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Topic (iii): Getting the support of all people when implementing data editing;

**Obtaining Wide Support for Statistics Canada's Integrated Business Statistics Program: a Key Task in the Project Plan**

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**I. Introduction**

1. Statistics Canada is implementing a new model for conducting business surveys called the Integrated Business Statistics Program (IBSP). The IBSP provides a common processing framework, including an integrated data editing approach using common methodologies.<sup>1</sup> From 2014 to 2017, over 120 economic surveys from ten different programs will migrate to this new integrated and harmonized framework.

2. From the early stages of this project, it was clearly recognized that obtaining support from the hundreds of employees involved in the process of data editing was key to increasing efficiency and quality. This paper will describe the mechanisms invoked to change the mindset of staff from a general notion that *"My survey and its respondents are so unique that it cannot fit in any standard model"* to one where *"We are looking forward to migrating our survey to the new harmonized model."*

3. A brief overview of the key aspects of the IBSP program and its fully integrated data editing approach will be presented in the second section of this paper.

4. The six key elements that contributed to obtaining buy-in from partners are discussed in the third section. The main points covered are: the importance of strong governance and clear directions, engaging survey managers in the development of the new approach, the deconstruction process to debunk the notion of the non-standard nature and uniqueness of the surveys, the use of proof-of-concepts, the communication strategy and the design choice.

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<sup>1</sup> For more details on the IBSP project, see Ravindra (2012)

## II. The IBSP- A new integrated framework for business surveys

5. The IBSP project was initiated in 2010 following the development of Statistics Canada's Corporate Business Architecture (CBA) vision. A committee of senior managers concluded that by consolidating processes and standardizing systems when necessary, cost savings could be achieved while maintaining the high quality standards in the delivery of services. The main objectives of the IBSP project are to attain more efficiency, enhance quality assurance and improve responsiveness in the delivery of new statistical programs.

6. To meet these objectives, the IBSP development team conceptualized and designed a generic framework flexible enough to be applied to a large number of heterogeneous business statistical programs. Every step of the business survey cycle underwent a review, was harmonized and optimized into a set of coherent processes.

7. The common features of annual, sub-annual, industry- specific and economy-wide business surveys under the umbrella of the IBSP include:

- (a) Use of Statistics Canada's Business Register as a common frame;
- (b) Use of electronic questionnaires as the principal mode of collection;
- (c) Standardization of survey content including income statement data, sales by type of client and location, and purchased services;
- (d) Active Collection Design based on the minimization of the coefficient of variation (CV) and approximation of bias (as opposed to the maximization of the weighted collection response rate);
- (e) Use of a common editing strategy anchored on the production of estimates on an iterative basis and on the on-going assessment of the quality of the data as it becomes available;
- (f) Mandatory use of generalized systems for sampling, imputation, estimation, application of confidentiality and dissemination;
- (g) Maximum use of tax and auxiliary data to replace collected data from respondents;
- (h) Implementing Integrated Infrastructure System based on a flexible metadata driven model;

8. In terms of data editing, the foundation of the new IBSP model is the introduction of the Rolling Estimates process (Godbout et al., 2011). Under this approach, a complete set of estimates and quality indicators are produced at various intervals from integrated collected and administrative data as they become available and imputed data for non-response. The quality of the estimates is compared with pre-determined quality targets. Units are assigned scores measuring their global impact on the quality of the estimates<sup>2</sup>. Only units that significantly contribute to improving the quality of domain estimates having a quality below target are eligible to be followed-up for non response and failed edits. Priorities are re-assigned after every iteration. Certification of the survey results can begin as soon as the quality target is reached for some domains.

