Using audit trails to monitor respondent behaviour in an Audio-CASI questionnaire

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1. Introduction

From November 2005 to January 2006, Insee and Drees (Department of Health) have conducted the *Événements de Vie et Santé* (EVS) survey under CAPI. After a face-to-face interview dealing with relationships between tragic events of life (death or suicides of close relations, violences, ...) and health, respondents had to answer a brief ACASI[1] questionnaire gathering the most sensitive questions: sexual activity, alcohol and drug use.

We have collected audit trail information for around 9000 complete surveys, which enabled us to consider a statistical study on this data. As it was our first ACASI experience, we chose to focus on the ACASI part to monitor respondent behaviour facing this tool, and try to improve data collection methodology.

This paper will explain how we processed the adt files and present the main results we obtained on the following issues:

- What is the average time spent by the respondent before giving an answer?
- Do respondents replay questions? Do they review or correct their answers?
- Who are the people who give up the ACASI questionnaire before the end?

All aspects will be discussed from the respondent's point of view (age, sex, nationality, academic level) and from the questionnaire's point of view (open/closed-ended questions, questions about dates/facts/feelings ...).

Besides, this paper aims at suggesting concepts for describing respondent behaviour. Perhaps more than the results on our survey, this may give ideas to anyone who would analyse an audit trail file and extract indicators from it. Every definition we suggest here can certainly be improved!

2. Blaise[2] options for the ACASI

During the first test, the "Stop on key" option was not checked, because survey managers were afraid that people would not listen to the whole question, as question text was always written on screen[3]. The ACASI questionnaire was far too long and respondents complained a lot for having to wait for the end of the question file. So for the real survey, the "Stop on key" option was chosen, and "Auto play" too. A yellow sticker was stuck on the "F11" key, in order to help people to use the replay function. Each question was followed by the instruction: "If you need to hear the question again, please press the yellow key". As Insee always uses the "Auto enter" option, this concerned the ACASI part too.

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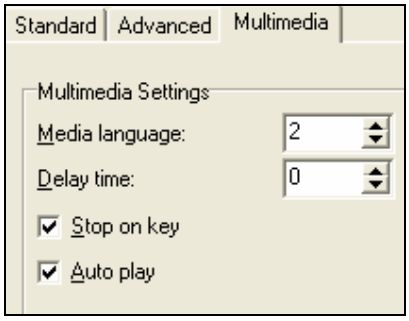
[1] Audio Computer Assisted Self-Interview
[2] The EVS survey used Blaise 4.6
[3] In order to increase confidentiality, the ACASI questionnaire of the *Cadre de Vie et Sécurité* survey (2007) makes it possible to hide question texts. In this case, we can imagine that it is harder to answer before the end of the question file...

Figure 1. Blaise multimedia options used for the EVS survey



Besides, to prevent interviewers from being able to read answers given in the ACASI part and thus increase confidentiality for respondents, a locking system was implemented. At the end of the ACASI questionnaire, a locking block was put on the route (and also declared as a parallel block in case of interruption before the end): it asked respondents if they wanted to lock their answers for good and prevent anyone (including regional survey administrators) from reading them. As this question was used as a filter question for the ACASI questionnaire, it became unreachable as soon as the "Yes" answer was chosen.

3. Audit trail files processing

Audit trail files (.adt) are text files recording the sequence of screen and fields visited during a Blaise interview. Every time a field is entered or left, or a specific action is performed, a record containing a time stamp, the current name, value and state of the field is created.

At the moment, Insee does not use adt files for real surveys, but only for tests, on small samples. The EVS survey was an exception, and remains the only one where we have collected so many adt files: 523, one for each interviewer. They contain 9139 forms including at least one variable on the ACASI questionnaire.

