

An agile approach to direct official surveys

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1. Recent trends

A basic document expressing the new role of direct surveys is produced by Statistics Netherlands and Statistics Canada [12]. It enhances that the methods of carrying out direct business surveys as conceived in recent years are no longer sustainable. Various analyses conducted by Istat [11,13,14] confirm these trends.

In order to address these trends, most of the NISs have undertaken complementary strategies. Firstly, they concern the progressive use of alternative sources and by applying data science techniques. In detail, a strategy towards which the main statistical institutes are oriented is that of reducing the role of direct surveys, resorting to them only when strictly necessary and when there is no availability of alternative sources, administrative or other type (big- data, sensor data, meter data, etc.). In Istat (Italian national statistical institute) several concrete progresses have been made in recent years on the use of administrative sources and some of them are currently under development (e.g. electronic invoicing or fees) while still today the use of other alternative sources is not very frequent as many applications are currently still at the prototype level. Summarizing these trends, there is a general convergence towards a multisource approach to surveys, in which the direct survey represents only one of the various components that can be used.

An immediate consequence, very interconnected with the trends described above, consists in the design of survey processes that are increasingly ‘agile’ and less invasive towards respondents, oriented to efficiency and timeliness. In this context, the use of simple data collection techniques supported by supplementary services aimed at reducing the missing answers and more generally the non-sampling component of the error is a particularly effective solution. The design of services to support users involved in the surveys (e.g. professional assistance services, web portals) are basic elements that contribute to increasing the efficiency of survey processes.

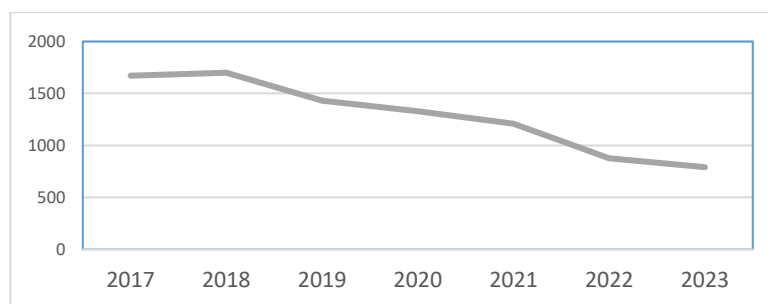
The following Figure 1 shows the trend of human resources employed in conducting data collection processes of business surveys from the introduction of the centralized data collection model in Istat, in 2016, up to today. In particular, the analysis shows a substantial halving of the resources employed in the data collection processes, falling from over 16 fte resources in 2017 to around 8 fte resources in 2023.

¹ Paragraphs: 2, 3, 4

² Paragraphs: 5

³ Paragraphs: 1,6,7,8.

Figure 1. Istat human resources employed in data collection for business surveys. Years 2017 - 2023 (Full Time Equivalent=100).



The reduction in available human resources did not only concern the personnel directly employed in the data collection processes but also that employed in other activities connected to the surveys. The need to continue to ensure adequate quality levels of the statistical outputs produced in relation to the substantial reduction in the human resources available has required a considerable effort aimed at increasing the efficiency of the data collection systems. This effort has made it possible to maintain substantial stability in response rates in official business surveys over the years.

2. Features of an agile approach to official direct survey data collection

The general characteristics of an 'agile' approach are traced back to Efficiency and speed, User orientation, Cost reduction, Multidisciplinary. The approach involves, in turn, a set of operational solutions in direct survey processes management, which can be summarized in the following principles. a) "Once only" approach: interoperability; b) Multisource approach; c) Adaptive survey techniques; d) Questionnaires optimization techniques; e) Process automation-oriented techniques; f) Primary role of CAWI technique; g) Design of Web portal for users; h) Design of specialistic assistance services to respondents; i) Smaller samples; l) Shorter questionnaires. All the principles listed must be applied with a view to maintaining adequate levels of quality and on this issue the reference is that of the TSE (Total Survey Error) paradigm [1,2]. In the context thus outlined, the specific focus of this document concerns the analysis of the effectiveness of CAWI technique supported by a centralized contact center service in business surveys.

2.1 CAWI technique: advantages and disadvantages

The data collection mode is defined based on the aims of the survey and the characteristics of the target population, maximizing data quality and minimizing costs.

Choosing a mode or a mix of data collection modes, in a specific field, is therefore a problem of maximizing quality with the constraint of available resources. There is no ideal data collection mode for all situations, but the advantages and disadvantages of each of them need to be assessed according to the specific situation of the survey.

In the business surveys, the CAWI mode, used in a single-mode design, represents a good compromise between quality and cost. This mode is in fact very adapted to the needs of business surveys, which often require the collaboration of multiple structures and roles of the enterprises. It also guarantees good coverage given the high digitization of enterprises. One of criticality, as highlighted in the literature, remains the absence of an interviewer which could negatively affects the response rate and the completeness of questionnaires.

The implementation of a Contact Center which supports the CAWI mode with the assistance to the compilation (Inbound) and the reminders for the recovery of non-response and partial responses (outbound), can partially compensate for these disadvantages and promote accuracy of responses and improvement of response rate in absence of the interviewer.

In details, reminders can be executed with different modes: massive postal reminders (sms, PEC or mail) to all units that at a certain date do not respond or telephone reminders customized for different cases (e.g. partial compilation, no compilation, "core" missing data). Telephone mode is more expensive, but highly effective, because in addition to the recovery of questionnaires (reduction of total non-response) it can

also improve the quality and completeness of the information collected (reduction of partial non-response).

3. User orientation as a solution aimed at increasing the efficiency of the data collection

Some technological and organizational solutions have already been implemented in Istat in 2016 at the same time as the introduction of the centralized data collection model [3,4,5,7,11]. These solutions require today further development and consolidation with a view to increasing the efficiency of data collection processes and hold up survey participation rates. Below are some thematic areas that require special consideration in the specific field of user orientation.