9. This is a very different way of processing and editing data from the traditional sequential approach that consists of vetting the data after each stage of the survey cycle. Under the previous model, the information was collected and cleaned (through follow-up calls or by the analysts). After collection activities were completed, imputation operations were done and the analysts, for a second time, validated and cleaned a set of micro records. Then in a third step, the macro estimates were calculated and

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<sup>2</sup> Methodological and mathematical details related to the quality indicators and measures of impact scores in IBSP can be found in Turmelle et al. (2012).

analysed, giving a third and final opportunity for analysts to manually correct data. This approach was very conducive to micro-editing and excessively time consuming.

10. To implement the new framework, getting the support of all parties involved was not an easy task as the approach represented a very different way of conducting surveys and editing data for several programs. The next section will describe the factors, initiatives and strategies implemented to alleviate fears and reduce resistance to change.

### **III. Getting wide support from staff: factors, initiatives and strategies**

#### **A. Strong governance: a key factor to engage collaboration**

11. The recommendations of the Task Force mandated with developing Statistics Canada's CBA stressed the importance of migrating to a decision-making process that no longer promotes the selection of tools, processes and systems to meet local preferences but rather to serve corporate interests in terms of efficiencies, quality and support. The development of corporate services to support surveys and the mandatory use of these centralized services were also recognized as essential to achieving the organizational objectives. The IBSP is one of the numerous initiatives under the new Corporate Business Architecture.

12. The vision for the CBA was communicated extensively through information sessions and informal discussion meetings and supported by ongoing messages from the Chief Statistician and the Co-chairs of the new CBA Management Committee. The work of all employees and management team has been directly or indirectly influenced by one of the many initiatives put in place following the establishment of the new Corporate Business Architecture. The framework and objectives were well defined and communicated to all. To foster compliance, manager's performance objectives were developed to engage them in this new approach and architecture.

13. Business surveys must now make use of several centralized services for IT, questionnaire development, collection services, business register, data processing, methodological support and dissemination services. Data editing should now be exclusively driven by the quality indicators produced at every iteration and performed with the common tools provided. The traditional sequential approach to data editing is no longer an option. The message was very clear. The management of a survey in silo with unique tools and methods is no longer acceptable and supported.

14. Statistics Canada's Enterprise Statistics Division was mandated to coordinate the harmonization of processes for the numerous and often heterogeneous surveys.

15. Adherence to this new business model was facilitated by the support and clear direction given by Statistics Canada's senior management. The strong governance from the start of the project was a key factor to engage the various partners in collaboratively defining survey specific solutions within the generic framework.

## **B. Getting program managers involved in the development of the generic framework**

### (a) Establishing the foundations of the IBSP model

16. A series of early consultations with program managers, survey analysts and methodologists contributed to establishing a collaborative environment fostering buy-in for change and ensuring that the decision-making process was supported by a wide array of inputs. This approach played a significant role in obtaining support and minimizing reluctance to change. In particular, two consultation processes helped establish the foundations of the IBSP model.

17. Naud (2009) looked at item response rates for 13 important financial variables for 60 business surveys. Sometimes a high percentage of units were manually imputed but these records only represented a small portion of the estimates. Saint-Pierre (2010) consulted with subject matter areas to get a good understanding of the reasons behind manual interventions and to find solutions to optimize the data editing process. Analysts from various surveys concluded that: improved questionnaire design, minimization of delays between the reception of data and the follow-up process, the optimal use of tax data, the production of early estimates, the automation of systematic manual interventions in the edit and imputation processor and the integration of auxiliary data in the imputation strategy would significantly reduce manual interventions of the data. These recommendations were taken into account in the design of the new processing framework in order to optimize the data editing process.

18. A second consultation process aimed at conducting a preliminary assessment of survey specific requirements was supported by a thorough review of existing methods and practices from sampling to certification of estimates. This extensive review was performed with each of the program managers and their methodologists. It resulted in identifying similarities between survey processes as well as exceptions to be taken into account in the design of the model. The requirements identified during the consultation process contributed to the development of a generic but flexible model.

