

COOPERATION ON MULTI-MODE DATA COLLECTION (MMDC)

MIXED MODE DESIGNS FOR SOCIAL SURVEYS - MIMOD

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Mixed-mode strategies for social surveys: how to best combine data collection modes

WP1 - Deliverable 2

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WP1: Investigation of mode organisation (concurrent vs consecutive multi-mode data collection)

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Preface

WP1 of MIMOD project explores the current status of survey designs within the European Statistical System (ESS) and aims at providing suggestions for mixed-mode strategies in the near future. The “MIMOD Survey on the State of the art of mixed-mode”, carried out in 2018 among the European National Statistical Institutes (NSIs), was the main deliverable of WP1 and has been used in all other WPs. This second deliverable focuses on some main features of mixed-mode designs based on different mode administration – concurrent or sequential – in order to provide readers with elements useful for deciding which data collection strategy adopt. Besides, the deliverable concentrates on the choice of mode(s) in ESS surveys, by considering differentiation of mode allocation, also termed adaptive mixed-mode survey design.

The evidences described in this deliverable are derived from the experiences that European NSIs reported in the MIMOD Survey. The deliverable is structured in the following way: Section 1 deals with the experiences on mixed-mode designs in the ESS. Section 2 tries to delineate the decision making process of the various mixed-mode design, given aims and constrains. Section 3 contains three case studies as examples of some designs explored in section 2. Finally, section 4 provides a summary of results and some proposal for future developments on these topics.

Section 1 – Experiences of the European NSIs

1.1 Introduction

Section 1 provides an overview on the state of the art of the use of mixed-mode strategies based on sequential, concurrent and adaptive/responsive designs, used by the European NSIs for their social surveys. The main social surveys that are considered in this deliverable are:

- Labour Force Survey waves 1 and 2 (LFS wave 1 and wave 2)
- Survey on Income and Living Conditions waves 1 and 2 (EU-SILC wave 1 and wave 2)
- European Health Interview Survey (EHIS)
- Adult Education Survey (AES)
- Survey on Information and Communication Technology (ICT)
- Household Budget Survey (HBS)
- Harmonised European Time Use Survey (HETUS/TUS).

Findings reported in this section are based on the information collected through the MIMOD survey, run in May 2018, about some specific aspects of the mixed-mode strategies employed by the EU NSIs, such as: which modes are combined, which sequence of modes are used in sequential designs, whether modes can be chosen by respondents in case of concurrent designs or which auxiliary variables are exploited by the NSIs to assign modes to sample units notwithstanding the data collection design.

One of the results of the MIMOD survey (WP1 – Deliverable 1) is that mixed-mode strategies can be considered nowadays as the ‘standard’ approach to collect data in social surveys: all the EU NSIs, but one, (Romania) use them. Furthermore, their use has increased over the last five years (Table 1 and 2).

Table 1. The use of mixed-mode data collection strategies in the European context

	Absolute values
NSIs using mixed-mode strategies	30
NSIs not using mixed-mode strategies	1
Total countries	31

Table 2. The use of mixed-mode in social surveys in the last 5 years

	Absolute values	% values ¹
Mixed mode increased	22	71.0
Mixed-mode remained unchanged	8	25.8
Mixed-mode decreased ^(*)	1	3.2
Total countries	31	100

^(*)The Netherlands is the only country that declares a decreasing trend because "some surveys that were mixed mode 5 years ago are now web only".

Mixed-mode designs are adopted for about 50 % of the social surveys. However, the use of a single mode design is still high (40.5%). Multi-mode, which consists in the use of different data collection modes to administer different sections of a questionnaire to the same respondent, is used in about 8% of the social surveys in the EU. It must be said that some NSIs do not conduct some of the social surveys investigated (Table 3).

Table 3. Data collection strategies in social surveys: mixed-mode, single mode and multi-mode

	% values ^(*)
Mixed-mode	50.2
- Mix of modes and sources	10.0
- Mix of only data collection techniques	40.2
Single mode	40.5
Multi-mode	7.9
Surveys not done ^(**)	1.4
Total	100

^(*) Calculated on surveys.

^(**) Iceland does not run AES and HEIS; Switzerland does not run EHIS and HETUS.

Note that 40.2% of the social surveys are a combination of data collection techniques only. In the following, the analyses will be based on this sub-group of surveys, that from this point on will be labelled as mixed-mode surveys

Mixed-mode designs are mainly based on a concurrent approach (51%), meaning that all modes in the mix are in the field at the same time. The use of a sequential administration of modes equals 15% of the total

surveys; partly sequential-partly concurrent designs are also frequent, being used by one NSI out of three (34.0%)¹ (Table 4).