As many organisations did, in order to make statistical analysis easier, we had to transform this huge amount of data into a more structured format. We have thus converted the adt files in SAS datasets including, among others, for each line:

- date
- time
- the form's primary key
- the name of the field considered
- its current value

Figure 2. Example of SAS dataset created from an adt file

	Date	Heure	Etat	Identif	Nom	Statut	Valeur	Cause	Action	Comm
3238	16/11/2005	11:41:30	FinChp	21606	VIOLSANT.CONCLUSION.MERCI	NORMAL	1	INPUTLINE FULL		
3239	16/11/2005	11:41:30	EntChp	21606	VIOLSANT.EVSAA.QAA1.AACSRSAG	NORMAL				
3240	16/11/2005	11:41:49	FinChp	21606	VIOLSANT.EVSAA.QAA1.AACSRSAG	NORMAL	23	INPUTLINE FULL		
3241	16/11/2005	11:41:50	EntChp	21606	VIOLSANT.EVSAA.QAA1.AACSNBP	NORMAL				
3242	16/11/2005	11:42:09	FinChp	21606	VIOLSANT.EVSAA.QAA1.AACSNBP	NORMAL	1	NEXT FIELD		
3243	16/11/2005	11:42:09	EntChp	21606	VIOLSANT.EVSAA.QAA1.AACSSXP	NORMAL				
3244	16/11/2005	11:42:16	FinChp	21606	VIOLSANT.EVSAA.QAA1.AACSSXP	NORMAL	1	INPUTLINE FULL		
3245	16/11/2005	11:42:16	EntChp	21606	VIOLSANT.EVSAA.QAA1.AACSPACT	NORMAL				
3246	16/11/2005	11:42:27	FinChp	21606	VIOLSANT.EVSAA.QAA1.AACSPACT	NORMAL	1	INPUTLINE FULL		
3247	16/11/2005	11:42:27	EntChp	21606	VIOLSANT.EVSAA.QAA1.AACSMST	NORMAL				
3248	16/11/2005	11:42:52	FinChp	21606	VIOLSANT.EVSAA.QAA1.AACSMST	NORMAL	2	INPUTLINE FULL		
3249	16/11/2005	11:42:52	EntChp	21606	VIOLSANT.EVSAA.QAA1.AACSPILL	NORMAL				
3250	16/11/2005	11:43:06	FinChp	21606	VIOLSANT.EVSAA.QAA1.AACSPILL	NORMAL	2	INPUTLINE FULL		
3251	16/11/2005	11:43:06	EntChp	21606	VIOLSANT.EVSAA.QAA1.AACSIVG	NORMAL				
3252	16/11/2005	11:43:11	FinChp	21606	VIOLSANT.EVSAA.QAA1.AACSIVG	NORMAL	2	INPUTLINE FULL		
3253	16/11/2005	11:43:11	EntChp	21606	VIOLSANT.EVSAA.QAA1.AACSTES	NORMAL				
3254	16/11/2005	11:43:20	FinChp	21606	VIOLSANT.EVSAA.QAA1.AACSTES	NORMAL	1	INPUTLINE FULL		
3255	16/11/2005	11:43:20	EntChp	21606	VIOLSANT.EVSAA.QAA1.AACSDTES	NORMAL				
3256	16/11/2005	11:44:18	Action	21606	VIOLSANT.EVSAA.QAA1.AACSDTES				REMARK CLICKED	Field:V
3257	16/11/2005	11:44:44	Action	21606	VIOLSANT.EVSAA.QAA1.AACSDTES				REMARK CHANGED	Field:V
3258	16/11/2005	11:44:52	FinChp	21606	VIOLSANT.EVSAA.QAA1.AACSDTES	NORMAL	1980	INPUTLINE FULL		
3259	16/11/2005	11:44:52	EntChp	21606	VIOLSANT.EVSAA.QAA1.AACSOCT	NORMAL				
3260	16/11/2005	11:45:31	FinChp	21606	VIOLSANT.EVSAA.QAA1.AACSOCT	NORMAL	6	INPUTLINE FULL		
3261	16/11/2005	11:45:31	EntChp	21606	VIOLSANT.EVSAA.QAA1.AACSREST	NORMAL				
3262	16/11/2005	11:46:03	FinChp	21606	VIOLSANT.EVSAA.QAA1.AACSREST	NORMAL	1	INPUTLINE FULL		
3263	16/11/2005	11:46:03	EntChp	21606	VIOLSANT.EVSAA.QAA2.AAINTRO1	NORMAL				
3264	16/11/2005	11:46:49	FinChp	21606	VIOLSANT.EVSAA.QAA2.AAINTRO1	NORMAL	5	INPUTLINE FULL		
3265	16/11/2005	11:46:50	EntChp	21606	VIOLSANT.EVSAA.QAA2.AAAL12M	NORMAL				
3266	16/11/2005	11:47:03	FinChp	21606	VIOLSANT.EVSAA.QAA2.AAAL12M	NORMAL	2	INPUTLINE FULL		
3267	16/11/2005	11:47:03	EntChp	21606	VIOLSANT.EVSAA.QAA2.AAALSOUV	NORMAL				

