Towards a standardized burden measurement system for surveys on businesses

Istat Working Group for the definition of a system of indicators on respondents' burden for surveys on businesses

Coordinator: Stefania Macchia
macchia@istat.it
(Istat, Directorate of Data Collection)

Workshop on Statistical Data Collection
The Hague, Netherlands, 3 – 5 October 2016
The background

During the second round of the peer reviews on the ESS Code of Practice carried out in 2015, it emerged that Istat already collected information on response burden in some business surveys but not in systematic and standardized way.

An improvement action for the definition and implementation of a systematic and standardized burden measurement system was formulated by Istat.

This is the task of this working group
The context - the transition to the new model for business surveys

ISTAT has just adopted a new Business Architecture, rearranging all the scattered resources and processes pertaining to the data collection phase under a new dedicated directorate.

**ISTAT Business Statistical Portal** implements this new approach for the organization and management of data collection processes, abandoning the so-called “stovepipe” model, in which each “stovepipe” identifies a specific field of statistics and its corresponding production system, and implementing a new model in which the production of statistics is no longer expected to operate through independent processes, but rather as a single, consistent and integrated pool of non-redundant building blocks (enterprise-centred model).

- It provides new integrated functions supporting respondents in several areas: survey unit management and updating, data collection process management, direct and proxy compilation of electronic questionnaires.
- It also provides a **single software tool for developing/designing electronic questionnaires:** GX (Generalised Italian (Data) Collection System XML), an in-house product using XML, to represent the main survey’s structure: survey metadata, survey variables, questionnaire structure, check plan and skipping rules.
The burden measurement

In order to identify indicators to be produced, factors that contribute to create burden have been considered.

- **actual/objective factors**, mainly due to **time** spent to provide responses

- **subjective factors**, connected with what is ‘perceived’ as burden by respondents.

It could depend on a number of aspects related to the survey design, to the characteristics of the respondent and to other external factors, so that to assess it would be necessary to gather additional data directly from the respondents.
The burden to be measured

Istat imposed two constraints:

- **do not cause further burden** to respondents in order to collect information on burden

- **limit internal investments** to set up IT procedure to estimate burden in different surveys

A set of indicators has been defined by relying on a strategy of maximum exploitation of available sources and minimal request of information from respondents.

Data concerning burden will be collected and processed for surveys already residing in the Portal environment or as soon as they migrate to it, so that a single generalized software procedure, based on GX, would be implemented and set up.
The burden to be measured

Burden can be considered from two orthogonal perspectives:

• burden by survey (BBS) i.e. the burden the single survey places on the involved businesses
• burden by business (BBB) i.e. the total amount of burden generated by all the surveys a business is involved in.

Istat decided to measure burden from both points of view,

➤ expressing BBS in terms of total time spent to fulfill the requested survey task,

➤ and BBB in terms of persistency.
Burden indicators by survey (BBS)

BBS will be measured in terms of:

1. **Time to fill in the questionnaire**
   - Source = **paradata** automatically recorded by GX. They store automatically all actions performed by respondents while navigating the data collection environment.

2. **Time to retrieve information to provide data**

3. **Number of persons involved in providing information**

4. **Problems encountered in fulfilling the task**
   - Source = ad-hoc section to be added to each survey questionnaire, as they migrate to the new GX system: ‘**burden section**’
Burden indicators by survey (BBS)

Source → PARADATA:

automatically produced by the software system (GX), are a very rich source of information, absolutely **objective** and **precise**. They allow to quantify the actual and net time each respondent dwells on each of the questionnaire sections, even if the compilation takes place in different sessions (the start and end times of each compilation session are recorded in terms of date, hour, minute, second). By processing these timestamps, it is possible to measure the duration of each session and, in case the questionnaire has been filled during different sessions, the summed duration of all sessions represents the total actual time spent to fill in the questionnaire.

This calculation is based on primary data and absolutely objective, while compilation times elicited directly from respondents could be affected by subjective evaluation and prone to perception bias.