Table 4. Concurrent and sequential mixed-mode designs

	Percent values ^(*)
Concurrent mixed-mode designs	51.0
Partly sequential, partly concurrent mixed-mode designs	34.0
Sequential mixed-mode designs	15.0
Total	100

^(*) Calculated on mixed-mode surveys

The higher use of mixed-mode compared to single mode and the higher prevalence of concurrent designs, can be also observed by disaggregating data collected per survey for the 31 NSIs (Tables 5 and 6).

Anyway, Table 5 also shows that for EHIS, AES and HETUS data collection strategies based on a single technique are the preferred ones and that for HBS and HETUS the multi-mode approach is largely adopted. As to the concurrent designs, they are largely used for LFS wave 2 and EU-SILC wave 1 (20 % points more than the average value, Table 6).

Table 5. Mixed-mode versus single mode per survey

Surveys	Absolute values					% values ^(*)				
	Mixed mode/sources*	Single mode	Multi-mode	Survey not done	Total countries	Mixed mode/sources	Single mode	Multi-mode	Survey not done	Total countries
LFS w1	18 (11)	13			31	58.1	41.9			100
LFS w2	23 (18)	7	1		31	74.2	22.6	3.2		100
EU SILC w1	19 (11)	12			31	61.3	38.7			100
EU SILC w2	20 (15)	11			31	64.5	35.5			100
EHIS	12 (12)	16	2	1	31	38.7	51.6	6.5	3.2	100
AES	14 (13)	15	1	1	31	45.2	48.4	3.2	3.2	100
ICT	18 (17)	12	1		31	58.1	38.7	3.2		100
HBS	13 (12)	9	9		31	42.0	29.0	29.0		100
HETUS/TUS	3 (3)	18	8	2	31	9.7	58.1	25.8	6.5	100

* In brackets are reported countries adopting mix of data collection techniques only

¹ Data refer to surveys using a mix of techniques and not of data sources or Registers (this means that, for example, surveys using a mix like 'CATI-Registers' are not considered).

Table 6. Concurrent versus sequential mixed-mode designs per survey

	Absolute values				Percent values			
	Concurrent mixed-mode	Partly sequential, partly concurrent	Sequential mixed-mode	Total per countries	Concurrent mixed-mode	Partly sequential, partly concurrent	Sequential mixed-mode	Total per countries
LFS wave 1	4	6	1	11	36.4	54.5	9.1	100
LFS wave 2	13	4	1	18	72.2	22.2	5.6	100
EU-SILC wave 1	8	2	1	11	72.7	18.2	9.1	100
EU-SILC wave 2	9	5	1	15	60.0	33.3	6.7	100
EHIS	5	4	3	12	41.7	33.3	25.0	100
AES	3	7	3	13	23.1	53.8	23.1	100
ICT	6	6	5	17	35.3	35.3	29.4	100
HBS	7	4	1	12	58.4	33.3	8.3	100
HETUS/TUS	2	0	1	3	66.7	0.0	33.3	100
Total surveys	57	38	17	112	51.0	34.0	15.0	100

An important feature of mixed-mode designs is the respondent's choice of the data collection mode: giving respondents a choice may be a good strategy as it may create goodwill and reduce costs (De Leeuw, 2005). The findings of the MIMOD survey (Table 7) are that 45.5 % of mixed-mode surveys allow respondents' mode choice, while 40.2 % assign modes to sample units and 14.3 % give the possibility to choose the mode only under certain conditions.

Table 7. Respondents' chance to choose the mode, by survey

Survey	Absolute values				Percent values			
	Mode chosen by respondents				Mode chosen by respondents			
	Yes	Only under certain conditions	No	Total per countries	Yes	Only under certain conditions	No	Total per countries
LFS wave 1	5	1	5	11	45.5	9.1	45.5	100.0
LFS wave 2	9	3	6	18	50.0	16.7	33.3	100.0
EU-SILC wave 1	4	1	6	11	36.4	9.1	54.5	100.0
EU-SILC wave 2	8	2	5	15	53.4	13.3	33.3	100.0
EHIS	7	2	3	12	58.3	16.7	25.0	100.0
AES	6	1	6	13	46.2	7.7	46.2	100.0
ICT	7	5	5	17	41.2	29.4	29.4	100.0
HBS	5	1	6	12	41.7	8.3	50.0	100.0
HETUS/TUS	0	0	3	3	0.0	0.0	100.0	100.0
Total surveys	51	16	45	112	45.5	14.3	40.2	100.0