3.1 Statistical web portal

The Business Statistical Portal, with its main functions, is a crucial tool at the service of users involved in business surveys and to ensure adequate participation rates in business surveys. Single point of access, possibility of delegation and updated status of the obligations to be performed represent very important services in the simplification of the statistical obligations required of users. After a few years from its put into production, the system requires an update and an extension of its functionalities, in particular with a view to greater integration with all the other tools used in the data collection of economic surveys. During the years 2022-2023, with the inclusion of the two transport surveys *Maritime Transport Survey* and *Air Transport Survey*, in the past managed with independent acquisition system, all the business surveys are included in the Portal and the latter can fully play its role.. Over the last few months, a process has also been launched to redesign the section of the Portal dedicated to the return of personalized information to the companies involved in the surveys in order to offset, at least in part, the required statistical burden. It should be remembered that some larger companies are involved in around 20 Istat statistical surveys each year, several of which produce data at infra-annual intervals.

Table 1. Surveys and Authorized Users of the Business Statistical Portal - May 2023.

Surveys included in the Portal	Number of companies authorized to access	Number of registered NSI external users	Number of registered NSI internal users	Number of Register data change reports
72	914.493	978.588	741	131.992

4. Centralized contact center service offered in the year 2022: overview

The Inbound service is centralized and multi-channel. It provides standard assistance to all the type of users (enterprises, organizations, farms, individuals, households) involved in the Istat CAWI surveys (in a context of unimode or mixed mode design). Assistance can be provided via a toll-free number or via email and PEC; these occurrences are reported in the survey presentation letter.

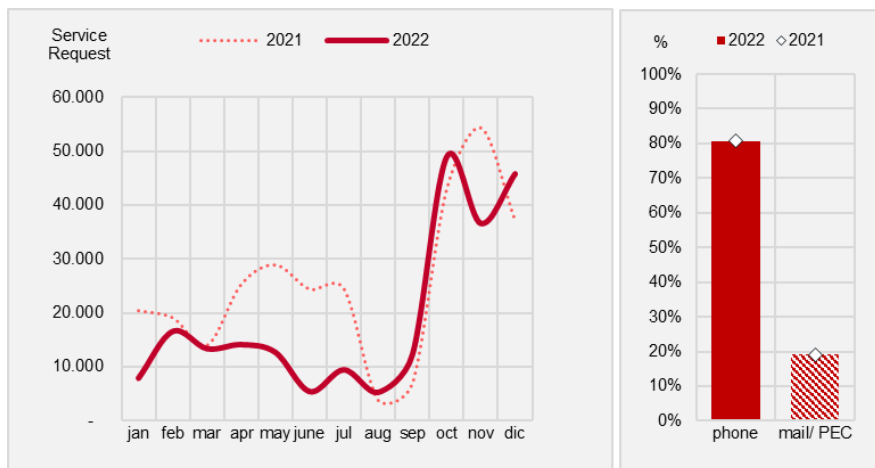
The centralized management of the service allows the standardization of the assistance procedures for the different types of units involved in the Istat surveys. This means a greater efficiency in terms of data collection times and costs (shorter response times and opportunity to achieve economies of scale) and better quality of the information provided to users (more efficient control, non-redundant information).

Since 2016, the service experienced a significant extension and growth in volumes and currently supports the data collection of around 90 surveys (recurring, occasional and permanent censuses), included in the National Statistical Program and issued by European Regulations.

In 2022 the centralized contact center handled in total 228.000 service requests (SR). Respondents used the phone channel in 80% of cases and the email/PEC channel in the remaining 20% (Figure 2). For the

phone channel, the average call duration was 6 minutes, while the average time of managing an email request was of 7 minutes.

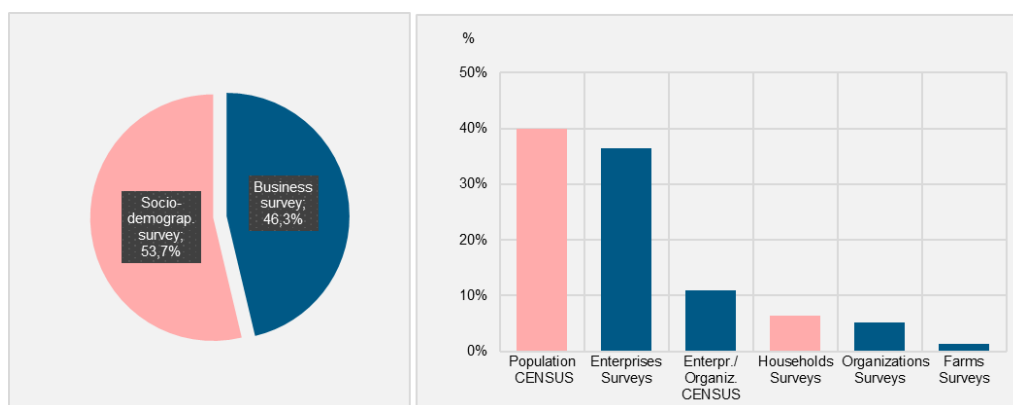
Figure 2. Number of SR handled monthly (on the left). Access Channel used by respondent units (on the right). Years 2021-2022.



In 46,3% of cases (105.495 SR) users were families or individuals involved in socio-demographic surveys (sample surveys and census); in the 53,7% of cases (122.505 SR) users were Enterprises, Organizations and Farms involved in business surveys (sample surveys and census).

More in detail, for the socio-demographic surveys the main volume of SR is due to Permanent Census of Population (39,9%), while sample surveys develop a very small contact flow in the year (6,4%). Instead for the business surveys, the main volume is generated by the recurrent economic surveys dedicated to the enterprises, short-term and structural surveys (36,5%) (Figure 3).