### (b) Development of the Business Process Model

19. Given the many stakeholders, it was impossible to involve every manager directly in the conceptualization of the operational model. The IBSP development team first defined the operational model taking into account the objectives of greater efficiencies and quality as well as the particularities of each survey. Simultaneously, a group of methodologists established the conceptual and methodological framework of the new data editing approach supported by the Rolling Estimates process (Godbout et al., 2011). In a second step, the proposed operational model was presented and validated with all program managers.

20. The different aspects of the new operating model were presented by four working groups (Content and Collection, Methodology, Metadata, Processing and Analysis). Each group included representatives from implicated survey programs and from centralized service providers. The operating model, business rules and working assumptions were presented, explained and fine tuned as needed based on feedback from program managers.

21. Each working group periodically reported to the project Steering Committee on the chosen orientations and key recommendations. Senior managers from each program involved in the IBSP were represented on that committee. Ultimately, decisions on contentious issues were taken quickly by the committee with in mind the scope, the quality and the efficiencies.

22. Once the model was defined, the next step was to adapt survey programs to the standardized solutions of the IBSP model. Involving survey analysts and employees working specifically on data editing process was essential and ensured the development of a flexible system. Going from specific in-house system solutions in favour of a generic and different model was not always obvious for the people for whom the change would impact their day to day work. The approach to sell the benefits of joining the integrated framework and adopting the new data editing model, was to deconstruct every current in-house survey processes and proposed alternate IBSP compliant solutions

### **C. Survey specific deconstruction process**

23. It was difficult for survey analysts to imagine that their surveys could be incorporated into the harmonized model developed for the IBSP. There was a notion that the unique nature of a given survey made it incompatible with the IBSP model. How could a business survey that measures the supply and disposition of energy sources be harmonized with a survey designed to measure revenues and expenses of a retail store? Or, how could these work with a survey that measures statistics on the movements of aircrafts at Canadian airports? How can a small sample survey compare with a census of tens of thousands of respondents or even an administrative file with millions of records? Why change methods that have worked for decades? Top-down approach? Is it really acceptable to have micro records that are not validated by an analyst?

24. Various forms of active or passive obstructionism periodically occurred during consultation sessions. With the hope of producing convincing evidence that a survey was definitely not a candidate for integration, participants flooded the IBSP team with anecdotal evidence, details and exceptions, or used program specific terminology and acronyms. At first glance, it was easy to believe that a particular survey program was really unique and that its requirements could not be met within the generic model.

25. The deconstruction process of each step of every survey has proven to be determinant in convincing even the most reluctant partners of the benefits of integrating their survey into the IBSP. This process literally debunked the notion that individual surveys are too unique to fit into a standardized framework.

26. A series of consultation sessions led by the IBSP development team were held one to two years before the integration of a given survey. These consultations brought survey managers, analysts, methodologists, managers of client divisions and the IBSP development team to the same table. In 2013, a total of 170 consultation sessions were held for the integration of 20 surveys. Depending on the complexity of the survey between two and thirty meetings were required to complete the work.

27. The deconstruction process included the following steps:

- (a) To ensure requirements were documented and well understood, current processes were scrutinized at a very detailed level. This included: reviewing content; assessing questionnaire design; identifying frame maintenance processes; reviewing processing methodology such as sample design, data editing techniques, imputation and estimation strategies; and analytic processes. This detailed review contributed also to defining common terminology and semantics.
- (b) The relevance and efficiency of the current processes and methods were assessed. Survey managers were asked to validate each processing step and explain how they were essential in generating quality data.

- (c) To meet these requirements, the multi-disciplinary team defined optimal survey specific, framework compliant solutions using standard methods supported by the centralized services and in accordance with the CBA principles. These solutions were documented and explained to surveys managers and analysts and adjusted based on feedback received. In the vast majority of cases, the notion of uniqueness of surveys could be taken into account with a simple adjustment to the metadata parameters. Compatibility with the IBSP model very often simply required changing the sequence of tasks, automating manual interventions and having a better understanding of the options offered by the generalized systems.
- (d) After these surveys specific reviews, the few remaining adjustments to the generic model, methods or services or extra functionalities still required were negotiated by the IBSP development team on behalf of the survey managers.
- (e) For every survey, a report detailing the *modus operandi*, the strategies and methodology to implement, the role and responsibilities of each stakeholder and a calendar of deliverables was produced. The benefits of the changes were also underlined. These reports were submitted to consultation participants for comments and approval.
- (f) The reports were then submitted to the management team of each program for approval.