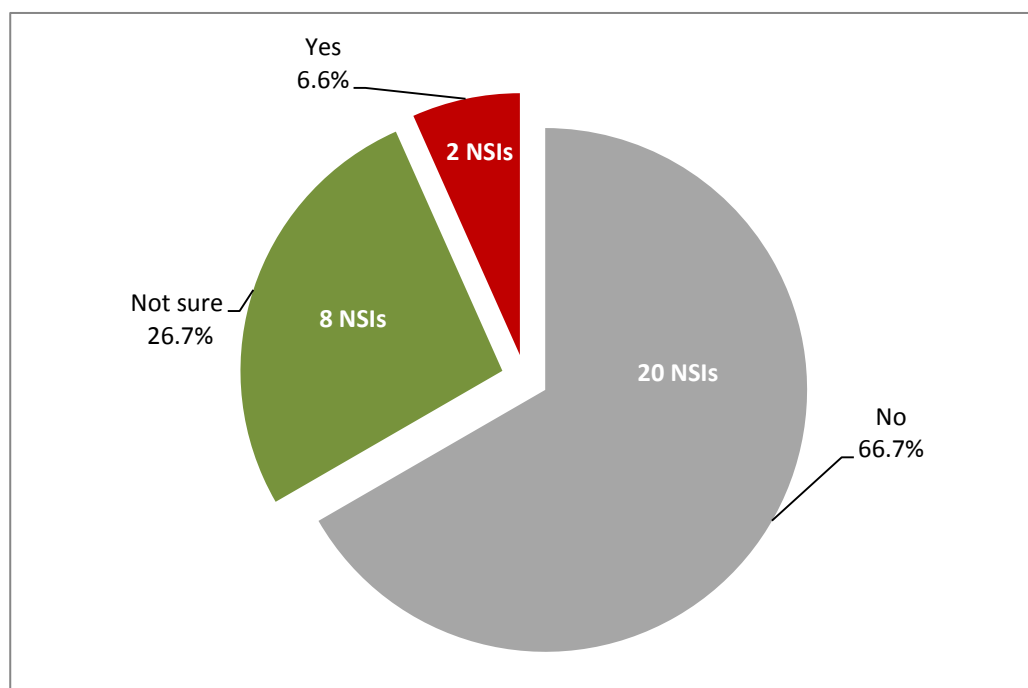
For these surveys, the EU NSIs combine modes in many different ways. Generally, combinations are made of two data collection techniques. The most frequently used are: CAPI-PAPI and CAPI-CATI. Largely adopted are also the 'mixes' CATI-CAWI, CAPI-CAWI and CAPI-CATI-CAWI (Table 8).

Table 8. Combinations of modes in mixed-mode data collection designs

	Absolute values	% values
CAPI-PAPI	20	17.9
CAPI-CATI	20	17.9
CATI-CAWI	18	16.1
CAPI-CAWI	16	14.3
CATI-CAPI-CAWI	17	15.2
PAPI-CAWI	6	5.4
CATI-PAPI	6	5.4
CATI-CAPI-PAPI	5	4.5
CAPI-PAPI-CAWI	3	2.7
CATI-PAPI-CAWI	1	0.9
Total mixed-mode combinations	112	100

The above combinations of modes can be administered sequentially or concurrently or by using both types of designs, through a partly sequential-partly concurrent strategy. For each design, data collection modes can be assigned to respondents or respondents can choose the mode they prefer. All these features are described in detail in the following chapter (1.2).

Concerning adaptive mixed-mode designs, the result of the MIMOD survey is that they are used by two countries only (Portugal and The Netherlands) and eight other countries declared they were not so sure whether their data collection designs could be ‘adaptive’ or ‘responsive’ (Figure 1).

Figure 1. The use of adaptive/responsive design in ESS surveys

Due to the difficulty of this topic, it was decided to further investigate it by contacting these eight countries through telephone interviews or by email. Results are reported in chapter 1.3.

The MIMOD survey investigated also the use of incentives for mixed-mode social surveys as a way to encourage respondents' participation. Nearly half of the countries (14 out of 31) use incentives that typically come in two main forms: monetary and non-monetary. Whatever the form, incentives are a good way not only to increase response rates, but also to thank respondents for their time. Table 9 shows the number of NSIs giving an incentive for each survey. It is interesting to notice that more incentives are given for HBS (8 countries out of 14), followed by AES (7 countries out of 13) and EU-SILC wave 2 (7 countries out of 15). For HETUS/TUS all three NSIs running this survey with mixed-mode offer an incentive to respondents.