After having summarised information regarding each field of each form on the same line (number of times, duration of each time where the field was accessed ...), we obtain one file of 209,364 observations. Our first goal was to study duration on each field, and we chose to focus on the *passage1* variable, which represents duration of the first time spent on the field (not necessarily the longest one, that would have been another possible option). We noticed odd values (up to 2 hours and a half on the same question!), so with the help of the graphical distribution of the *passage1* variable, we chose to exclude durations longer than 360 seconds, which finally gave us 209,333 observations.

4. The respondents behaviour facing the ACASI questionnaire

In each sampled household, one person was drawn to be respondent for the individual face-to-face interview, and then for the ACASI questionnaire at the end. The person drawn was the one who had the nearest following birthday (from the interview date) among the 18-75 years old. Theoretically, this kish method guarantees an equal repartition of men and women and of age groups. Besides, proxy was not authorised: the kish had to answer in person. In order to have results depending on kish characteristics, age, sex, nationality and academic level of the 8893 individuals who had read at least two questions[4] of the ACASI questionnaire were transfered from the adt file to the SAS database.

[4] A lot of cases where only one question was read may correspond to a demo made by the interviewer and can be considered as unit non-response.

Then, in order to discuss each issue from the questionnaire's point of view, we have defined the following two groups for each question of the ACASI questionnaire:

- Form (based on technical criteria):

  - **Closed-ended**: the variable has an enumerated type, from the basic Yes/No type up to nine choices.

  - **Open-ended**: in this case, Blaise integer type. This makes a slight difference with the usual definition of "open-ended" which implies an open zone where free text can be typed. For example, we consider the question "During your whole life, how many sex partners did you have?" as open-ended even if the authorised range for answers is in fact limited (1..99).

This distinction makes a real difference for the respondents: with the "Auto enter" option, Blaise goes automatically to the next question when a valid answer is entered, but for open-ended questions, if the respondent enters an answer that does not fill the entire field (just like "3" if the variable type is "1..99"), he needs to press the "Enter" key himself to validate his answer.

- Content (kind of information the questions ask for):

  - **Facts**: question asking for objective realities

    Ex: "During your whole life, have you ever drunk alcohol?"

  - **Feelings**: more subjective question, open to interpretation

    Ex: "During your whole life, did you ever feel that you should reduce your alcohol consuption?"

  - **Numbers**: objective question, to be answered with a number (except dates)

    Ex: "How many glasses of alcohol did you drink last sunday?"

  - **Dates**: objective question, to be answered with a date, an age, or asking if an event happened during a well-defined period

    Ex1: "How old were you when you smoke cannabis for the first time?"
    Ex2: "Did it happen during the last twelve months?"

4.1. Duration on each field

On average, the ACASI questionnaire followed nearly 68 minutes of face-to-face interview, which was already longer than usual. Most of the time, Insee, in order to ease the interviewers' work, to reduce the response burden and to increase data quality, tries to limit interview time to one hour. In that context, interview time is a permanent concern for a survey manager. In an ACASI questionnaire, it of course depends on the number of questions, but also on the time spent on each question: adt files give us very accurate information on this subject.

