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The respondent as the focus of the questionnaire design

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Abstract

Poor questionnaire design is one of the primary sources of response error. Paying attention to question content, wording and format helps maximize accuracy in the information collected through the prevention, detection and correction of inconsistencies and the reduction of the response burden. It is questionnaire designer responsibility to simplify the questionnaire navigation and the cognitive task required by the survey questions, also by exploiting all the potentialities offered by CA techniques.

Respondent, as leading actor in the survey process, must be the focus of the questionnaire design. Quantitative and qualitative methods can be used to collect information on respondents' difficulties: cognitive interviews; experimental studies; interviewer and respondent debriefing; structured probes on completion problems; analysis of the requests for help addressed to the contact center; and paradata analysis. These techniques provide feedback on the questionnaire completion process, and consequently shed light on sources of response error in the questionnaire. This information can be used to enhance both the response rate and data quality.

For example, for the Survey on discrimination against LGBT + people, the novelty and sensitivity of the topic have required the involvement in the questionnaire design process of experts, and potential respondents through an online cognitive pretest.

The introduction of the CAWI-CATI mixed mode technique in the agricultural census suggested an experimental investigation to understand if farmers could fill in the online questionnaire by themselves, and how we could help them retrieve the information and provide reliable, accurate and comprehensive answers.

The respondent as the focus of the questionnaire design[1]

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Summary

Poor questionnaire design is one of the primary sources of measurement error. It is the questionnaire designer's responsibility to simplify the questionnaire navigation and the cognitive task required of the respondent to complete the survey questions, also by exploiting all the potentialities offered by computer assisted techniques.

The respondent, as the leading actor in the survey process, must be the focus of the questionnaire design. Quantitative and qualitative methods can be used to collect information on the respondents' difficulties: cognitive interviews; experimental studies; interviewer and respondent debriefings; structured probes on completion problems; analysis of the requests for help addressed to the contact center; and paradata analysis. For example, for the survey on discrimination against LGBT+ people, the novelty and sensitivity of the topic required the involvement in the questionnaire design process of experts and potential respondents through an online cognitive pretest.

The introduction of the CAWI-CATI mixed mode design in the Agricultural census required an experimental investigation in order to understand if farmers were able to complete the online questionnaire by themselves and to identify the means necessary to retrieve the information in order to provide reliable, accurate and comprehensive answers.

Keywords: questionnaire design**,** data quality, response burden, answering process

[1] This work is the result of a common effort. Paragraphs 1, 2 and 3 have been written by Sabrina Barcherini; paragraph 2.1 has been written by Serena Liani; paragraph 2.2 has been written by Simona Rosati; paragraph 2.3 has been written by Katia Bontempi; paragraph 2.4 has been written by Gabriella Fazzi; paragraph 2.5 has been written by Samanta Pietropaoli; paragraph 2.6 has been written by Barbara Lorè.

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1. Introduction

The construction phase of the questionnaire is a delicate and complex moment in the data collection process, in which skills and competence are required. In the words of Sudman and Bradburn, "*even after years of experience, no expert can write a perfect questionnaire*" (Sudman/Bradburn 1982).

While designing a questionnaire, it is the researcher's responsibility to simplify the cognitive task required of the respondents so that they are less likely to introduce distortions in the data collected. From this point of view, the respondent can be seen as a leading actor in the survey process. To design a good questionnaire, the researcher should place the respondent at the center of the questionnaire design to ensure usability, a pleasant task completion process and a high level of data quality.

In this paper we will describe the different quantitative and qualitative methods used to collect information on respondents' difficulties and provide some case studies. We will begin with the cognitive interview, a tool to understand how respondents answer survey questions, to evaluate the quality of their responses and, as a result, to improve the questionnaire design. Next, we will go through discuss a set of structured and standardized questions that we include at the end of each questionnaire to collect information on problems that the respondents may have had with either the contents or the navigation.

Other problems occur in the fieldwork and are detected by interviewers. Structured debriefings with them are useful to improve the data collection tools and overcome any critical issues. An analysis of the requests for help addressed to the contact center can also give key information to improve the questionnaire. In addition, a paradata analysis is useful to detect questionnaire pain points: frequent break-off points, too long or too short completion times and the most frequent error prompts. Finally, the introduction of quality checks in the questionnaire is not only a tool to improve the data quality but is also a resource to develop support strategies to make the questionnaire completion an easy and stress-free experience.