Table 9. The use of incentives by survey

Survey	Countries adopting mixed-mode		
	Offering an incentive	Total	% values
LFS wave 1	3	11	27.3
LFS wave 2 and subsequent ones	2	18	11.1
EU-SILC wave1	5	11	45.5
EU-SILC wave 2 and subsequent ones	7	15	46.7
EHIS	4	12	33.3
AES	7	13	53.9
ICT	4	17	23.5
HBS	8	14	57.1
HETUS/TUS	3	3	100.0

A more detailed analysis on how incentives can be employed to balance costs and effectiveness in reaching response rate, is described in paragraph 1.4. This paragraph also deals with some aspects of communication strategies, since they are a fundamental part of the survey process and are, in general, planned to be compliant with aims and constraints of the data collection design. Therefore, they will be analysed as a component/factor to be taken into account in the decision process to define the mixed-mode data collection strategy. A deeper analysis of communication strategies can be found in Deliverable 2 of WP4.

1.2 Mixed-mode strategies used in the ESS

This paragraph describes the mixed-mode strategies used by NSIs in terms of mode combinations, mode sequences, respondents' mode choice, and all those characteristics useful to understand the decision process of mixed-mode data collection designs.

As mentioned before, concurrent mixed-mode strategies are the most frequently used designs and will be explored in paragraph 1.2.1, while sequential designs, the less frequently adopted, are discussed in par. 1.2.3. Designs based on a mix of the two strategies, quite common among the EU NSIs, will be analysed in paragraph 1.2.2.

1.2.1 Concurrent mixed-mode data collection designs

Concurrent mixed-mode designs apply when different data collection modes are in the field at the same time. Modes can be assigned in advance to sub-groups of sample units or sample units can choose the mode they prefer.

The table below shows for which surveys this strategy is adopted by the European NSIs, how the choice of modes is managed and which type of fieldwork organisation each NSI implements.

Table 10. Features of concurrent mixed-mode strategy adopted by EU NSIs

Survey	Country	Data collection modes			Modes chosen by respondents (*)	Fieldwork: in-house, outsourced, partially in-house and partially outsourced
LFS wave 1	Greece	CAPI	PAPI		no	In-house
	Luxembourg	CATI	CAWI		yes	Partially
	Czech Republic	CAPI	PAPI		no	In-house
	Finland	CATI	CAPI		yuc	In-house
LFS wave 2	Slovenia	CATI	CAPI		No	In-house
	Luxembourg	CATI	CAWI		yes	Partially
	Portugal	CATI	CAPI		yes	In-house
	Belgium	CATI	CAWI		yes	In-house
	Lithuania	CATI	CAPI		no	In-house
	Croatia	CATI	CAPI		yes	In-house
	Hungary	CATI	CAPI		yes	Outsourced
	Germany	CATI	CAPI	PAPI	yes	In-house
	Ireland	CATI	CAPI		yes	In-house
	Czech Republic	CATI	CAPI	PAPI	yuc	In-house
	Estonia	CATI	CAPI		no	In-house
	United Kingdom	CATI	CAPI		yuc	In-house
	Italy	CATI	CAPI		no	Partially
EU-SILC wave 1	Greece	PAPI	CAWI		yes	In-house
	Hungary	CAPI	CAWI		yes	Partially
	Malta	CATI	CAPI		no	In-house
	The Netherlands	CATI	CAWI		no	In-house
	Switzerland	CATI	CAPI		yuc	Outsourced
	Czech Republic	CAPI	PAPI		no	In-house
	Latvia	CATI	CAPI		no	In-house
	Italy	CATI	CAPI		no	Outsourced
EU-SILC wave 2	Greece	PAPI	CAWI		yes	In-house
	Slovenia	CATI	CAPI		yes	In-house
	Hungary	CAPI	CAWI		yes	Partially
	Malta	CATI	CAPI		no	In-house
	Switzerland	CATI	CAPI		yuc	Outsourced
	Cyprus	CATI	CAPI		no	In-house
	Czech Republic	CAPI	PAPI		yes	In-house
	Bulgaria	CAPI	PAPI		no	In-house
	Italy	CATI	CAPI		no	Outsourced
EHIS	Luxembourg	PAPI	CAWI		yes	In-house
	Sweden	CATI	PAPI	CAWI	yes	In-house
	The Netherlands	CAPI	CAWI		no	In-house
	Czech Republic	CAPI	PAPI		no	In-house
	Estonia	CAPI	CAWI		yes	In-house