With the Blaise options used here, respondents were able to answer before the end of the audio file reading the question: this happens indeed more than 7 times out of 10. So the duration measured on each question with the help of the adt file can be in fact

considered as the sum of three more or less distinct stages: listening and/or reading (and understanding) the question, looking for the answer, typing the answer. The duration of the question file can be used as a reference for measuring the "length" of each question, as every file was recorded by the same voice, of someone speaking very clearly. As we can easily imagine, this contributes a lot to the response time (see model below): a long question takes more time to be understood and answered than a shorter one...

Table 1. Mean response time by question and mean number of questions answered for each part of the ACASI questionnaire

	Mean number of questions answered	Mean response time by question	Field	Mean duration of audio files
ACASI questionnaire	23.3	15.1 s	Respondents to at least 2 questions of the ACASI questionnaire	19.9 s
sex part	10.0	17.5 s	Respondents to at least 1 question of the considered part among those above	23.1 s
alcohol part	10.0	14.1 s		17.9 s
drugs part	3.7	10.8 s		16.5 s

The average response time by question is 15.1 s, median is 12 s and third quartile is 19 s. Drugs part gathered 23 of the 62 questions of the ACASI questionnaire, but most of the questions concerned only those who declared having consumed cannabis or other drugs, which explains the very low mean number of questions answered. Response time increases with age, decreases with academic level, is higher for men, for foreigners[5] and for open-ended questions.

We have built a logistic model to see how the factors listed below explain the chance to be in the higher quartile of the response time distribution (more than 19 s), and to try to distinguish the different effects. In order to limit the selection bias due to filters based on age and gender of the respondent (giving thus specific populations of respondents to filtered questions), we only kept the 34 unfiltered questions for the model. This excluded in particular the drug part of the analysis because it concerned only the 18-64 year olds. In spite of this precaution, model results have to be interpreted cautiously because there may remain bias due to the internal filters of the questionnaire: if a filter question is strongly explanatory for the response time, this could upset the model. Introducing these filter questions in the model could be a solution, but the questionnaire we are working on is very complicated, so in order to keep the model readable, we will admit this simplification here.

This model underlines two very strong effects: the duration of the sound file and the form of the question have a decisive influence on the response time. For the length of the question, it was obvious. For the open-ended questions, we can suggest two explanations: first, with equal sound file durations, a closed-ended question is answered more quickly because the respondent answers as soon as he hears the right proposition for him (let's recall here that all answers were read in the sound file for categorical variables); secondly, an open-ended question requires more thinking and more typing (and even sometimes manual validation as we said before). All other effects are significant too (p-values < 0,0001).

[5] The ACASI questionnaire was only in French for the EVS survey

Table 2. Characteristics affecting the chance to get a long response time for a question

Characteristics		%	Difference with the reference situation (point)	Odd Ratio
Respondents	18-24 years old	20.0	-1.0	0.8
	25-34 years old	21.5	-0.9	0.9
	45-54 years old	27.7	+1.2	1.2
	55-64 years old	29.9	+2.2	1.4
	65-75 years old	32.5	+3.0	1.5
	No qualification	32.6	+1.2	1.2
	CEP (Primary education certificate)	33.2	+0.9	1.1
	Brevet (Year 10 / Ninth grade)	26.8	-0.8	0.9
	Bac. tec. (Technological baccalaureate)	23.5	-1.4	0.8
	Bac. gen. (General baccalaureate)	21.6	-2.3	0.6
	Bac + 2 (2 years after baccalaureate)	21.8	-2.2	0.6
	Bac > 2 (more than 2 years after baccalaureate)	20.3	-2.8	0.5
	Foreigner	31.8	+2.0	1.3
	Naturalised French	30.1	+1.4	1.2
	Male	27.8	+1.2	1.2
Questions	Sound file ≥ 20 s	46.7	+41.8	13.5
	Form: open-ended	42.6	+51.0	19.5
	Content: dates	25.7	-4.1	0.4
	Content: numbers	43.7	-3.1	0.5
	Content: feelings	2.4	-2.9	0.5
	Alcohol part	16.8	-2.6	0.6
Whole population		26.4	-	-
Reference situation		6.5	0	1