28. At the end of this process, survey managers and analysts had a good understanding of the processing and methodological framework of the IBSP and their respective role and responsibilities in the data production cycle. Since they actively participated in the development of solutions, initial concerns and resistance to change were greatly reduced. Partners were also reassured that the new methods introduced would enhance quality and reduce workload. The outcome of this process was the recognition that every survey could ultimately be managed within the standardised framework.

#### **D. Use of large-scale proof-of concepts**

29. Prior to the formal introduction of the new processing framework for the IBSP, a large-scale simulation of the Rolling Estimates was performed. For both reference years 2010 and 2011, the entire Rolling Estimates process was simulated for approximately 50 business surveys with a series of four monthly iterations.

30. These simulations were used as a test bed for the introduction of the new data editing approach supported by the Rolling Estimates. The results confirmed the huge potential of the new approach for generating savings in terms of follow-ups and data editing efforts while maintaining the overall quality of the estimates. This test also provided an opportunity for demonstrating the IBSP model to non-methodologists, obtain feedback and enhance the design of the tools and quality measures for data editing and analysis.

31. A key objective of the simulation was to introduce analysts to the new data editing approach and convince them of its potential. To practice this new way of analysing the data, estimates were generated at regular intervals along with quality indicators and a record level measure of impact score. To help the analysts with the new features developed in the prototypes, comprehensive analytical guidelines and a 'Frequently Asked Questions' document were produced by the development team. Information sessions were held prior to the simulation and support was provided on an ongoing basis throughout the project.

32. This exercise provided an opportunity to test whether the analysis should be done using pre-defined sets of reports or cubes or by simply allowing employees to query the data using a commercial-off-the shelf tool with options to build their own custom reports. The latter approach was used for the first

simulation. A more sophisticated analytical tool prototype was developed for the second year. A series of pre-defined dynamic reports were offered to the analysts. Based on their feedback, this is the model that was retained under the IBSP.

33. A series of “compass check” meetings with survey managers were held during the simulations to answer questions, concerns and identify adjustments required. Comments on the usefulness of various quality indicators or scores, proposed adjustment to the data editing and analysis approach, and missing or unnecessary functionalities in the analytical tool prototype were all documented and recommendations were provided to the development team (Sambell et al. 2012). The development of both the validation application and analytical tool has been strongly influenced by the comments from the analysts that took part in the simulation.

34. Several analysts found that Rolling Estimates were extremely beneficial to better target manual interventions in the data editing process. The Rolling Estimates allowed for early identification of records in error and problems impacting the estimates (ex. out-of-scope records, capture errors). Corrections were targeted and resulted in increasing the quality of the estimates in the subsequent iteration. While a large number of analysts were apprehensive when the approach was first presented, several survey managers did introduce the use of the Rolling Estimates prototype results in their current data validation process. This experience was so successful that many analysts requested to reproduce the simulation in the following cycle.

35. The analysis of the results of the second simulation<sup>3</sup> finally convinced the most skeptical non-methodologists of the relevance of the approach. With a methodology that replicates very closely what is implemented under IBSP, the results showed that 98 per cent of the 8,600 domains of estimation included in the 47 surveys taking part in the simulation reached their quality target with an expected reduction of one third in the number of non-response follow-ups.

36. Whether the non-methodologists were survey analysts or managers, collection or processing staff, IT experts or senior managers, these large scale prototypes ended-up being very effective to obtain buy-in for the new model, particularly in regards to its data editing component.