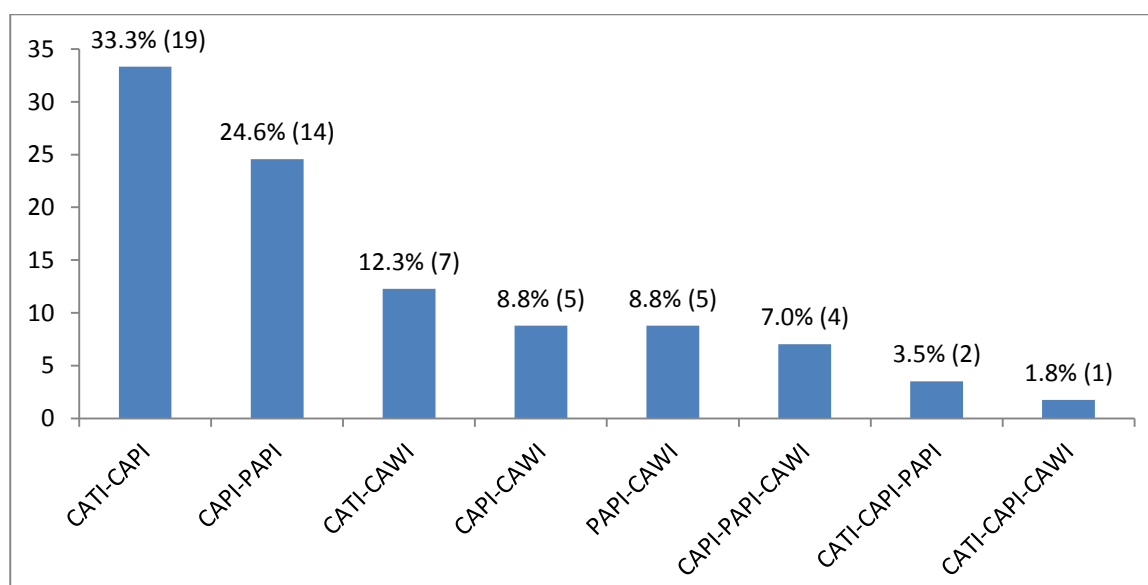
AES	Belgium	PAPI	CAWI		yes	In-house
	Hungary	CAPI	CAWI		yes	Partially
	Czech Republic	CAPI	PAPI		no	In-house
ICT	Portugal	CATI	CAPI	CAWI	yes	In-house
	Belgium	PAPI	CAWI		yes	In-house
	The Netherlands	CATI	CAWI		no	In-house
	Switzerland	CATI	CAWI		yes	Outsourced
	Czech Republic	CAPI	PAPI		yuc	In-house
	Estonia	CATI	CAWI		yes	In-house
HBS	Slovenia	CAPI	PAPI		no	In-house
	Belgium	CAPI	PAPI	CAWI	yes	In-house
	Lithuania	CAPI	PAPI		no	Outsourced
	Hungary	CAPI	PAPI	CAWI	yes	Partially
	Cyprus	CAPI	PAPI		no	In-house
	Czech Republic	CAPI	PAPI		no	In-house
	Poland	CAPI	PAPI	CAWI	yes	In-house
HETUS/TUS	Belgium	CAPI	PAPI		no	In-house
	Estonia	CAPI	PAPI		no	In-house
Total surveys 57						

(*) YUC: Yes, but under certain conditions.

Concurrent mixed-mode designs are characterised by a large variety of mode combinations. These, in general, involve two modes, with a high prevalence of CATI-CAPI (33%) and CAPI-PAPI (25%) (figure 2).

It is to be noted that in the entire deliverable the acronym PAPI refers both to PAP and PAPI, since in the MIMOD survey the questions about modes did not make a distinction between the two of them. Which of the two mode is used is sometimes understandable from the description of the data collection strategy.

Figure 2. Mode combinations used in concurrent mixed-mode designs - percentages (absolute values in brackets)



In concurrent designs, CAWI is used less frequently than CAPI, CATI or PAPI. Specifically, CAWI is mentioned in 22 designs out of 57 (39%), CAPI in 45 cases (79%), CATI in 29 cases (51%) and PAPI in 25 cases (44%). This is probably a consequence of the organisational complexity of the concurrent design: the presence of an interviewer allows to better manage the different modes available on the field at the same time, especially when respondents' mode choice is allowed.

The higher use of interviewer-assisted modes has an impact on costs, that could be contained in case the fieldwork is totally managed in-house. The fieldwork organization is, in fact, a further relevant aspect for these designs, both for the organization complexity and for costs. Most social surveys mixing modes concurrently are based on completely in-house solutions (76%) (Table 11).

Table 11. Fieldwork organisation for concurrent mixed-mode designs (in-house or outsourced)

Fieldwork organisation	Concurrent mixed-mode designs	
	Absolute values	% values
Completely In-house	43	76.0
Partially In-house and Partially Outsourced	7	12.0
Completely Outsourced	7	12.0
Total surveys	57	100

The choice of data collection modes: a respondents' choice or an NSI's decision?