But paradata are a noisy, inherently unstructured and highly redundant source

They will be processed and modeled and a **structured, non-redundant and relevant informative base** will be built to be used to systematically produce the burden indicator for each survey, but also to allow survey managers to make all the analysis they could be interested in.
Source → BURDEN SECTION:
ad-hoc section to be added to each surveys questionnaire, as they migrate to the new GX system
Burden indicators by survey (BBS)

- Time to fill in the questionnaire

The indicator of burden will be processed for respondent businesses, namely those that submitted a completed questionnaire:

- this does not imply any further consideration for structural surveys (SBS),
- a clarification has to be made on short term surveys (STS): only businesses who provided data for all the periods of the reference year are considered as respondents (12 months for monthly surveys, 4 quarters for quarterly surveys).

**SBS surveys**

\[ \overline{ACT} ({}^{(1)}}) = \frac{\sum_{i=1}^{n} CT_i}{n} \]

Where

- \( CT = \) compilation time of the ‘\( i \)' respondent business
- \( i = \) ‘\( i \)' respondent business
- \( n = \) total number of respondent businesses

**STS surveys**

\[ \overline{ACT} ({}^{(2)}}) = \frac{\sum_{i=1}^{n} (\sum_{j=1}^{m} (CT_i)/n)}{m} \]

Where

- \( CT = \) compilation time of the ‘\( i \)' respondent business
- \( i = \) ‘\( i \)' respondent business
- \( n = \) total number of businesses respondent for all the periods of the reference year (constant value for all the periods)
- \( j = \) ‘\( j \)' period
- \( m = \) total number of periods
- **Time to retrieve information to provide data**

The indicator of burden will be processed for *respondent businesses*, who provided data for this question

- This datum is surely subjective and, if the respondent perceives the task of providing data for statistical survey as a burden, it could be overestimated.
- The question is structured in classes of dimension. An approximation of the time spent on average will be elaborated, taking the central value of each class as reference time for the final calculus. The last class will not be considered for this calculus because defining the central value would need not available information. In addition, this class is selected by a very low percentage of respondents.

\[
\text{(3) } \overline{AR}T (\text{Average Retrieval Time}) = \frac{\sum_{i=1}^{n} (RT_i)}{n}
\]

Where

- RT = retrieval time of the ‘*i*’ respondent business
- *i* = ‘*i*’ respondent business
- *n* = total number of businesses which responded to the burden section
Burden indicators by survey (BBS)

- Number of persons involved in providing information

The indicator of burden will be processed for respondent businesses, who provided data for this question

• It is worth considering that the fact of involving more than one person may have several explanations: providing the requested data requires different professional skills, so that different experts within the business must be contacted or, particularly for STS surveys, the person who fills the questionnaire could not be the same in all data collection periods during the year

\[
\bar{P_I} (\text{Persons Involved}) = \sum_{i=1}^{n} (P_I)/n
\]

Where
\( P_I = \) persons involved in providing information
\( i = \) 'i' respondent business
\( n = \) total number of businesses which responded to the question of the burden sections
Problems encountered in fulfilling the task

The indicator of burden will be processed for respondent businesses, who provided data for this question:

- The set of response options of this question is surely not exhaustive and respondent’s attitude towards collaboration is not being investigated (this would have required a wider set of questions which in turn would have caused more burden on respondents).
- This question does not allow to single out the specific problem/difficulty, but it can be viewed as evidence of some problems occurring, especially in the context of surveys freshly migrated to the new IT system, or every time the questionnaire has undergone deep changes.
- The indicator will be simply expressed through a table showing the frequency distribution of businesses per number of problems encountered. This information allows to monitor the evolution of the phenomenon, with the aim of reducing the percentage of respondents encountering the higher numbers of difficulties.

<table>
<thead>
<tr>
<th>Number of difficulties declared by the respondent</th>
<th>Number of respondent businesses</th>
<th>% of respondent businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Summary report on burden by survey (BBS)**

<table>
<thead>
<tr>
<th>Summary report on response Burden</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) ( \text{ACT} ) = Average Compilation Time</td>
</tr>
<tr>
<td>(2) ( \text{ART} ) = Average Retrieval Time</td>
</tr>
<tr>
<td>(3) ( \bar{P} ) = Average number of Persons Involved in providing information</td>
</tr>
<tr>
<td>(4) Frequency distribution of businesses per number of problems encountered</td>
</tr>
</tbody>
</table>

Raw Number of respondent businesses _____ Raw Number of respondent units _____

Coordination function used in selection of sample: ____________________________________________
Burden indicators by survey (BBS)

First results of burden indicators on ICT survey

Survey on the use of information and communication technologies (ICT) on the basis of EC Regulation on Statistics on Information society involving active enterprises in industry and services with 10 or more employees.