2. Methods for placing the respondent at the center of the questionnaire design

Quantitative and qualitative methods can be used to collect information on respondents' difficulties: cognitive interviews; experimental studies; interviewer and respondent debriefings; structured probes on completion problems; analysis of the requests for help addressed to the contact center; and paradata analysis.

2.1 Listening to the respondents: the cognitive interview

The task of the questionnaire designer is to grasp what the respondents experience when they answer the survey questions, with the aim of avoiding pitfalls in the design process. The cognitive interview is a pretesting method which helps the designer to gain such an understanding, since it investigates the cognitive processes involved in responding to survey items. It allows researchers to identify the problems which respondents face when they interact with the questionnaire, «to evaluate the quality of the response or to help to determine whether the question is generating the sort of information that its author intends» (Beatty 2004, 45).

The cognitive interviewer allows the respondents to perform the answering task and, during or at the end of the questionnaire administration, asks them to talk about what they were thinking while they answered. This information helps the designer to obtain a deeper understanding of: how the respondent comprehends the intention of the question and the meaning of the words and phrases; what types of information the respondent needs to recall in order to answer the question and which strategies are used to achieve this; how willing the respondent is to give accurate and truthful answers; and how well the response categories given by the questions fit the respondent (Willis 2005, 36). The aim is to improve the questionnaire design by identifying problems in the question-and-answer process and therefore making modifications to the items in order to address the problems identified (Willis 2015, 17). Ultimately, the cognitive interview gives the researcher a chance to design the questionnaire together with the respondent.

At the Italian Institute of Statistics, the cognitive interview is an integral part of the questionnaire design process, whenever there is sufficient time and resources to devote to this demanding activity. It has been used for pretesting questionnaires addressed to several different target groups: not only individuals and households but also enterprises and institutions. We have also experimented with new modes of conducting cognitive interviews which take advantage of the Internet. For example, in 2017 for a pretesting of the questionnaire for the Survey on aspects of daily life we resorted to the web probing technique, asking a set of probe questions during the self-administration of the web questionnaire itself. This technique proved to be useful because it allowed us to reach a large sample of respondents and to collect their feedback in a short time (Bologna, Lorè, Macchia, Orsini 2020). Finally, to address the distancing measures necessary in response to the Covid-19 pandemic, we have submitted several questionnaires (e.g., the questionnaire of the Survey on employment discrimination of LGBT people and the questionnaire of the Survey on information and communication

technology in enterprises) to an online cognitive pretest via a videoconferencing system, finding that this mode of administration is convenient both for the survey organizers and the respondents, perhaps additionally providing the respondents with increased privacy (Liani and Fazzi 2021).

2.2 Collecting feedback from the interviewers

Interviewers have unique and valuable knowledge about the main problems which respondents encounter in the field (Barcherini 2019). Collecting their feedback is useful to improve the data collection tools and overcome any critical issues. Thanks to the direct relationship with the respondents, the interviewers can provide the researcher with first-hand information about questionnaire problems in the field (De Maio 1983, Campanelli, Martin and Rothgeb 1991): which aspects went well and which were problematic; and what impact each problem had on the respondent's answers (Collins 2015).

There are two methods to collect interviewers' feedback: debriefing questionnaires and in person or online debriefing sessions. It is possible to undertake this task using only one method or both, in a combined way. This choice depends, on the one hand, on how much the researcher can invest in terms of cost and time, and, on the other, on the topic and the survey design. For example, for a consolidated survey, it can be convenient to use just one method; in the case of a pilot survey a more in-depth discussion with the interviewer may be necessary through both a questionnaire and a debriefing session, in view of the definitive survey design.

The debriefing questionnaire consists of an evaluation form regarding various aspects of the survey questionnaire. It can be completed for each interview in order to obtain case-by-case feedback on specific issues; alternatively, it is possible to ask each interviewer to fill in a single questionnaire to cover all the interviews (Collins 2015). The first method allows the collection of more detailed information, including on the frequency with which a problem arises, but it is certainly more onerous; the second is less time-consuming but it does entail a risk that the interviewer's memory is focused only on isolated cases (De Maio 1983).