## **E. Communication Plan**

37. Several initiatives were put in place to present and obtain feedback on the principles and framework of the IBSP.

- (a) **General information session:** Information sessions open to all employees were held on a regular basis. The vision of the project, its objectives, the implementation schedule and key features (two-phase sampling, electronic questionnaires, Rolling Estimates, data validation tools and top down analytical approach) were presented to a large audience. These sessions were recorded and remain available as a reference for all employees.
- (b) **Targeted information session by programs:** A number of customized program specific presentations were made to staff and management in each subject matter division. While the key features of the new model were presented, the focus of these sessions was to explain how the new model would benefit each program. For example, the potential efficiencies by program derived from the results of the Rolling Estimates simulation were presented to each participating division. The new roles and responsibilities of analysts and survey managers were also discussed in these

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<sup>3</sup> The methodology and results of the simulation are presented in Mills et al. (2013).

sessions as well as the tasks and deliverables calendar for the transition to the new processing model.

- (c) **Client satisfaction evaluation:** All partners were invited to participate in feedback sessions organised to:
- Assess the awareness of the staff in regards to the IBSP;
  - Evaluate the communications strategies adopted by the various working groups;
  - Evaluate the ability of the development team to understand the needs and requirements and to show flexibility;
  - Evaluate the satisfaction in the decision-making process;
  - Evaluate the satisfaction vis-à-vis the governance structure of the project;
  - Understand the major concerns of the stakeholders vis-à-vis the project;

This was an excellent opportunity for the project management team to get the pulse of the staff in regards to the project and adjust the communication strategy to address concerns.

- (d) **Newsletter:** A quarterly newsletter was distributed to employees working for statistical programs in-scope for the IBSP. Each newsletter included one or two articles on key elements of the project. Various topics were covered such as the electronic collection strategies, the optimal use of administrative data and more technical topics such as the two-phase sampling approach or the calibration of the estimations were explained in a non-technical manner to non-methodologists.
- (e) **Open access to documents and key presentations:** Many presentations on specific processes and methodology, assessments, studies and system functionality documents are available on the various components of the IBSP. These are available on a portal open to all employees of Statistics Canada and on an intranet site. Key documents for each process of the new model are clearly identified and are recommended reading for analysts, managers and support staff of surveys in scope for integration
- (f) **Training:** A suite of courses were developed to provide basic information on the methods, tools, analytical approaches and business rules of the IBSP. The content was organised in eight different modules and requires employees to dedicate close to four days over a one year period to complete the program. Some of the courses are mandatory for staff working on IBSP related programs.

## F. The design choice

38. The very high level of vertical integration of the new model almost completely prevents the use of non-integrated processes in the survey cycle. This was a design choice. For example, units eligible for follow-up are solely determined after they are identified to significantly impact on the quality of estimates. Quality indicators and scores are calculated with standardized procedures after a complete set of estimates is produced via a generalized system for units sampled from the central business register. The required inputs for the estimation are derived from the output of another generalized system used for imputation. The input to the imputation process are the data from collection, tax or other auxiliary file that are automatically integrated from their respective centralized repository into the processing system without any kind of manual interventions or data editing. It is not possible to conduct a process or sub-process outside the regular flow. Such development would require pre-approval by a committee of senior managers.



## IV. Conclusion

39. Obtaining the support of survey managers, analysts and corporate partners was absolutely essential to the success of the large-scale implementation of the harmonized model for business surveys. To achieve this, the right balance between a strong governance imposing direction and solutions and getting partners involved in the development of the new methods and tools had to be achieved. The right balance between flexibility and standardized approaches was essential. The easy solution for getting wide support would have been to adapt to all demands and try to satisfy all requirements, including exceptional alternative flows. This would not have been optimal in the long run. It was decided at the beginning of the project to steer away from this path. The efforts deployed to obtain support from all partners in this transformational business model were considerable and have been very successful.

## V. References

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