Response rate of ICT survey in 2015 was about 61%.

<table>
<thead>
<tr>
<th>Summary report on response Burden for ICT Survey year 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) ( \overline{ACT} ) = Average Compilation Time: 46.92</td>
</tr>
<tr>
<td>(2) ( \overline{ART} ) = Average Retrieval Time: 69.94</td>
</tr>
<tr>
<td>(3) ( \overline{PI} ) = Average number of Persons Involved in providing information: 2.17</td>
</tr>
<tr>
<td>(4) Frequency distribution of enterprises per number of problems encountered</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of difficulties declared by the respondent</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of respondent enterprises</td>
<td>56.24</td>
<td>20.22</td>
<td>12.96</td>
<td>6.38</td>
<td>2.73</td>
<td>1.04</td>
<td>0.23</td>
<td>0.20</td>
</tr>
<tr>
<td>Number of respondent enterprises</td>
<td>10,432</td>
<td>3,751</td>
<td>2,405</td>
<td>1,183</td>
<td>506</td>
<td>192</td>
<td>43</td>
<td>38</td>
</tr>
</tbody>
</table>

- Number of respondents used: 19,421
- Coordination function used in selection of the sample: negative coordination
First results of burden indicators on ICT survey

Compilation time, by size class (ACT)

<table>
<thead>
<tr>
<th>Size class</th>
<th>N</th>
<th>Mean (minutes)</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-19</td>
<td>8962</td>
<td>41.95</td>
<td>50.75</td>
</tr>
<tr>
<td>20-49</td>
<td>3614</td>
<td>43.30</td>
<td>56.64</td>
</tr>
<tr>
<td>50-99</td>
<td>1952</td>
<td>46.47</td>
<td>64.40</td>
</tr>
<tr>
<td>100-249</td>
<td>2064</td>
<td>54.11</td>
<td>75.37</td>
</tr>
<tr>
<td>250+</td>
<td>2465</td>
<td>64.68</td>
<td>95.44</td>
</tr>
<tr>
<td>Total</td>
<td>19057</td>
<td>46.92</td>
<td>64.01</td>
</tr>
</tbody>
</table>

\[ACT = \text{Average Compilation Time}\]

Data show a certain direct relation between size classes and net time needed to complete the questionnaire.

Respondents ICT2015 and burden section by size class (absolute value and percentages)

<table>
<thead>
<tr>
<th>Size class</th>
<th>Total</th>
<th>Respondent to ICT and not to burden</th>
<th>Respondent both to ICT and burden</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-19</td>
<td>9146</td>
<td>0.70</td>
<td>99.30</td>
</tr>
<tr>
<td>20-49</td>
<td>3675</td>
<td>0.65</td>
<td>99.35</td>
</tr>
<tr>
<td>50-99</td>
<td>1982</td>
<td>0.50</td>
<td>99.50</td>
</tr>
<tr>
<td>100-249</td>
<td>2109</td>
<td>0.95</td>
<td>99.05</td>
</tr>
<tr>
<td>250+</td>
<td>2509</td>
<td>0.88</td>
<td>99.12</td>
</tr>
<tr>
<td>Total</td>
<td>19421</td>
<td>0.72</td>
<td>99.28</td>
</tr>
</tbody>
</table>

*Enterprises are considered as respondents to the burden section if they answered at least one between retrieval time and persons involved.

Respondents to the BURDEN SECTION

This table reports the percentage distribution of respondents who only answered the survey and respondents who gave an answer also to the burden section, showing a very good data representativeness.
Respondents ICT2015 by retrieval time of information classes, by size class (percentages)

