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Statistics Canada's Experiences in Planning, Costing, Managing and Assessing Data Collection of Multi-Modes Social Surveys

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Abstract

Statistics Canada has always aimed to identify opportunities for strategic improvement in data collection approaches, as well as innovative data collection methods that may better align with current respondent communication preferences. To meet these requirements, Statistics Canada has implemented new multi-mode collection strategies. Although necessary, these changes have increased the complexity of the survey collection processes and the risk of not reaching survey objectives. In fact, postmortem survey analyses have indicated that key survey planning assumptions were not always aligned with the expected response rate or survey budget—or both. In practice, both survey budget and survey response rate need to be based on realistic key planning assumptions to manage and achieve and manage expected results. This paper describes Statistics Canada's experiences in planning, costing, managing and assessing multi-mode surveys, including how differences between planned and observed key planning assumptions affect survey results, budget and cost.

Keywords: Paradata, survey planning assumptions, budget/cost, active management, expected/observed results and key indicators

1 Introduction

As a national statistical agency, Statistics Canada conducts many social surveys each year using both web and computer-assisted telephone interview (CATI) data collection components to be more aligned with respondent communication preferences and to meet statistical data information requirements. These social surveys can be monthly, quarterly, annual or occasional, and cover a wide range of—often sensitive—social topics. In addition, these surveys use various types of frames and collection strategies that depend on the quality and availability of contact information and the target population. The introduction of multi-mode surveys and the changes in the survey design and collection strategies of many existing surveys have increased the complexity of the planning, budgeting, monitoring and assessment of the data collection processes. They have also increased the risk of not reaching expected survey objectives according to the planned budget. This is particularly the case for occasional or new survey topics aimed at using new customized frames to try to target specific—and often hard to reach—populations. The main challenge of collection managers in these circumstances is to identify realistic planning assumptions to determine the expected response rate and the associated budget (cost). This paper summarizes the planning, costing, managing and assessment aspects of the data collection process, with a focus on multi-mode surveys that have both web and CATI components. It includes past and current experiences of how the differences between expected and observed key assumptions affect response rate, budget and effective cost.

2 Data collection context

At Statistics Canada, the majority of social surveys use a multi-mode collection approach, with web as the primary mode. Currently, all social surveys are being transitioned to the Integrated Collection and Operation System and Collection Management Portal (CMP) by the end of 2020. The CMP has provided a common solution for multi-mode surveys to meet the collection needs of all surveys, including the 2016 Census and upcoming 2021 Census. Data collection for surveys with a CATI component is conducted and managed from call centres located in five regional offices (ROs) across the country. In the CMP, interviewers are automatically assigned to a given survey when they log in to the system via the targeted level of work feature. This feature takes into account the profile of the interviewer, and the CMP call scheduler is used to automatically deliver individual cases to interviewers during collection.

According to the CMP vision, ROs are no longer responsible for their own samples. Instead, samples are available to all interviewers in all ROs across Canada – national sample. From a data collection planning perspective, this is a very important change that requires new indicators and metrics to monitor and manage collection efforts and productivity against results, by RO. It is in this data collection context that the overall data collection strategy must be planned, costed, monitored and evaluated for the majority of multi-mode social surveys.

3 Planning

The planning step involves gathering information about key survey assumptions, survey design, collection strategies, special considerations and operational constraints to assess the likelihood of obtaining the expected survey results (often in terms of response rate), and to evaluate the corresponding survey cost, or budget. In practice, these inputs are required early in the planning process. They are essential to evaluating and validating the collection budget so that targeted objectives can be achieved. In other words, key realistic planning assumptions, response rates and survey budget must be aligned. To that end, collection planning managers should be involved as early as possible in the decision-making process to ensure that the key planning assumptions are realistic and achievable. This will allow the targeted responses rates within the planned budget to be reached, taking into account survey design, collection strategies and operational considerations.

First, the key assumptions are generally common to all types of surveys (with a few exceptions). To be operationally useful, these key planning assumptions should be relevant, measurable and comparable at any point in time, and consistently updated throughout data collection to reflect progress and changes. The key assumptions are total sample size; expected hit rate (percentage of in-scope units); number and percentage of completed interviews, by mode (e.g., by web and CATI, by total); and average interview time.