Furthermore, the debriefing questionnaire "should include open questions to allow interviewers to raise unanticipated problems as well as closed questions asking for more specific information" (Collins, p.39). Instead, the interviewers debriefing session consists of a discussion between the researchers and interviewers on any critical issues in relation to the questionnaire, following the completion of a significant number of interviews. Typically, the discussion is focused on a set of topics previously defined by the researchers' group. When

questionnaires and debriefing sessions are combined, the questionnaire results provide the points track for the discussion session (Fowler 1989). In this way, the discussion is centered on the most critical aspects (Bishoping 1989).
In general, at Istat, the interviewers debriefing is focused on the following issues:

- Difficulties in responding (topics, sequence, wording, response categories, recallability, proxy questions etc.)
- Usability of the computer assisted questionnaire (intuitive layout, call-to-action buttons position, tooltips use, performing warning messages etc.)

For example, the debriefings carried out in relation to the Labor force survey, Household budget survey and Population census provided significant results useful to improve the questionnaire design, with the dual aim of reducing the respondent burden and increasing the quality of the collected data. The results of the interviewers debriefings carried out for the Labor Force Survey made it possible to propose a set of changes in wording, classifications and sequence questions. In relation to the Household Budget Survey, thanks to the interviewers debriefings, changes were proposed to the questionnaire; for example, some graphic aspects of the diary were improved and some obsolete questions were deleted (e.g. the possession of a satellite navigation device). Finally, in relation to the Population census, the interviewers debriefing results allowed an improvement of the online questionnaire usability and layout (e.g. call-to-action buttons and tooltips) and the wording of warning messages. Moreover, a more colloquial and commonly used language was chosen for some of the questions.

2.3 Collecting feedback from the respondents

Collecting feedback from the respondents is an easy way of detecting problems which they may have experienced during the questionnaire completion, both relating to content and technical issues. The respondents' feedback analysis provides important suggestions which can be exploited in future editions of the survey in question or in designing other surveys.
Generally, the respondents' feedback is collected by means of a set of structured and standardized questions, placed in a specific block at the end of the questionnaire. Feedback questions often have a multiple-choice format and are designed to investigate more deeply several completion aspects, such as:

- how the questionnaire was completed (*Who has filled in the questionnaire? Did you need any help in filling in the questionnaire?*). Understanding who filled in the

questionnaire or if they needed any help could suggest opportunities to simplify the questionnaire structure or to improve the usability of the tool

- technical difficulties with the computer assisted questionnaire, including login, browsing, etc.
- survey questions which worked poorly and need to be rephrased in a simpler way to minimize the respondent's cognitive workload (*Which survey questions were difficult to answer?*)
- the respondents' mode propensity (*Would you have been willing to be interviewed through a different mode?*). Understanding the respondents' preferences is helpful in terms of choosing the best technique or the combination of techniques to invest in when the aim is to maximize the survey participation.

Although the results are based only on the respondents' answers, and nothing is known about the non-respondents' point of view, this information, combined with the respondent's characteristics, can assist in an identification of which respondents have encountered problems and which types of problems (Fabi et al., 2021). This can be useful in terms of finding questionnaire design solutions to minimize the burden and improve the data quality, without any extra costs.

2.4 Identifying the most frequent completion issues: analysis of help desk tickets

When we cannot rely on mediation by an interviewer, the Istat Contact Center is the primary interaction point for any difficulty that the users may encounter. The Istat Contact Center manages about 60 statistical processes, an average volume of about 80,000 requests for assistance per year, also known as tickets. These tickets need to be grouped in relation to the subject of the issue to identify those that may be expressions of incomprehension or difficulty that the respondent may have had while filling in the questionnaire.

The significant number of tickets collected per year requires that we rely on automatic machine learning techniques for the ticket categorization. We have adopted a formal and data-driven approach: all the relevant information is extracted from the data, except for the class labels of the training set, which are externally defined (Bianchi, 2022). We have employed an initial Text Mining phase, which includes tokenization, stop-word elimination, lemmatization with Part-Of-Speech recognition and feature extraction; next, we have adopted a classification phase, in which we have experimented with deep and traditional learning.