In concurrent mixed-mode designs, the two strategies of mode choice, by respondents or by the NSI, are used with almost the same frequency, but with a slightly higher prevalence for the first one (Table 12). However, considering also when it is offered under certain conditions (for instance, if only non-respondents can choose the mode they prefer), the possibility to decide mode raises to 56.1 %. The choice of mode by respondents is harder to manage, but it is used to reduce response burden and encourage participation. On the other side, the decision of the NSI on which mode to assign is less complicated, but requires the availability of auxiliary information.

Table 12. Respondent's chance to choose the mode in concurrent mixed-mode designs

Mode chosen by respondents	Concurrent mixed-mode designs	
	Absolute values	% values
Yes	26	45.6
No	25	43.9
Yes, but under certain conditions (<i>e.g. from non-respondents or from response in previous waves</i>)	6	10.5
Total surveys	57	100

Mode combinations and mode choice are managed in different ways for the different surveys by the NSIs. A focus on the concurrent strategies used for the nine social surveys can be found in Annex 1. Hereafter, a summary of the main findings is reported.

Concurrent mixed-mode designs: summary

Mixing modes concurrently is a widespread strategy, being adopted by 51% of the main social surveys. Advantages of this design are a reduction of the duration of the survey, allowing better timeliness, and the possibility of increasing response rates by offering choice.

However, there is no clear evidence about improvement in response rates when respondents are given this choice (De Leeuw, 2005). Allowing respondents to choose how they complete may create an additional cognitive burden that functions to deter response and makes it more likely they won't complete the survey at all (Henning, 2013). The online-mail combination may be an exception, since when a paper questionnaire is offered together with an online link, most respondents use paper. When a link is provided and a paper questionnaire can be requested, then virtually no one applies for paper.

Concurrent designs ask for a more complex organization, since modes are on the field at the same time and everything must work in parallel and from the beginning of the data collection.

MIMOD findings show a large variety of designs made of different mode combinations. However, most concurrent strategies involve two modes: one survey out of three adopts CATI-CAPI (33%) and one out of four CAPI-PAPI (25%). Overall, CAWI appears to be less frequently used than interviewer-assisted modes, probably because concurrent designs take advantage from the presence of an interviewer for the management of different modes in the field.

Push to web strategies are often applied to promote CAWI participation in order to reduce costs. As an example, in Portugal for the ICT Survey, CAWI is offered to the entire sample and in the advance letter respondents are informed about the CAWI questionnaire, stressing the advantages of this mode and also all the support available through toll-free numbers and e-mails.

In order to meet individual preferences and reduce respondents' burden, it is common to allow mode choice (56% of concurrent mixed-mode surveys). This option, of course, complicates logistics and overhead. A good communication strategy is then fundamental to make a concurrent design work efficiently.

Three types of concurrent strategies based on respondents' choice are generally used by the EU NSIs:

- 1) Modes are on the field at the same time, but respondents cannot choose the mode since they are assigned a priori by the NSI according to some auxiliary variables: usually demographic information or the availability of phone numbers and email addresses, or respondents' preference towards some modes, coming from previous waves or survey editions. For multi-wave surveys, it is a common practice to ask respondents, at the end of first wave, for the preferred mode for future waves;
- 2) Modes are on the field at the same time and all respondents can choose all modes available from the beginning. It requires very well organised fieldwork and case management system;
- 3) Modes are on the field at the same time and are assigned in advance, but respondents can choose whether to accept it or to choose an alternative one. Generally, in order to meet respondents preferences, self-administered versus interviewer-assisted modes are offered (but a possible higher mode effect may come out).

Moreover, in some cases, the choice of mode is managed concurrently, but modes are administered sequentially. To do this, the choice of the preferred mode is proposed to sample units in the invitation letter where different, sequential, time periods of data collection with each mode are also announced. This can make survey organisation less complex.

The option to switch respondents to a different interview mode can raise planning problems. When the fieldwork is outsourced (entirely or partly), it is necessary to know in advance how many interviews will be realised with each technique. So, how to establish in advance the amount of interviews per mode in case some of them are interviewer-administered? Previous experiences or pilot studies can help in answering this question. This is the case for Luxembourg that reported that: “In order to estimate the number of CATI and CAWI interviews, before introducing the mixed-mode design, a pilot study was done. There, 50% of the persons used the CATI, and 50% the CAWI. In our contract with the external firm we kept the 50% as an upper limit for the CAWI interviews.”

Allowing respondents switching from one mode to another might also cause bias. This is especially true when the switch is from CAWI to CAPI because concentration in some geographical areas can occur and therefore should be kept under control.