- Independent variables: age, higher diploma, duration of the sound file, question form, nationality, question content, part of the questionnaire, gender.
- Reference situation: a closed-ended question, asking for facts, belonging to sexuality part of the questionnaire, read by a sound file lasting less than 19 s, answered by a woman, aged between 35 and 44, native French, having a vocational training certificate or a vocational diploma.
- Field: unfiltered questions, belonging to ACASI questionnaires where at least 2 questions were read, and where every independant variable of the model is known, which makes 158 752 questions.
- Interpretation: 20.0% of the questions read by the 18-24 year olds have a response time in the upper quartile (more than 19 seconds); belonging to this age group makes the value decrease by 1.0 point (or multiplies by 0.8 the chance of having a response time exceeding 19 seconds) compared to the reference situation, all other characteristics being equal (statistically significant at 5%).

4.2. Replay, review and correct

The respondent's ability to use the Blaise tool was an important concern for EVS survey managers. They had no idea of how people who had never used a computer during their whole life would react to this tool. First tests were quite encouraging, and interviewers were even able to convince people who began by refusing the ACASI questionnaire. They used to stay nearby while the respondent was answering the ACASI questionnaire, which enabled them to help if necessary. Adt files give us

here the opportunity to see how respondents have used the Blaise tool. We will define the three following concepts to describe the respondent behaviour.

- Someone **replays** a question file when:
  - we have a "Mediastart" action in the adt file,
  - this action occurs at least 2 seconds after the previous one when several are recorded in a row.

Actually, we sometimes have dozens of mediastart actions recorded in the same second. This may correspond to continuous pressures on the F11 key. We could have kept only one mediastart action for each time the respondent is on the variable, but we think that repeated mediastart actions are significant, so we chose the above definition.

- Someone **reviews** an answer when:
  - the field has already a value when it is entered,
  - at least 1 second is spent on the field,
  - the field has always the same value when it is left.

This may happen because of the "Auto enter" option: as soon as a valid value is entered on a field, Blaise goes automatically to the next field on the route. If you want to verify your previous answer, you need either to look at the formpane (but who knows except the professional interviewers?) if it is still visible, or to jump back to the previous question: this is the phenomenon we are measuring here. The 1 second criterion was added to eliminate the variables you will find "on your road" leading to the question you really want to reread.

- Someone **corrects** an answer when:
  - the field has already a value when it is entered,
  - the field has a different value when it is left.

This may correspond either to a mistype, or to a regret on a given answer.

First important result: in nearly 60% of the forms, neither of the three phenomena can be found. This means that in those 60% of forms, the ACASI questionnaire is filled without any replay or jump back. On the opposite, we have 3% of forms cumulating the three. At the form level, replaying at least one question is observed in 24.5% of the cases, reviewing in 16.9% and correcting in 15.4% of the cases. Reviewing at least one question and correcting at least one question are strongly linked phenomena: both require the same ability to use arrow keys from the respondent.

In order to analyze these phenomena at the field level, we will define the following indicators for each variable:

$$\text{Replaying intensity} = \frac{\text{Number of replays of the sound file associated with the variable}}{\text{Number of ACASI forms where the variable is read at least once}} \times 100$$

$$\text{Reviewing intensity} = \frac{\text{Number of variable reviews}}{\text{Number of ACASI forms where the variable is read at least once}} \times 100$$

$$\text{Correcting intensity} = \frac{\text{Number of variable corrections}}{\text{Number of ACASI forms where the variable is read at least once}} \times 100$$

The mean replaying intensity is 2.1, reviewing intensity is 3.6 and correcting intensity is 1.0. They vary a lot from one question to another, revealing interesting effects due to the questionnaire design. We will not discuss these results further here because we would need to include the whole questionnaire to show relevant examples. We can just notice that correction intensity is very interesting to study for very sensitive questions such as drug consumption questions: do respondents correct their first answers? If so, what kind of corrections are they doing?[6]

Besides, we have built three logistic models, with the same principles and same comments as the former one, in order to explain the chances of having at least one replay, review or correction on a question. They show that higher age, lower academic level and foreign nationality tend to increase the three phenomena. Replays, reviews and corrections happen really more often on open-ended questions: does this mean that open-ended questions cause more difficulties to respondents? We tend to believe it...