Figure 3. Volume of SR by type of survey (on the left) and type of respondent units (on the right). Year 2022



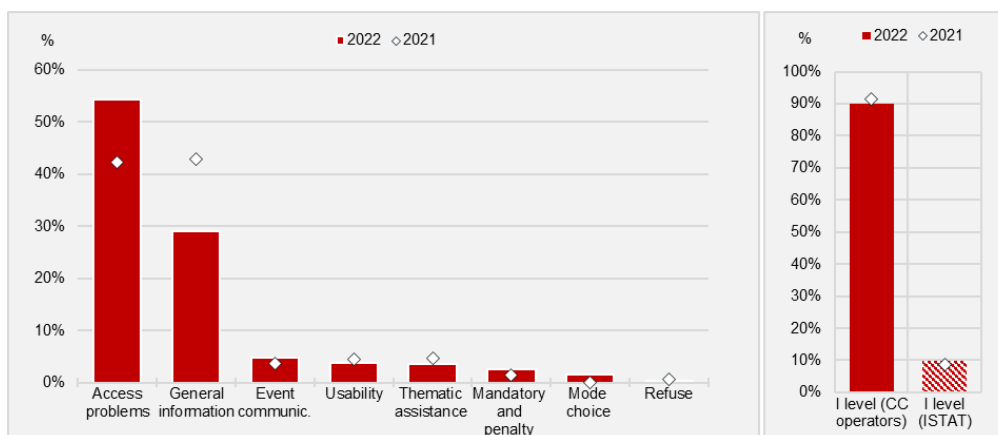
As concern the reason of the contact, the different cases can be grouped in 8 macro-class, in the order, as follow:

1. *Access problems* (54,3%) - Requests relating to the difficulties in accessing the site (resetting passwords, losing or forgetting login credentials, ..);
2. *General information* (29,1%) - Generic information requests on the survey, like: topic, use of the data, data collection methods, schedule of data collection, etc.

3. *Event communication* (4,7%) - The users contact to communicate an event which could compromise the eligibility in the survey or influencing the way to compiling the questionnaire;
4. *Usability* (4,4%) - request which highlight problems of usability with the data collection system (e.g. visualization of the questionnaire within the system, roles and powers for completing the questionnaire) or with electronic questionnaire (e.g., non-editable fields, methods of sending the questionnaire and receiving the receipt of successful completion, etc.);
5. *Thematic assistance* (3,6%) - Information about specific variables of the questionnaire or eligibility aspects;
6. *Mandatory and penalty* (2,7%) - Specific information requests about the obligation to replay and the administrative penalty;
7. *Mode choice* (1,6%) - Request to compiling with the support of a telephone interviewer (CATI), for the surveys which include a mixed mode CAWI-CATI;
8. *Refuse* (0,3%) - The units declares that they don't want to cooperate.

Another important aspect concerns the resolution (Figure 4). In 90% of the cases, requests were resolved by contact center operators (I level) and the remaining 10% by Istat referents (II level). This gap is set to improve further over the time as the experience acquired progressively by operators positively affects the number of requests resolved at the first level. A criticality on this aspect can be due to the change of provider of the service.

Figure 4. Reason of SR (on the left). Resolution of SR (on the right). Years 2021-2022

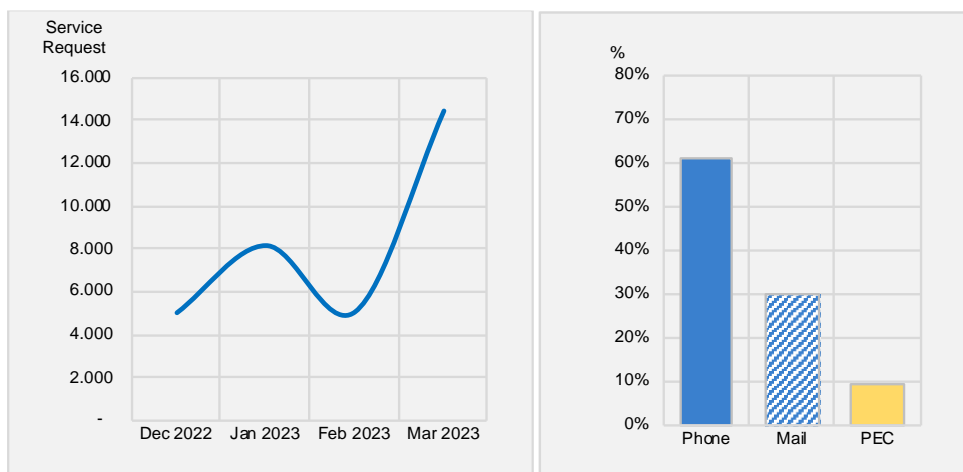


4.1 Focus on the Permanent Business Census

The data collection of the last Permanent Census of Businesses took place from 28 November 2022 until 31 March 2023. It involved 278.000 Italian enterprises. The units involved could contact the inbound service through the toll-free number (active from Monday to Friday from 09.00 to 19.00) or writing to the assistance e-mail box or PEC. Outside the time of service the enterprises could leave their contact details to be called back within 24 hours by an operator.