We have applied this automatic technique of categorization to the tickets arising from certain economic surveys, such as the Survey on Research and Development in enterprises and the Survey on information and communication technologies in enterprises. This type of survey contains many critical issues which users may encounter during the completion due to the complexity of the questionnaires: they require detailed quantitative information; use tabular forms for filling out many questions; and contain many prompts, many of which are blocking (also known as hard prompts). Therefore, this dataset was representative of the various cases of requests for assistance.

We have prepared a training set of about 8,000 tickets, classified in seven distinct classes[3]. We have analyzed the specific classes to detect the most troubling questions and the specific points of the questionnaire where the users have complained about usability problems. The first group consisted of usability tickets relating to difficulties in accessing the site, highlighting problems connected with the usability of the electronic questionnaire (e.g., non-editable fields, methods of sending the questionnaire, etc.) or requesting the reopening of a questionnaire already sent so that the respondent could proceed with the correction of data entered incorrectly. The second group was composed of tickets with requests for "Information on questions", requesting assistance in completing a specific question in the questionnaire (e.g., the question does not apply to the case of the user or the case of the user is not present in the questionnaire).

We have used the collected information for the redesign of the subsequent editions of the Survey on Research and Development in enterprises and the Survey on information and communication technologies in enterprises: we have changed the wording of the most problematic questions and have simplified the matrix compilation.

2.5 Tracking navigation issues and the propensity to answer: paradata analysis

Paradata analysis is another method which can help researchers effectively evaluate questionnaires. A large amount of paradata can be recorded and used for the analysis.

Whenever a respondent uses a device to participate in a web survey, the device reveals information to the server about itself. This information is device-type paradata, known as user agent strings, which can be used to measure the behavior of respondents who access the questionnaire from different devices. Completion, break-off and partial interview rates can be

[3] General information; usability; information on questions; interactions with Istat; eligibility; unclassifiable; uncertain.

also computed by the device and other survey quality criteria can be recorded, such as the number of missing items.

In this paper we consider a few of these statistics, which are related to certain case studies we have administered. In surveys on households, such as the Survey on aspects of daily life (ADL) and the Population census, the paradata analysis revealed an increasing usage of mobile devices, which suggests the possibility of redesigning questionnaires with a focus on mobile screens to improve the survey quality.

Paying attention to higher break-off rates may be informative about points of the questionnaire where non-cooperation is more likely. Possible causes of break-offs are the topic, the sensitivity of the questions, the burden of answering the questions, the format of the questions, the number of questions on a page, the layout, etc. The analysis of paradata collected in the Survey on Research and Development in enterprises and in the Survey on information and communication technology in enterprises has led to the identification of strategies of reminders to minimize break-off rates. The largest enterprises are invited by telephone or email to complete the questionnaire, and this produces positive effects in terms of the response rate of the questionnaires left in draft.

Examining the most frequent prompts activated during completion can be useful in detecting respondents' difficulties. In relation to the R&D survey most of the break-offs corresponded to questionnaires with a large number of prompts activated, which proved discouraging for the respondents. Messages requiring responses to omitted questions gave us hints on how to redesign the R&D questionnaire, leading us to simplify the question contents and provide reminders of previous answers to help the respondents to insert consistent information.

A change of answer can be either an indication of potential confusion about a question or a sign of a shortcut strategy, as respondents decide to reduce the cognitive effort and provide a satisfactory but less accurate answer. The time spent on a page or on a question can be used as a proxy for the respondent's cognitive effort. Longer or more complex questions require more effort and increase the response time. The total response time is related to the characteristics of both the respondent and the question. For example, in the Survey on information and communication technology in enterprises more experienced respondents (e.g., those involved in multiple surveys) answered in a shorter time, proving more confident with the questionnaire completion.

By analyzing paradata we can also estimate the response propensities. For example, by including paradata in relation to the Survey on information and communication technology in enterprises as a predictor in a logistic regression model, we found that the probability of a

response was about 40% higher for enterprises where 30 minutes was spent in filling the questionnaire in the 2018 edition compared with enterprises with a longer completion time.