<table>
<thead>
<tr>
<th>Size class</th>
<th>Retrieval of information time classes</th>
<th>Up to 30 minutes</th>
<th>More than half an hour and up to 1 hour</th>
<th>More than 1 hour and up to 3 hours</th>
<th>More than 3 hours and up to 10 hours</th>
<th>More than 10 hours and up to 30 hours</th>
<th>More than 30 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-19</td>
<td></td>
<td>41.11</td>
<td>41.00</td>
<td>15.77</td>
<td>0.29</td>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>20-49</td>
<td></td>
<td>36.64</td>
<td>41.95</td>
<td>18.36</td>
<td>2.53</td>
<td>0.28</td>
<td>0.28</td>
</tr>
<tr>
<td>50-99</td>
<td></td>
<td>32.49</td>
<td>39.86</td>
<td>22.01</td>
<td>4.73</td>
<td>0.51</td>
<td>0.41</td>
</tr>
<tr>
<td>100-249</td>
<td></td>
<td>25.11</td>
<td>38.36</td>
<td>28.52</td>
<td>6.05</td>
<td>0.91</td>
<td>1.06</td>
</tr>
<tr>
<td>250+</td>
<td></td>
<td>15.41</td>
<td>35.94</td>
<td>34.33</td>
<td>10.85</td>
<td>1.62</td>
<td>1.65</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>34.33</td>
<td>40.12</td>
<td>20.68</td>
<td>3.76</td>
<td>0.57</td>
<td>0.54</td>
</tr>
<tr>
<td>Missing=210</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Average Retrieval Time (ART)

There is a clear-cut concentration of enterprises of all sizes in the first three classes of retrieval time and, moreover, it is evident that a larger amount of time was needed by companies with at least 50 persons employed. The extra time required by larger enterprises is justified by the fact that a more complex organization implies more intensive use of ICT, which results in a longer path of the questionnaire.

Using central value of each time classes (even if the classes do not have the same width) Average Retrieval Time (ART) has been calculated. Standard deviation shows high dispersion of the data around the mean.
Problems encountered in fulfilling the task
About 1 out of 2 respondents was experiencing no difficulties (49%). For all sizes of enterprise the highest difficulty was related to the length of the questionnaire (21%), also conceptual difficulties were big obstacles to fill in the questionnaire (26.5%); finally, very few indicated the importance of the difficulties encountered in the new data collection tool (9%).
Burden indicators in terms of persistency (BBB)

The persistency indicators aim at measuring burden from the point of view of a single enterprise potentially involved in several Istat surveys in a given time period.

In the last years, many National Statistical Institutes have been increasingly using sampling coordination techniques to reduce the overlap between samples of different surveys. Nevertheless, large enterprises are more likely to be selected into survey samples, causing a “persistent” burden to these statistical units.

Two groups of persistency indicators will be produced referring to planned and actual burden, respectively.

- **Planned burden** → is based on the number of surveys a unit is selected for.
- **Actual burden** → considers the number of questionnaires the enterprise fills in.
Burden indicators in terms of persistency (BBB)

- $S_1, S_2, \ldots, S_n$ = number of enterprises selected into (exactly) 1, 2, \ldots, $n$ surveys during year $t$
- $R_1, R_2, \ldots, R_n$ = number of enterprises that have filled in (exactly) the questionnaires of 1, 2, \ldots, $n$ surveys during year $t$

**Planned burden**

$$S_k' = \frac{\sum_{i=k}^{n} S_i}{N} \cdot 100 = \text{percentage of active enterprises selected into at least } k \text{ surveys during year } t$$

**Actual burden**

$$R_k' = \frac{\sum_{i=k}^{m} R_i}{N} \cdot 100 = \text{percentage of active enterprises responding to at least } k \text{ surveys during year } t,$$

Where:
- $N$ = the total number of active enterprises according to Asia, the Italian business register,
- $n$ and $m$ = the maximum number of surveys an enterprise is involved in during year $t$, in the sense of planned and actual burden, respectively.
Implementation plan and perspectives

It is planned to:

✓ design and develop the system to produce, store and disseminate such indicators systematically and, possibly, automatically
✓ process paradata to build a dedicated database to be used to systematically produce the burden indicator for each survey, but also to allow survey managers to make all the analysis they could be interested in
✓ store the standard burden indicators to be produced for each survey in the Istat official system for reference metadata and quality indicators documentation (SIDI/SIQual). In the next period the best way to store such information, also on the basis on the test conducted, will be designed and set up.
✓ identify the best way to disseminate the standard burden indicators. Actually, at first, being the indicators available only for a limited set of surveys, the publication of the report, expected by the end of 2016, could be sufficient. It is deemed more relevant to design the best way to disseminate such information in a systematic and standard way when data from a larger number of surveys will be available.
✓ Make suggestions on how the automatically calculated and disseminated indicators should be analyzed and interpreted, in order to identify strategies for further improvement of business surveys
REFERENCES