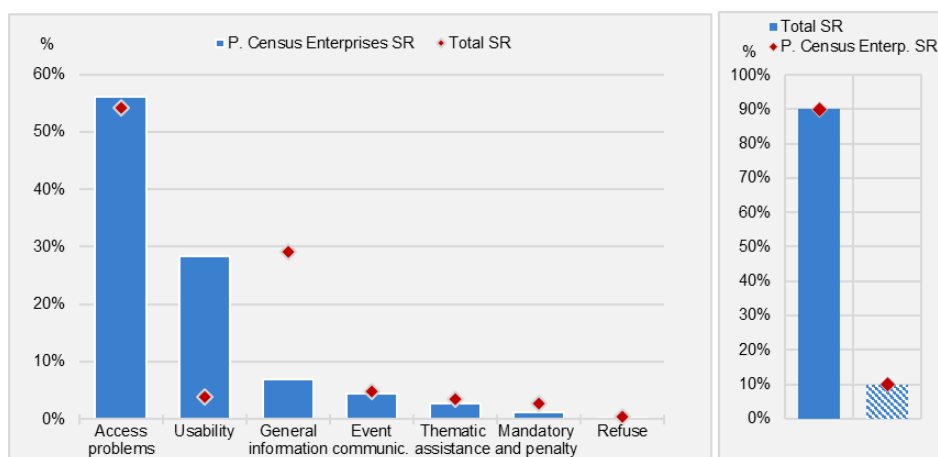
The census has developed in total 32.822 service requests. The use of mail/PEC channel for communications and support requests is widely widespread among the enterprises, compared to household, in fact the asynchronous channel had a significant weight of about 40% (Figure 5).

Figure 5. Permanent census of Enterprises ed.2022 - Number of SR handled monthly (on the left). Access Channel used by enterprises (on the right).



The main reason of assistance requests from enterprises concerned access problems (54,3%) (Figure 6). Compared to the total SRs, the second reason for requesting assistance concerned the usability of data acquisition system and the questionnaire (28,4% for the Permanent Census of Enterprises vs 3,8% for the total). This gap is probably due to the complexity of completing questionnaire which, in the case of the enterprises, requires the cooperation of several structures and roles with consequent problems of delegations and permissions to compile. Instead, regarding the problem solving at I Level, the Census of Enterprises showed a value similar to the total cases (about 90%).

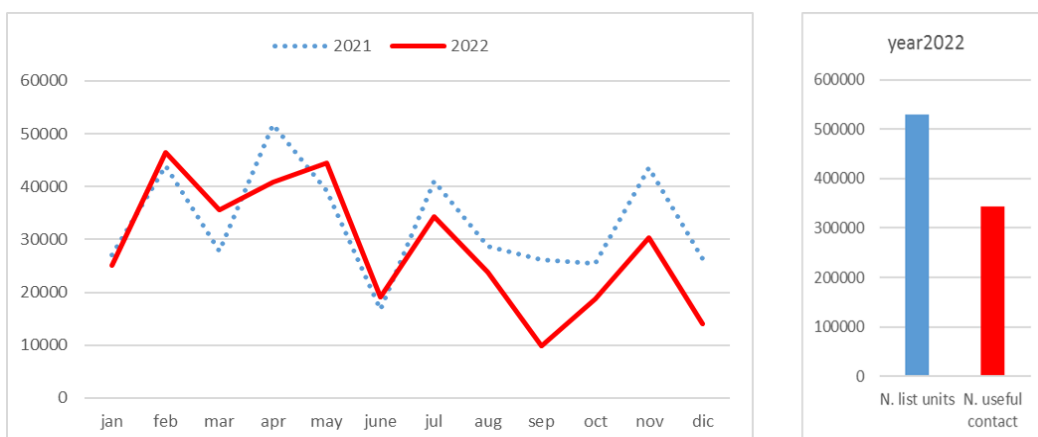
Figure 6. Permanent Census of Enterprises vs Total SR ed.2022 - Reason of SR (on the left) - Resolution of SR (on the right).



5. The Outbound service

The Outbound service, on the other hand, is only by telephone, because email and PEC reminders are managed with automated procedures directly by Istat. It mainly involves enterprises and institutions, only recently some surveys on individuals have been introduced. In 2022 the centralized contact center handled about 530,000 telephone reminders, of which about 343,000 with successfully completed reminders or with units that sent the questionnaire before the reminder (useful contact) (Figure 7).

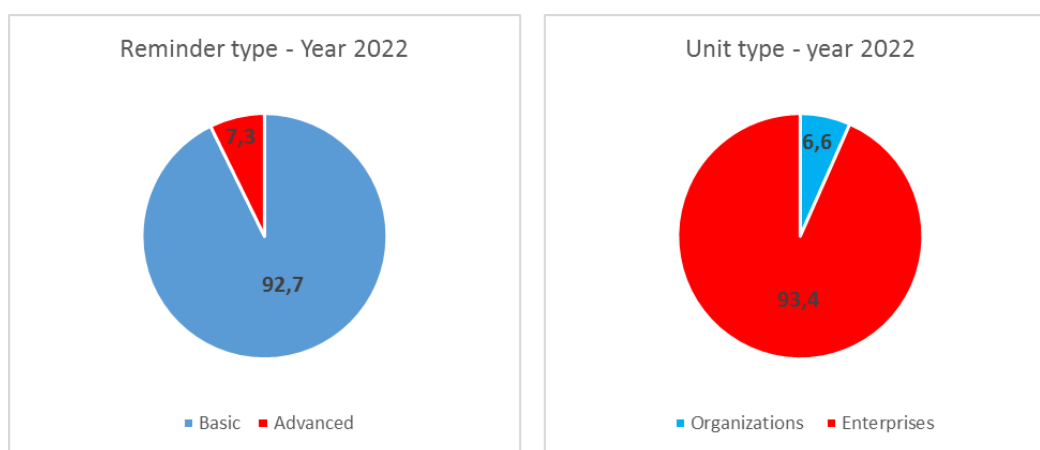
Figure 7. Number of useful contact handled monthly, years 2021-2022 (on the left). Number of useful contacts vs total number of contacts (on the right), year 2022.