Second, survey design information refers to survey frame (e.g., area, telephone, dwelling and person-level frames), sample allocation and composition. The sample composition provides information about the proportion of the sample with mailing addresses, land line telephone numbers and cellular phone numbers. This information is helpful for determining the likelihood of targeted overall response rates being reached, as response rates vary greatly by type of case. For example, there is a much lower response rate (17.4%) for cases with a mailing address but no phone number (no possible CATI non-response follow-up [CATI NRFU]), as shown in Table 1. These proportions can also be used to fine-tune collection strategies and budget. For example, 42.5% of the sample in Table 2 could be eligible for short message system (SMS) reminders because

they have both a mailing address and at least one cellular phone number (eligibility for SMS notifications relies on the respondent being notified of the possibility in their initial invitation letter).

Table 1: NCS - Q2_2018 - 12% of cases without phone numbers

	Sample size	Percentage of Sample	EQ completes	EQ completion	CATI completes	CATI completion	Response Rate
With telephone	13,191	87.9%	4,197	31.8%	2,873	21.8%	53.6%
Without telephone	1,809	12.1%	307	17.0%	7	0.4%	17.4%
Total	15,000	100.0%	4,504	30.0%	2,880	19.2%	49.2%

EQ refers to electronic questionnaire (web respondents)

Table 2: CADS-W1 18.7% no phone, 42.8% with at least one cell

Mailing flag	Telephone Flag	Cell phone flag	Sample size	Percentage of sample
With mailing address	With phone	With cell	4,670	42.5%
With mailing address	With phone	Without cell	4,062	36.9%
With mailing address	Without pho	No cell	2,054	18.7%
Without mailing address	With phone	Without cell	41	0.4%
Without mailing address	With phone	Without cell	173	1.6%

Third, the overall collection strategy refers to the type, number and interval between invitation letter and reminders. Collection begins with a mailed letter inviting respondents to complete the web survey, and this is followed by a series of reminder letters. Depending on the available information, SMS and email can also be sent along with reminder letters. The number and interval of reminders depends on the length of the collection period. CATI NRFU is generally used for web non-respondents and for cases where there is a phone number but no mailing address. Historically, contact and collection modes were generally the same however this is no longer the case except for CATI NRFU. For example, the contact mode can be letters, SMS or email, while the expected response mode would be through the web application.

Fourth, special considerations and some operational constraints concerning more subjective (and often difficult to quantify) information need to be examined. The nature and sensitivity of the survey topic, as well as the characteristics of the target population, are some common examples of special considerations. Operational constraints include technical system limitations, organizational factors (e.g., interviewers need to know their schedule in advance), RO capacity (e.g., almost all Statistics Canada collection resources are dedicated to the monthly Labour Force Survey in the first few days of the 10-day collection period) and production plans (PPs). Three months before collection starts, the PP is produced based on this planning information, determining the work intensity and expected daily results. In other words, the PP describes the collection effort (e.g., number of hours) and expected results (e.g., number of completed interviews) throughout the collection period, keeping with operational constraints (e.g., Labour Force Survey week and weekends). Coordination on the PP between ROs becomes even more important under the CMP given the national sample context. The PP is also one of the cornerstone of the survey monitoring process, which aims to evaluate the daily progress of collection by comparing observed with the expected survey results. Finally, the planning step must determine the level of need for survey progress monitoring reports and active management support. These decisions depend on the level of risk at which the survey will not attain the targeted response rate according to the planned budget and cost.

4 Costing

Let's assume target response rate can be obtained according to the key planning assumptions. It that situation, how can collection managers evaluate or validate the survey budget? The budget scheme presented in Table 3 is described using the Canadian Housing Survey (CHS) summary shown in Table 4.

In Table 3, box 1 indicates the final number of expected web respondents (35,354). These respondents are less costly because there is no CATI cost. Box 2 indicates the amount of system time[1] spent to contact and encourage cooperation from the expected 39,009 CATI respondents (i.e., the system time of all calls before the interview). Box 3 represents the amount of system time devoted solely to conducting the 39,009 CHS CATIs. Box 4 represents the amount of system time spent to confirm a non-response or out-of-scope case (about 58,875 cases, i.e., the sample minus the total number of web and CATI responses).

Box 3 is the expected average CATI time (20 minutes) multiplied by the expected number of CATI respondents (39,009), then divided by 60 to equal 13,003 system time hours. Boxes 2 and 4 refer to the unsuccessful calls (i.e., all calls that do not result in a full interview). At the end of the collection period, the average system time of unsuccessful calls is about 1.6 minutes per call. This is based on postmortem analysis of numerous past CMP surveys (constant across CMP surveys). However, interviewers are more likely to make appointments, leave messages on answering machines or be refused during the first part of the collection period, driving up this average. No-contact calls—which are shorter—are more likely to be observed during the last part of the collection period. Based on previous surveys with similar frame, design and collection strategies, it is possible to determine and fix the collection effort in advance in terms of the average number of calls that will likely be required for the targeted response rates.