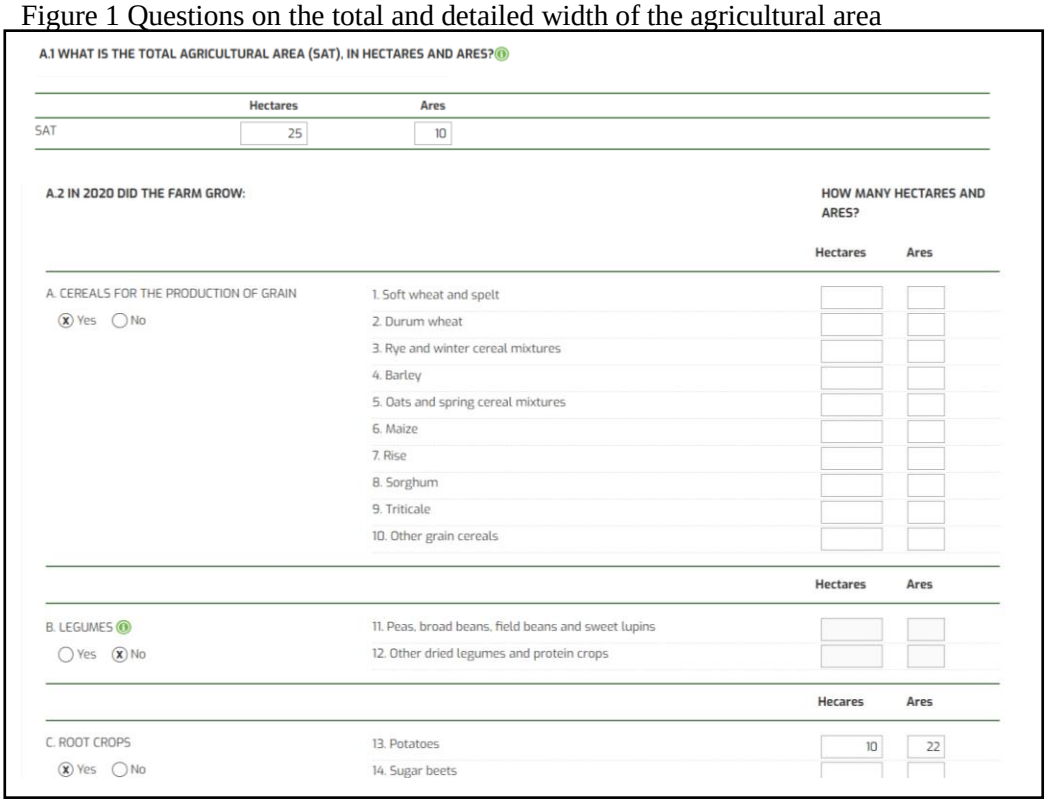
2.6 Facilitating the answering process: quality checks

One of the main advantages of computer assisted questionnaires is the possibility of implementing features which ensure high data quality (e.g. automated branching, soft and hard prompts for validation, non-response detection, tailored wording, etc.). Mistakes are identified at the moment they are made and the respondents are responsible for the editing. This can be burdensome and annoying, especially in self-completion when the interviewer's valuable contribution is not available. Thus, a balance between accuracy and burden should be found.
We usually consider quality checks as a way of maximizing accuracy. In a flipped perspective, they could become a tool to support the completion task. Ultimately, what we really want is to prevent respondents from making mistakes, so quality checks should be designed as tools for prevention before than correction. If we help respondents improve their accuracy, they are less likely to get blocked or be asked for additional actions, consequently being charged with an extra cognitive workload and burden.
This is particularly relevant when it comes to designing quantitative questionnaires. In such cases, respondents are often requested:

- to recall overall information
- to distribute the same quantities according to multiple classifications
- to be consistent across the questionnaire.

This is a significant request and measurement errors can occur at any stage. Such is the case, for example, with the Agricultural census, where farmers are asked to report the width of the soil surface according to a taxonomy of around 90 land uses, by tenure type and by method of irrigation.

Figure 1 Questions on the total and detailed width of the agricultural area



A.1 WHAT IS THE TOTAL AGRICULTURAL AREA (SAT), IN HECTARES AND ARES?