The reminder generally consists of a courtesy phone call informing the unit of the involvement in the surveys and the deadlines for sending the data (basic Outbound). Only for some specific surveys, the operators of the outbound service provide assistance in completing the questionnaire (advanced Outbound).

In 93.4% of cases the units were Enterprises involved in recurrent economic surveys (short-term and structural surveys) and only in 6.6% of cases the units were Organizations involved in business, cultural and demographic surveys (Figure 8).

Figure 8. Percent of useful contacts by type of reminder (on the left). Percent of useful contacts by type of unit (on the right).



For the basic reminder, the average call duration was 3 minutes, while the average time of advanced reminder was of 10 minutes. Generally reminders have a longer duration for Organizations (2.2) than for Enterprises (1.2).

5.1 Focus on the Permanent Business Census

For the last Permanent Census of Enterprises the basic outbound service was preceded by a massive search of the telephone numbers of Enterprises that have never registered on the data acquisition system

dedicated to the survey (Business Statistics Portal). The contact center managed to recover more than 8,000 missing telephone numbers out of a list of about 15,000 (54.5 percent).

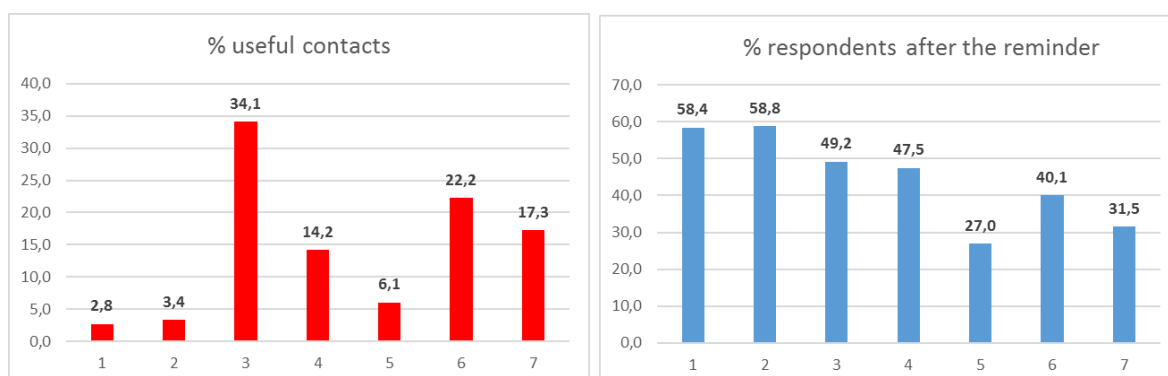
In total, three different waves of basic telephone reminders were made. The first two waves, of about 35,000 units each, were aimed at different units all belonging to the different segments into which the sample was divided. In the third wave, of about 6,000 units, some units (31.7 percent) already present in the first two waves were contacted again.

Table 2. Permanent Census of Enterprises 2022, telephone outbound reminders

Typology	n. units in the list	% units contacted	% responding units after reminder
1st telephone reminder	35,111	28.7	39.7
2nd telephone reminder	36,761	30.3	44.2
Final telephone reminder	5,971	68.3	50.3

The data in the Table 2 show that the effectiveness of reminders, measured by the number of respondents after the reminder on the number of useful contacts, increases as the reminder date approaches the survey due date.

Figure 9. Useful contacts by segment (percentage values, on the left). Respondents after the reminder by segment (percentage values, on the right).



Segments number 3, 6 and 7 (see also paragraph 6) recorded the highest number of useful contacts while segments number 1 and 2 recorded the highest number of questionnaires sent after the reminder (Figure 9). Segments number 3 and 4 also have a number of questionnaires sent after the reminder close to 50 percent, while segment number 5 registers the lowest percentage (27.0 percent).

6. Effectiveness of the centralized contact center service, for segments of the 2022 Permanent business census sample

For data collection purposes, the sample was divided into 7 segments, according to the following variables: dimension, previous registration to web portal, new entry in the web portal, questionnaire type (long or short form). A detailed description of the identified segments follows.

1. Large economic units at national level (500+ employees) registered to web portal, with long questionnaire (1,612 companies)
2. nationally relevant economic units (250-500 employees) registered to web portal, with long questionnaire (2,282 companies)
3. Medium economic units (20-250 employees) registered to web portal, with long questionnaire (62,521 enterprises)

4. Small economic units (10-20 employees) registered to web portal, with long questionnaire (29,753 companies)
5. Other economic units (10 AND more employees) NOT registered to web portal, or NEW Portal with long questionnaire (32,394 companies)
6. Micro economic units (less than 10 employees) registered to web portal, with short questionnaire (44,054 companies)
7. Micro economic units (less than 10 employees) NOT registered to web portal, or NEW Portal with short questionnaire (105,788 companies).

Response rates for each segment are reported in the following Figure 10. Particularly low are the rates observed in segments 5 and 7, respectively at 28 and 36 per cent.

Figure 10. Response rates by segments of the Permanent business census 2022 (percent values).

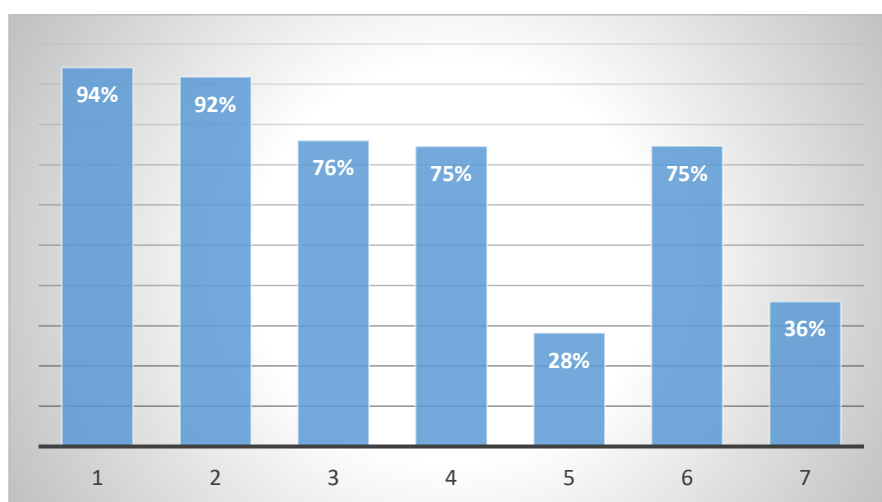


Figure 11. Respondents to Permanent business census 2022, with and without assistance, by segments (percent values).