Box 2 and box 4 together can be derived as follows: the total number of the expected CATI sample—that is, the expected web respondents (93,157) are subtracted from the total sample, which is then multiplied by the average number of unsuccessful calls per expected CATI case (fixed at 9.1 calls in this CHS example), then multiplied again by the average system time for unsuccessful calls (1.6 minutes)—is divided by 60 to equal 22,610 system time hours. The total expected system time is then estimated at 35,613 hours. The expected average number of calls per CATI case can also be derived from an existing budget. First, the expected total number of calls is equal to 880,225 calls: total non-interview system time hours (boxes 2 and 4) are multiplied by 60, then divided by 1.6 minutes for unsuccessful calls; the resulting number is then added to the total number of expected CATI interviews (one call per interview in box 3). Then, the expected average number of calls per CATI case is equal to the expected total number of calls divided by the expected CATI sample—that is, the total sample minus expected web respondents (93,157)—for 9.5 calls, on average.

Table 3: Budget sheme

Web respondents **(1)**	
System time before CATI interview **(2)**	System time for CATI interviews **(3)**
System time for non-response and out-of-scope cases **(4)**	

While system time represents the amount of time interviewers are logged in to the CMP system, interviewer collection payroll hours (often called collection hours) represent the amount of time claimed and paid for interviewers' direct data collection activities. This is expected to be similar to, but larger in practice than, system time hours (Laflamme 2009). Collection hours indicate the real field cost of the survey because they include all tasks related to direct data collection, but do not always involve the collection instrument. For

[1]. System time refers the total time logged in to the system once a case has been opened by interviewers.

example, administration, management, the senior interviewer, tracing (when applicable), training and the cost of reminders (for letters and SMS) are not included. The difference between these two concepts can also be explained by lags between calls, breaks, some tracing activities done outside of the system, and meetings with supervisors, for example. The typical ratio of system time hours to collection hours is around 60% for CMP surveys. Therefore, the total number of collection hours (survey budget) can be estimated at 59,355 hours (35,613 divided by 60%) for the CHS, according to the key planning assumptions.

For existing budgets or surveys that do not use the proposed budget scheme (Table 3), it is possible to estimate the amount of collection effort (the expected average number of calls per CATI case) to assess whether the budget makes sense—that is, whether the amount of financial resources is sufficient to reach the targeted response rate.

A survey budget is generally determined well before data collection starts, and sometimes uses partial and inaccurate information. Any changes to the key assumptions or survey parameters (e.g., frame, average time of interview) between the budget agreement and field data collection might affect response rate because the budget is fixed. For some of the most important planning assumptions, data collection units generally have no direct responsibility. To alleviate the risk of not reaching the response target or not properly assessing the survey budget, all collection partners (e.g., regional offices, collection managers, subject-matter experts and methodology teams) need to maintain ongoing communication to ensure that any changes in the key planning assumptions or survey parameters are well communicated and understood.

5 Managing

At Statistics Canada, survey management primarily refers to active management (AM) activities. AM can be defined as a set of plans and tools for monitoring and managing data collection while collection is still in progress (Laflamme et al. 2017). An AM program provides timely, factual, topical and relevant data on survey performance and progress throughout collection to ensure that collection problems are identified early and decisions on how to correct problems are based on cost, effort, data quality and the response rates attained up to that point. There are four main objectives to AM. The first is to determine whether, at any given point during collection, the observed key indicators are aligned with the key milestones identified at the planning phase using the production plans (expected results). The second objective is to be proactive in identifying problems through timely analysis. The third is to correct these problems as early as possible, before collection is finished. The final objective, which is more global in scope, is to make effective use of collection resources to strike the most appropriate balance between data quality, timeliness and survey costs. The next two subsections focus on two key aspects of AM: survey monitoring and timely analysis.

5.1 Survey monitoring

Monitoring survey progress is typically done through reports. The survey reporting plan identifies the type of information needed, as well as any variables that are required for reporting at various levels of aggregation. The reporting plan also ensures that this information is available on a timely basis during the data collection period. The series of reports developed for and implemented in the CMP currently uses several data sources: multi-mode transaction; interviewer payroll; key planning assumptions (including production plan); planned budget; and, often, sample design information. In practice, the most recent transaction and interviewer payroll files become available the day after a given transaction takes place. Some past key indicators can no longer be derived given the national context of the CMP, such as response rate by RO, since ROs are not responsible for their own samples anymore. To that end, new indicators, metrics and analytical approaches were implemented to monitor survey progress against expectations during the data collection period for CMP surveys.