A further relevant aspect in concurrent mixed-mode designs is the “IT system”. When there are electronic questionnaires for different modes (CAWI, CATI, CAPI), it is more convenient to develop them with the same software, in order to allow the possibility to move respondents from one subsample/mode to another. Furthermore, a completely in-house fieldwork facilitates the organisation and reduce costs (it is in fact adopted by 76% of concurrent surveys).

1.2.2 Partly sequential-partly concurrent mixed mode designs

“Partly sequential-partially concurrent” mixed-mode designs represent those strategies where the first data collection mode remains on the field when the second one(s) is (are) made available to respondents.

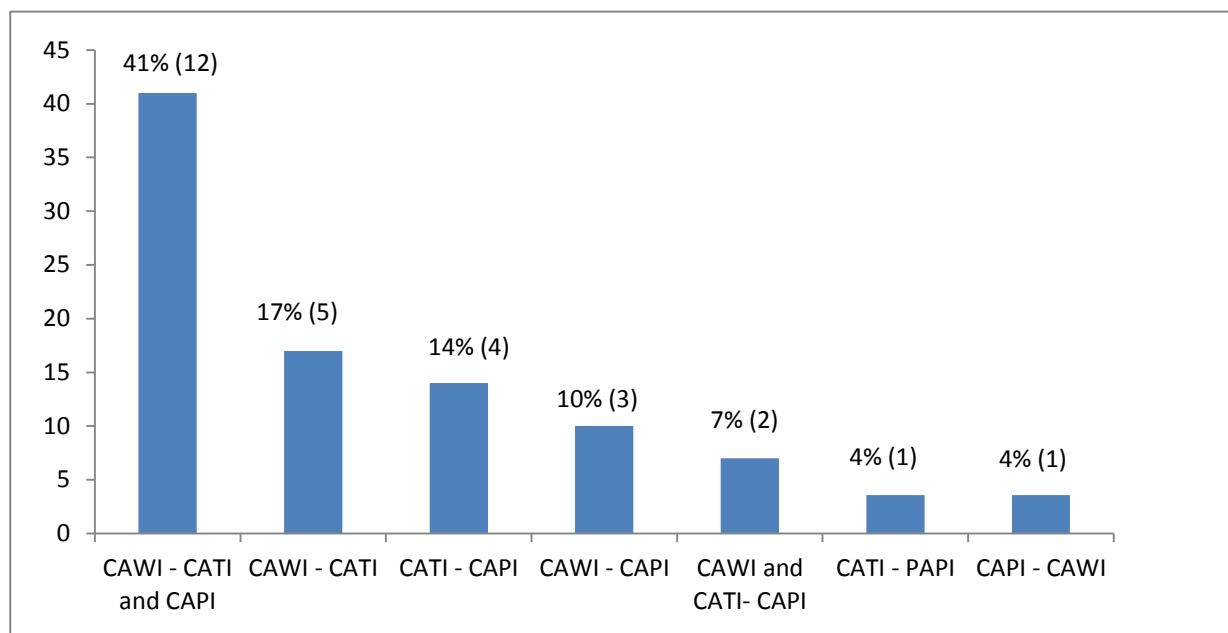
The table below shows for which surveys this design is adopted by the European NSIs, how the choice of modes is managed and which type of fieldwork organisation each NSI implements. The ‘Type of sequence’ column indicates if the same sequence of modes is used for all sample units or if different sequences are applied for different sample subgroups. In this latter case, which mode is used as first, second or third is not specified.

Table 13. Features of “partly sequential-partly concurrent” mixed-mode strategies adopted by EU NSIs