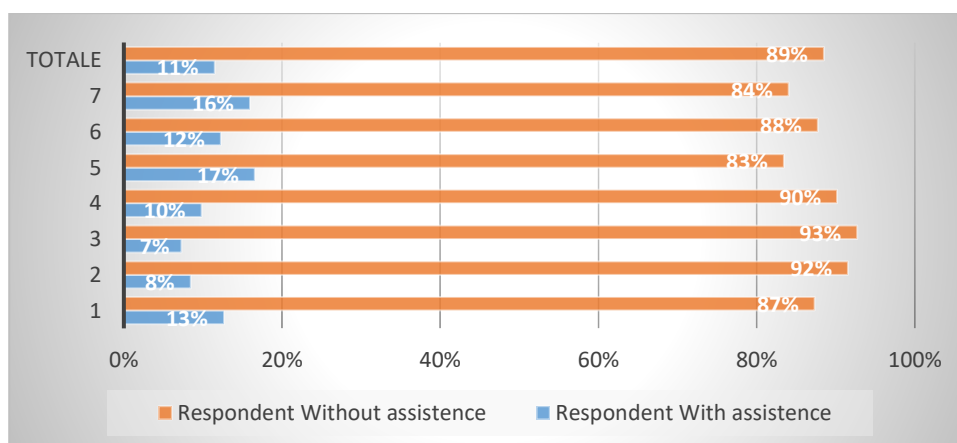
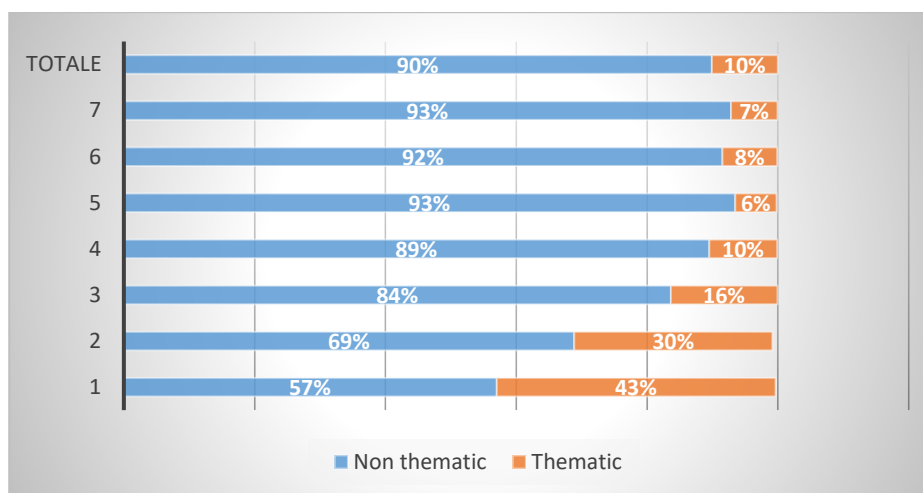


Figure 11 shows that about 11% of respondent companies called the service in order to have assistance, on average for 11 minutes. The use of the service especially concerned companies included in segments 5,7,1,6, (mainly micro and very large enterprises), while lower is the use of the service for small and medium-sized enterprises. Furthermore, requests for assistance are more frequent among companies not previously registered on the web portal.

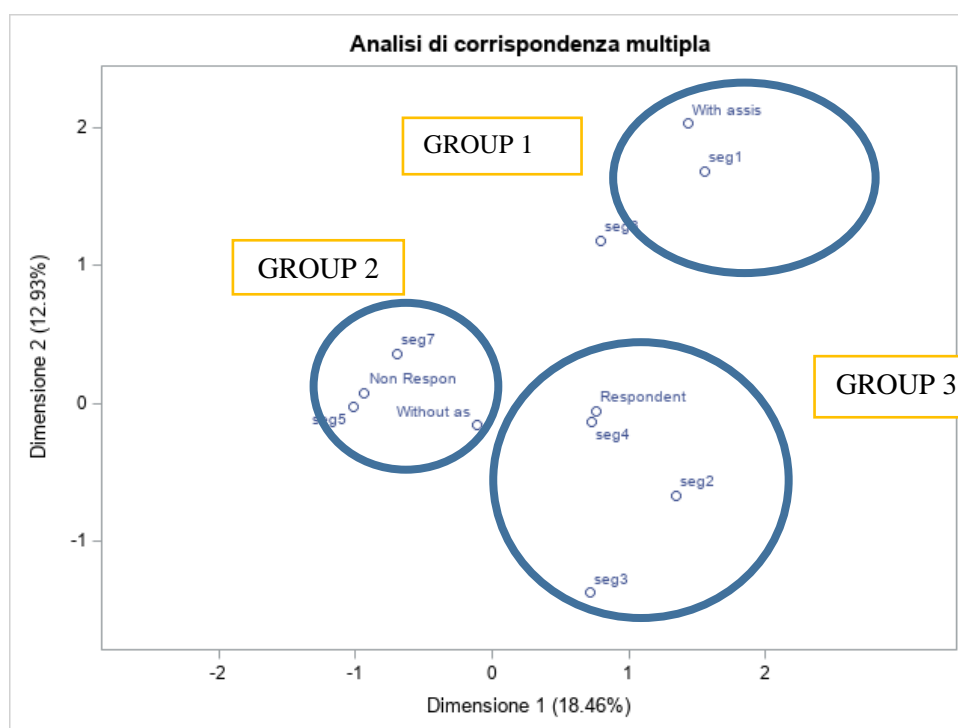
Concerning the content of the service requests by segment, larger companies that are already registered on the web portal record more thematic (content of the questionnaires) requests (43 percent) while for smaller units, notably those not previously registered on the portal, prevail the non-thematic content requests (Figure 12).