5.2 Timely analysis

Given the increasing complexity of survey design and survey collection strategies, value must be added to survey monitoring reports by providing a timely, factual and evidence-based analysis regarding the collection progress. The main objective of this analysis is to determine whether the observed key indicators correspond with the key expected planning assumptions and results (e.g., response rate) throughout the collection period.

Tables 4 and 5 were extracted from one of the main AM reports. Table 4 presents the survey status at 76.7% of the collection period. In terms of electronic questionnaire (EQ) responses, the CHS was progressing well. On February 24, observed EQ completion (26.8%) was slightly higher than expected (25.8%) at this point of collection, according to the PP. However, the observed CATI completion (18.5%) was significantly lower than expected (27.7%). The reason for these differences is explained in Section 7.

At the same time, Table 5 analyzes RO compliance with the national PP, as well as the relative performance of the RO. In practice, any given RO with 20% of the national budget should be spending about 20% of the budget at any point during collection (PP compliance). In addition, if a given RO has spent 20% of the budget (observed results), it should also have contributed 20% of the national CATI responses (observed results). A lower national proportion of either system time hours or collection hours compared with a higher national proportion of CATI respondents is an indication of higher performance. During collection, the observed response rate and productivity are often compared against the proportion of the budget spent to predict the final response rate. This is to determine the likelihood of achieving the target response rate.

Table 4 : CHS - 201811

Collection period			
First	Last	Current	Percentage of collection period
01/11/18	31/03/19	24/02/19	**76.7%**

Summary			
	Expected	Observed	Final target
Sample	125,157		
Hit rate	99.0%	98.8%	
Web completion	25.8%	26.8%	28.5%
Web responses	31,984	33,207	35,354
CATI completion	27.7%	18.5%	31.5%
CATI responses	34,308	22,842	39,009
Response rate	53.5%	45.3%	60.0%
Average interview time (minutes)	20	32	

Table 5: Relative planned and observed contributions of each regional office

	Production plan (expected)			Observed results		
RO	% System Hours	% Collection Hours	% CATI Resp	% System Hours	% Collection Hours	% CATI Resp
EDM	14.1%	14.1%	14.1%	15.3%	14.6%	14.2%
HFX	17.1%	17.1%	17.2%	17.7%	17.5%	18.6%
SHER	19.1%	19.1%	19.1%	17.1%	17.7%	18.5%
STURG	33.6%	33.6%	33.4%	34.3%	34.0%	34.2%
WIN	16.1%	16.1%	16.2%	15.6%	16.3%	14.5%

6 Evaluating

AM reports and analysis make it possible to assess the overall data collection process to determine best practices and share experiences so that problems are not repeated. Survey managers can take advantage of the lessons learned from past CMP surveys to fine-tune key planning assumptions to improve collection strategies and reduce the risk of not reaching survey objectives. The postmortem evaluation of the data collection should also document the type of problems identified, the decisions made to correct these problems, the effect of these corrective actions, and how the differences between expected and observed assumptions affected both response rate and cost.

7 Impact of the differences between expected and observed key assumptions

Among the key assumptions, average interview time, CATI completion rate, survey frame and characteristics of the ample composition are likely the factors with the greatest effect on both response rate and survey cost. The example in Table 4 is used as a case study to demonstrate the differences between expected and observed key assumptions. The CHS had a final response rate of 49.1% (28.2% web and 20.9% CATI), while the target was 60.0%. First, the observed average time of interview was 32 minutes instead of the planned 20 minutes, which reduced the amount of collection effort (box 2 of Table 3) on non-response or out-of-scope cases (box 4 of Table 3) because of a fixed budget. Therefore, the estimate of system time hours for CATIs (box 3 in Table 3) becomes 20,805 hours (rather than 13,003 hours) for 32 minute interviews for the same number of expected CATI cases (39,009) under a fixed budget. The estimate of the average number of calls per CATI case would then decrease from 9.1 calls to 5.9 calls per CATI. In the field, however, an average of 7.8 calls were observed because fewer CATI responses were achieved (25,512) than expected (39,009). Despite putting less collection effort into CATI cases, the expected CATI completion was neither realistic nor achievable, at 31.5%. For similar surveys that used the same frame and similar collection strategies, the observed CATI completion ranged from 18% to 23% (CHS observed completion was 20.9%)—far below the expected rate. Even if the budget had been increased, the target response rate would not have been achieved with the same collection strategy. Increasing the budget, web collection period, and number and type of reminders[2] to maximize web completion and reduce the pressure on CATI collection would have helped to increase the response rate—but not enough to attain the expected 60.0% response rate.

