is imperative that the messages aimed at staff be thoroughly thought through and that they answer the types of concerns raised not only by managers but by all levels and areas in the Agency.

    5. Using standard tool sets and development frameworks saves money and decreases the risk of failure, however, the use of these tools must be governed closely and projects must have access to at least some resources with knowledge of these tools and practices. It is also important to properly account for the learning curve for staff with little or no experience with the standard tools and methods.

    6. Engage the staff. They have great ideas and many are very willing to help and to be a part of the transformation. At the end of the day, this transformation is for them and they will inherit the good and the bad results of the initiative when the senior managers move on.

V. Conclusion

34. Over the past year, a significant amount of work has gone into a transformation that is fundamental to the success of the new corporate business architecture and resulting consolidation of IT. The road has often been bumpy, with many challenges still to come. Over the next few years the benefits, risks and costs associated with these changes will become more obvious and we will learn whether the new CBA business model helps StatCan meet the economic challenges it faces while still remaining relevant to Canadians and Canadian businesses.

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