	Hectares	Ares
SAT	25	10

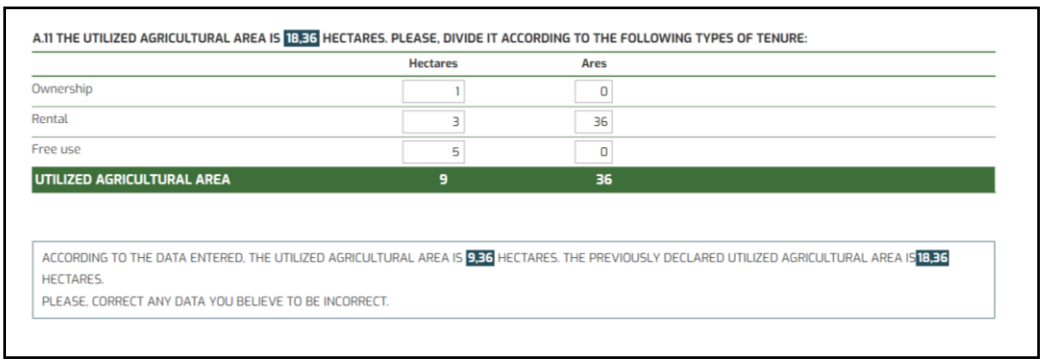
A.2 IN 2020 DID THE FARM GROW:		HOW MANY HECTARES AND ARES? Hectares	Ares
A. CEREALS FOR THE PRODUCTION OF GRAIN (X) Yes ( ) No	1. Soft wheat and spelt		
	2. Durum wheat		
	3. Rye and winter cereal mixtures		
	4. Barley		
	5. Oats and spring cereal mixtures		
	6. Maize		
	7. Rise		
	8. Sorghum		
	9. Triticale		
	10. Other grain cereals		
		Hectares	Ares
B. LEGUMES ( ) Yes (X) No	11. Peas, broad beans, field beans and sweet lupins		
	12. Other dried legumes and protein crops		
		Hecares	Ares
C. ROOT CROPS (X) Yes ( ) No	13. Potatoes	10	22
	14. Sugar beets		

Source: The Italian census of agriculture – Year 2020

Once the first distribution has been completed, it is good to automatically compute the totals and submit them to the respondent for validation. When we are sure that the figures are correct, we can use them as reminders for further, more complex requests.

When completing longer distributions, the respondents should be provided with sums computed in real time, so that they can compare them against the reminders and promptly realize whether they are making any mistakes.

Figure 2 Automatically computed sums and reminders



A.11 THE UTILIZED AGRICULTURAL AREA IS 18,36 HECTARES. PLEASE, DIVIDE IT ACCORDING TO THE FOLLOWING TYPES OF TENURE:

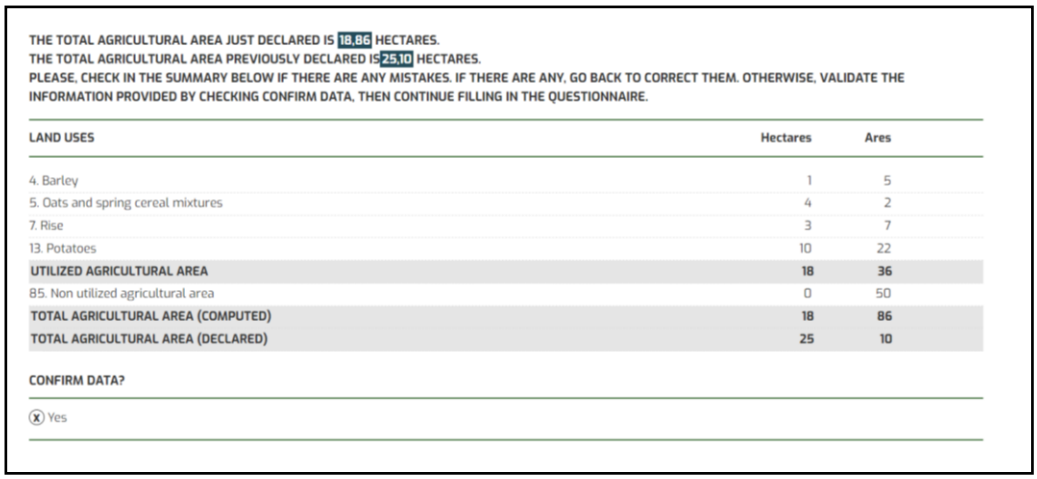
	Hectares	Ares
Ownership	1	0
Rental	3	36
Free use	5	0
UTILIZED AGRICULTURAL AREA	**9**	**36**

ACCORDING TO THE DATA ENTERED, THE UTILIZED AGRICULTURAL AREA IS 9,36 HECTARES. THE PREVIOUSLY DECLARED UTILIZED AGRICULTURAL AREA IS 18,36 HECTARES.
PLEASE, CORRECT ANY DATA YOU BELIEVE TO BE INCORRECT.