The accuracy and robustness of these estimates at the planning step can greatly affect survey results and budget. The overall impact depends on the many interdependent factors with different effects on response rate and cost. For example, a shorter survey interview time and higher web completion than expected will increase the amount of effort spent on CATI cases (because the CATI sample will be smaller than expected) and reduce the number of CATI responses required to reach the target response rate. Table 6 shows an example of how the interaction between two key assumptions—hit rate, which is the sample size minus out-of-scope cases and then divided by the sample, and web completion rate—affect the response rate for a fixed number of CATI responses. In the example, the targeted response rate is 50%, with a 28% web completion rate and a 90% hit rate. Increasing or decreasing one or both of these assumptions could increase or decrease the response rate for a fixed number of CATI responses. In general, survey planning managers aim to minimize the differences between planned and observed key planning assumptions at the planning phase. For higher-risk surveys, it is a good practice to use more conservative key assumptions to better manage survey expectations and give collection managers some flexibility.

[2]. For the first time, Statistics Canada is using one SMS reminder.

Table 6: Response rate based on observed hit and web completion rates for a fixed number of CATI responses

		Observed web completion rate in the field										
		23%	24%	25%	26%	27%	28%	29%	30%	31%	32%	33%
Observed hit rate in the field	85%	46.3%	47.3%	48.3%	49.3%	50.3%	51.3%	52.3%	53.3%	54.3%	55.3%	56.3%
	86%	46.0%	47.0%	48.0%	49.0%	50.0%	51.0%	52.0%	53.0%	54.0%	55.0%	56.0%
	87%	45.8%	46.8%	47.8%	48.8%	49.8%	50.8%	51.8%	52.8%	53.8%	54.8%	55.8%
	88%	45.5%	46.5%	47.5%	48.5%	49.5%	50.5%	51.5%	52.5%	53.5%	54.5%	55.5%
	89%	45.2%	46.2%	47.2%	48.2%	49.2%	50.2%	51.2%	52.2%	53.2%	54.2%	55.2%
	90%	45.0%	46.0%	47.0%	48.0%	49.0%	50.0%	51.0%	52.0%	53.0%	54.0%	55.0%
	91%	44.8%	45.8%	46.8%	47.8%	48.8%	49.8%	50.8%	51.8%	52.8%	53.8%	54.8%
	92%	44.5%	45.5%	46.5%	47.5%	48.5%	49.5%	50.5%	51.5%	52.5%	53.5%	54.5%
	93%	44.3%	45.3%	46.3%	47.3%	48.3%	49.3%	50.3%	51.3%	52.3%	53.3%	54.3%
	94%	44.1%	45.1%	46.1%	47.1%	48.1%	49.1%	50.1%	51.1%	52.1%	53.1%	54.1%
	95%	43.8%	44.8%	45.8%	46.8%	47.8%	48.8%	49.8%	50.8%	51.8%	52.8%	53.8%

Finally, it should be noted that for some of the most important planning assumptions, data collection units generally have no direct responsibility (Laflamme and Bonhomme 2016). For example, the survey topic, target population and questionnaire length are the responsibility of subject-matter experts, while the sample design (including survey frame, sample allocation and composition) is the responsibility of methodology teams. This is why ongoing communication is essential between collection partners to ensure that the key planning assumptions and survey parameters are as precise as possible to alleviate the risk of not reaching survey objectives or not having sufficient financial resources. In other words, all parties must collaborate during collection.

Conclusion

Postmortem analyses of recent CMP surveys have clearly demonstrated the importance of achievable key assumptions during the data collection planning process. In addition, gathering relevant and accurate information such as survey design, collection strategies and operational constraints helps to improve the accuracy of the collection planning and costing process during the collection planning phase. The main challenge for survey collection planning managers is obtaining these key assumptions and survey design parameters from data collection partners as early as possible in the planning process. This allows them to evaluate the appropriate survey budget, and therefore reduce the risk of not reaching the expected response rate. Finally, any changes to the key assumptions or survey parameters between the budget agreement and the beginning of field data collection could affect the response rate because the budget is fixed. To reduce potential issues, all collection partners need to maintain ongoing communication to ensure that any changes are well understood.

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