4.3. The item non-answer issue

As all fields were programmed with the NOREFUSAL, NODONTKNOW and NOEMPTY Blaise attributes, item non-answer corresponds here with interrupted questionnaires. Obtaining the highest response rate as possible is always a major concern for survey managers, so we tried to know where in the questionnaire some respondents gave up and what characteristics may explain interruptions.

The interruption rate among questionnaires where at least 2 questions have been read (which excludes cases of “hidden” unit non-answer) is 2.2%. More than 3 interruptions out of 4 concern questionnaires where less than 4 questions were read: they happen at the very beginning of the questionnaire. This is quite comforting from the questionnaire design point of view, because it means there is no specific rejection linked with a question or a theme: the people who gave up would probably have done so anyway.

In order to determine the effects leading to a higher chance of interruption, we have built a logistic model including the respondent’s characteristics and the duration of the preceding face-to-face interview.

[6] For results on these subjects, see Bart (2007), « Analyse du comportement des répondants lors de la collecte du questionnaire auto-administré de l’enquête Evénements de Vie et Santé », *Mémoire FCDA*, ENSAI.

Table 3. Characteristics affecting the chance to have the ACASI questionnaire given up before the end

Characteristics	%	Difference with the reference situation (point)	Odd Ratio
55-64 years old	2.9	+ 0.9	2.2
65-75 years old	6.6	+ 2.7	4.8
No qualification	5.6	+ 1.2	2.6
CEP (Primary education certificate)	5.0	+ 0.7	2.0
Foreigner	6.5	+ 1.4	3.0
Whole population	2.2	-	-
Reference situation	0.7	0	1

- Independent variables: age, higher diploma, nationality, sex, duration of face-to-face interview.
- Reference situation: a woman, aged between 35 and 44, native French, having a vocational training certificate or a vocational diploma, who had a face-to-face interview duration in the 2nd quartile.
- Field: respondents to at least 2 questions of the ACASI questionnaire, with every independant variable of the model known, which makes 8893 individuals.
- Interpretation: among respondents aged between 55 and 64, 2.9% gave up the ACASI questionnaire before the end; belonging to this age group makes the value increase by 0.9 point (or multiplies by 2.2 the chance of having the ACASI questionnaire given up) compared to the reference situation, all other characteristics being equal (statistically significant at 5%).

We have three significant effects: ages over 55, low academic level and foreign nationality increase the non-response risk. This is especially true for the 65-75 year olds: they had a shorter questionnaire than others because the drug part was only for the 18-64, but belonging to this age group multiplies the risk by nearly 5 anyway. However, a 6.6% rate of interruption is not that bad, but the over 65 remains clearly a population to be considered with an extreme care for the ACASI questionnaires.

We did not have here the languages fluently understood by the respondent, but we may imagine that some of the foreign people had difficulties to understand French. That is indeed what the interviewers reported. Gender of the respondent and duration of the preceding face-to-face interview have no significant effect: interruptions do not seem to be due to weariness caused by an especially long face-to-face interview.

5. Conclusion

Adt information is able to tell a lot about respondent behaviour. The fact that all the phenomena we have described and measured here remain limited is in my opinion good news for data quality: it would have been quite worrying to see a lot of corrections or interruptions on a variable. The results we obtained here may help questionnaire designers in their constant quest to reduce data collection time, for example by privileging closed-ended questions. Two specific populations appear in every analysis: over-55 years old and foreign people. Technical solutions exist for helping both of them. For example, the *Cadre de Vie et Sécurité* survey includes now an ACASI questionnaire too, and several languages have been implemented under the Blaise tool (English, German, Arabic, Turkish, ...). For the over 55, nothing particular has been done yet, but we can imagine a specific design (larger font size?) that would perhaps help achieving a better response rate. ACASI technology is now recognized as very efficient for collecting sensitive data, so we will certainly

experiment with it again in the next years, and try to improve our programming methods on this specific aspect.

6. Acknowledgements

Many thanks to Jean-Yves Bart for his help in English translation.

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