Source: The Italian census of agriculture – Year 2020

Sometimes the classifications are quite long, as in the case of the Agricultural census, and the respondents are expected to complete very complex tables. Most frequently, very few fields are filled in, with the majority left empty. This can result in the respondents scrolling forward and backward multiple times, trying to figure out where they went wrong and not being able to fix the mistakes. To support this process, it is useful to show summary screens, where all the responses provided are displayed. In the Agricultural census the average number of land uses per farm was 2.3. Thus, the summary screen is a good solution to ease the task of searching for the point where the incorrect information was entered.

Figure 3 Example of summary screen



THE TOTAL AGRICULTURAL AREA JUST DECLARED IS 18,86 HECTARES.
THE TOTAL AGRICULTURAL AREA PREVIOUSLY DECLARED IS 25,10 HECTARES.
PLEASE, CHECK IN THE SUMMARY BELOW IF THERE ARE ANY MISTAKES. IF THERE ARE ANY, GO BACK TO CORRECT THEM. OTHERWISE, VALIDATE THE INFORMATION PROVIDED BY CHECKING CONFIRM DATA, THEN CONTINUE FILLING IN THE QUESTIONNAIRE.

LAND USES	Hectares	Ares
4. Barley	1	5
5. Oats and spring cereal mixtures	4	2
7. Rise	3	7
13. Potatoes	10	22
UTILIZED AGRICULTURAL AREA	**18**	**36**
85. Non utilized agricultural area	0	50
TOTAL AGRICULTURAL AREA (COMPUTED)	**18**	**86**
TOTAL AGRICULTURAL AREA (DECLARED)	**25**	**10**

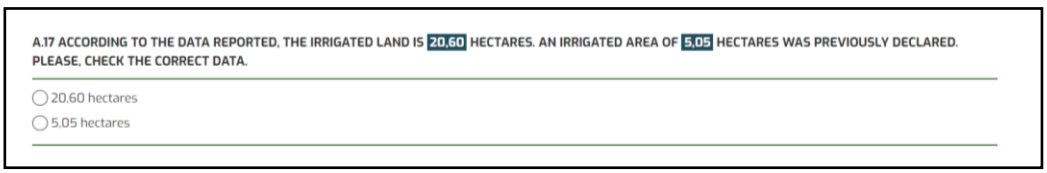
CONFIRM DATA?

(x) Yes

Source: The Italian census of agriculture – Year 2020

Sometimes the figures do not add up despite all these supportive measures. As a last resort, reconciliation questions can be visualized, inconsistent data shown, and respondents asked to decide which should be considered correct. The option selected is taken as a reminder for the following questions.

Figure 4 Reconciliation questions



A.17 ACCORDING TO THE DATA REPORTED, THE IRRIGATED LAND IS 20,60 HECTARES. AN IRRIGATED AREA OF 5,05 HECTARES WAS PREVIOUSLY DECLARED. PLEASE, CHECK THE CORRECT DATA.

( ) 20.60 hectares
( ) 5.05 hectares

Source: The Italian census of agriculture – Year 2020

3. Conclusions

All these methods provide feedback on the questionnaire completion process and consequently shed light on any sources of response error. It is the questionnaire designer's responsibility to detect problems and look for solutions. To achieve this aim, we can apply different methods, encompassing mouse and eye tracking.

Paying attention to question content, wording and format helps to maximize accuracy in the information collected through the prevention, detection and correction of inconsistencies and the reduction of the response burden. *"Each questionnaire is also unique, an original. A designer must cut and try, see how it looks and sounds, see how people react to it, and then cut again, and try again"* (Converse and Presser 1986).

Unfortunately, a number of constraints often hinder this process. Sometimes the need to compare data across time does not allow for any changes, even when a possible solution is available. In other cases computer assisted techniques represent an obstacle due to software limitations. Regulations often impose strict indications but many times the questionnaire is not improved simply because of a resistance to change.

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