Figure 12. Respondents to Permanent business census 2022, by contents of service requests and by segments (percent values).



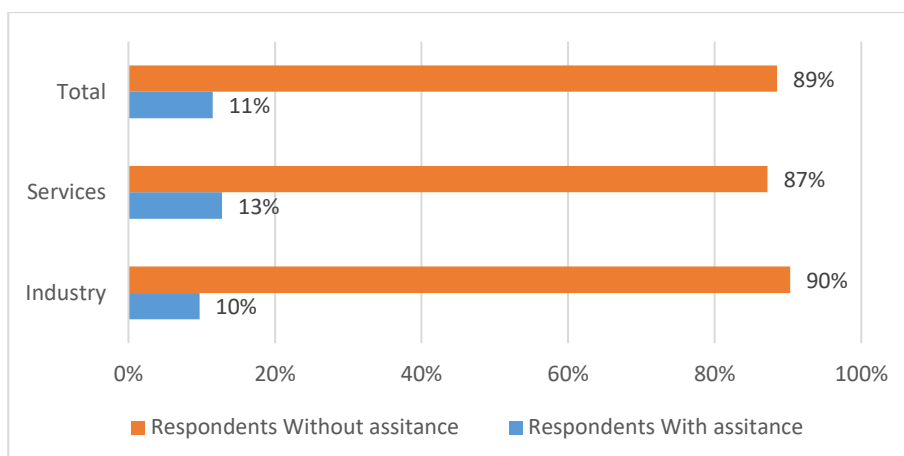
To better understand the relationships between the variables: response rate, use of inbound service and segment, a multiple correspondence analysis was carried out. The percentage of inertia explained by the first two dimensions is equal to 18.46 percent and 12.93 percent respectively.

Figure 13. Analysis of multiple correspondences for segment, assistance and response to the questionnaire of the Permanent business census 2022.



The analysis identified three main groupings pointed out in Figure 13. Group 1 reports segments characterized by higher service rates associated with satisfactory response rates (effective service); Group 2 segments associated to a lower service rates and satisfactory response rates (autonomous businesses). Group 3 shows segments with higher service rates associated with unsatisfactory response rates (unresolved service).

Figure 14. Respondents to Permanent business census 2022, by economic activity sector (percent values).



The analysis of requests for assistance by respondents to the 2022 Permanent Business Census by macro sector of economic activity shows a greater tendency to request assistance service support from companies in the service sector (13 per cent) compared to the industry sector (10 per cent) (Figure 14). The reasons of this difference may concern both the smaller average size of companies belonging to the service sector and the experience of industrial companies to participate in surveys conducted by the National statistical institute.

Figure 15. Respondents to Permanent business census 2022, by legal form (percent values).

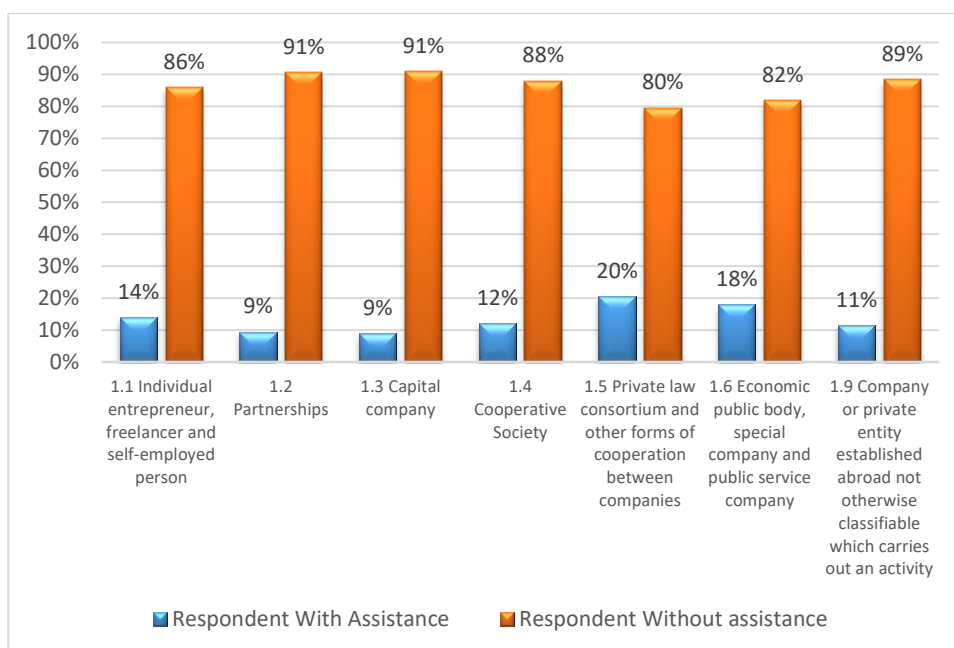


Figure 15 shows that the use of inbound assistance is limited for the legal forms Partnership and Capital company while it tends to be more significant for Individual entrepreneurs, freelancers and self-employed persons and for cooperative companies. The other legal forms have a limited weight in the Permanent Census sample.

7. Other innovative solutions to increase the efficiency of the data collection system

7.1 Use of alternative sources

Data collection through direct statistical surveys presents growing problems of sustainability, therefore it must be increasingly agile and characterized by adequate participation rates and high quality standards. This need implies a new approach to survey processes aimed at minimizing the burden on respondents by resorting to direct surveys only when strictly necessary and at the same time reducing the amount of information requested and more generally the effort required of the respondent. This approach implies maximizing the use of alternative sources to those from direct surveys on businesses. In the field of business surveys, the new sources to be used can be traced back to the following main types a) information collected for administrative purposes; b) other information available mainly in the form of big data (in particular data from web platforms, meter data, sensor data, etc.). As regards the first type, the activity has been aimed at the acquisition and operational use in the direct surveys of new sources, interacting, in coordination with the various players involved, with the administrations who hold them. The activity includes an experimental phase, currently in progress, of analysis based on comparison with traditional sources from direct detection. Then the phase of effective use in the investigation processes, replacing traditional sources where possible, will be carried out. In this context, particular attention is paid to the operational use of the electronic invoicing and fees available from the Italian Revenue Agency. In Istat, the systematic acquisition of these sources is underway according to the timescales necessary for business surveys. The activity presents various obstacles both at a regulatory level with the need to establish supply agreements with supplier bodies, and at a technical level as it is necessary to identify the most suitable environments for archiving the data received, and at a methodological level as it is necessary to confirm the possibility of integrating data from direct surveys with data from administrative sources. Another aspect to manage is that of the protection of personal data acquired through administrative sources. Once fully operational, these sources can make significant lightening of the economic and structural surveys on the turnover of both industry and services and those on retail sales.

With regard to the second typology, the first objective is to identify the information available and the contexts of possible operational application in the field of economic surveys. That involves the use of techniques aimed at extracting and making usable the new sources for the purposes of economic surveys. Also in this case the objective, in a first phase, is to start an experimental activity aimed at combining the information available from direct surveys with that obtained from new sources, with the aim of evaluating its quality and responsiveness to information needs. The activity is attributable to the path identified in Istat by the Roadmap for the production of Trusted Smart Statistics (TSS) [8, 16]. The Roadmap is a strategic document that guides the implementation of operational programs prepared annually for the production of new statistical products made with Big Data sources, typically through the use of new technologies and methodologies. The activity is mainly oriented towards the dimensions of efficiency, due to the automated integration of data sources and flows and the reduction of the statistical burden on respondents. For the aforementioned objectives, the application of web scraping techniques and other forms of web intelligence is also foreseen for the acquisition of information present on the web and useful for the purposes of business surveys. A first example of application of these techniques concerns the retrieval of information on multinational companies to be used for the reconstruction of production chains. Other applications concern the automation of the coding processes of the products realized by companies or of the economic activity sector, through the acquisition of the information available on the websites and the use of machine learning techniques.

Finally, further fields of interest in order to implement the use of alternative sources concern the application of interoperability techniques for the real-time acquisition of information available in a structured form at other National Statistical System institutions and System-to-System (S2S) communication for the digital acquisition of data available in the so-called smart industries (Industry 4.0).

7.2 Process automation techniques

The reduction trend of human resources employed in data collection processes, the availability of increasingly trained and skilled human resources and the development of new technologies, in particular connected to the use of Artificial Intelligence (AI), Web Intelligence (WI), as well as the opportunities offered since the development of industry 4.0, the application of automation techniques of survey processes has become an increasingly important aspect in the design of statistical business surveys [15].

Examples of applications currently under development in Istat concern the automation of some repetitive phases of the assistance service offered to respondents, as well as automated procedures for the coding of products realised by businesses and the sector of economic activity to which they belong. Of particular interest are also the techniques aimed at acquiring information on the structure of multinational companies and its changes over time as well as the reconstruction of production chains.

8. Conclusions: the prospects for the realization of an agile approach to direct official surveys

The centralized inbound and outbound contact center service represents a relevant issue in the convergence towards an agile data collection process aimed at efficiency and compliance with user needs. The service is an effective support to the CAWI technique as it helps to sustain response rates even in the case of decreasing human resources employed in the data collection processes. In the specific case of the 2022 Permanent business census, 11% of respondents required the inbound service, for a total of about 11 minutes of average assistance. The share of requests for assistance varies by segment of the sample. In segments 1 and 6 the role of inbound assistance was effective as it was accompanied by high response rates. In segments 5 and 7 relatively high service demands were associated with very low response rates. In these cases the service was of help but it is not enough and should be accompanied by complementary solutions. In general, the greatest usefulness of the service tends to be concentrated on larger companies, characterized by greater organizational complexity and a greater number of surveys, or on micro-enterprises, less accustomed to participating in surveys and less equipped. But, for the latter it is necessary to identify additional tools in order to support the participation rates.

The adoption of a CAWI technique supported by a contact center service is only one component of the convergence towards an agile approach to official direct investigations of companies. In particular, the continuing trend of decreasing human resources, the development of new technologies and the increasingly pressing need to reduce the burden on respondents will open new challenges for producers of official statistics. The prospect is the convergence towards a multi-source approach to data collection aimed at making the most of the availability of alternative sources to those from direct surveys. In particular, the primary sources will be those of an administrative nature, those in the form of big data and those coming from the web. In this context, a greater role will be played by data science techniques aimed at adequately exploiting these sources. Fundamental to achieving these objectives is the exploitation of process automation technologies, in particular artificial intelligence and web intelligence. In this context, direct survey will continue to play an important role, but only in situations where recourse to other sources is not possible. They will also tend to take on a more agile form, with smaller samples, shorter questionnaires, automation of data collection and simpler collection techniques, as CAWI with specialistic services to support the user .

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