Survey	Country	Data collection modes	Sequence of modes			Type of sequence	Modes chosen by respondents (*)	Fieldwork: in-house, outsourced, partially in-house and partially outsourced
			1	2	3			
LFS1	Denmark	CAWI- CATI	CAWI	CATI		same	yes	Outsourced
	Latvia	CATI-CAPI	CATI and CAPI			same	yes	In-house
	Lithuania	CAWI-CATI-CAPI	CAWI	CATI and CAPI		same	yes	In-house
	The Netherlands	CAWI-CATI-CAPI	CAWI	CATI and CAPI		same	no	In-house
	Slovak Republic	CAPI-PAPI				different	no	In-house
	Germany	CAPI-CATI-PAPI	CAPI	PAPI and CATI		same	yes	In-house
LFS2	Austria	CATI-CAPI	CATI	CAPI		same	yuc	Partially
	Denmark	CAWI- CATI	CAWI	CATI		same	yes	Outsourced
	Latvia	CAWI-CATI-CAPI	CAWI	CATI and CAPI		same	yes	In-house
	Slovak Republic	CATI-CAPI-PAPI				different	no	In-house
EU-SILC 1	Lithuania	CAWI-CATI-CAPI	CAWI	CATI and CAPI		same	yes	In-house
	Denmark	CAWI-CATI	CAWI	CATI		same	yes	In-house
EU-SILC 2	Austria	CATI-CAPI	CATI	CAPI		same	yes	In-house
	Lithuania	CAWI-CATI-CAPI	CAWI	CATI and CAPI		same	yes	In-house
	Estonia	CAWI-CATI-CAPI	CAWI	CATI	CAPI	same	yuc	In-house
	Denmark	CAWI-CATI	CAWI	CATI		same	yes	In-house
	Latvia	CATI-CAPI-CAWI				different	yes	In-house
EHIS	Slovenia	CAWI-CAPI	CAWI	CAPI		same	yes	Partially
	Lithuania	CAWI-CAPI	CAWI	CAPI		same	yes	In-house
	Latvia	CATI- CAPI-CAWI	CAWI	CATI and CAPI		same	yes	In-house
	Austria	CAPI-CAWI				different	no	In-house
AES	Lithuania	CAWI-CAPI	CAWI	CATI and CAPI		same	yes	In-house
	Spain	CAWI-CATI- CAPI	CAWI and CATI	CAPI		same	yuc	Outsourced
	Estonia	CATI-CAPI	CATI	CAPI		same	yes	In-house
	Finland	CAWI-CAPI	CAWI	CAPI		same	yes	In-house
	Latvia	CAWI-CATI-CAPI	CAWI	CATI and CAPI		same	yes	In-house
	Norway	CAWI-CATI	CAWI	CATI		same	no	In-house
ICT	Lithuania	CAWI-CATI-CAPI	CAWI	CATI and CAPI		same	yes	In-house
	Croatia	CAWI-CATI-CAPI	CAWI	CATI and CAPI		same	yuc	In-house
	France	CAWI-CATI-PAPI	CAWI and CATI	PAPI		same	yuc	In-house
	Latvia	CAWI-CATI-CAPI	CAWI	CATI and CAPI		same	yes	In-house
	United Kingdom	CAPI-PAPI				different	no	In-house
	Slovak Republic	CAPI-PAPI				different	no	In-house
	Spain	CAWI-CATI-CAPI				different	yuc	In-house
	United Kingdom	CATI-CAPI				different	no	In-house
HBS	Austria	CAPI-CAWI	CAPI	CAWI		same	yes	In-house
	Sweden	CATI-PAPI	CATI	PAPI		same	yes	In-house
	United Kingdom	CAPI-PAPI				different	no	In-house
	Slovak Republic	CAPI-PAPI				different	no	In-house
Total surveys	39: - 29 same mode sequence to all sample units -10 different mode sequences to different sample sub-groups <i>(*) YUC: Yes, but under certain condition</i>							

It can be noticed that, also for this type of strategy, the variety of mode combinations is quite large. Differently from concurrent designs, there is a high prevalence of mode combinations made of CAWI as first mode, followed by CATI and CAPI as second mode. Paper questionnaires (PAPI) are rarely used. Figure 3 shows modes combinations used in “party sequential-partly concurrent” mixed-mode designs when the same sequence of modes is applied to all sample units.

Figure 3. Modes combinations used in “party sequential-partly concurrent” mixed-mode designs (same sequence of modes to all sample units) - Percentages (absolute values in brackets)



It is evident that whatever modes are used, all strategies follow the well-known rule, aimed at cost reduction, of using the cheapest mode as the first one and the more expensive one(s) at a later stage. The only exception is Austria that for HBS uses CAPI at the beginning of the data collection and CAWI afterword.

Same or different sequence of modes?

EU NSIs frequently apply the same data collection design to all sample units. In a few cases, the sequence of modes is different for different sample sub-groups². This is the case for:

- Slovak Republic for LFS wave 1 and 2
- Latvia for EU-SILC wave 2
- Austria for EHIS
- Norway for AES³

² In these designs modes are differently assigned to respondents and they might be thought as adaptive. In fact differentiation is based on mode access (i.e. having a phone number or having access to internet) that may be considered a ‘characteristic’ of a person/household. Therefore, strictly speaking, they may be called adaptive, but it is such a rudimentary form that they are never called in this way by the literature. On the contrary, adaptation in subsequent survey waves may be adaptive when it is based on answers in the earlier wave(s) or covariates.

- Spain and United Kingdom for ICT
- Slovak Republic and United Kingdom for HBS

Descriptions of the different sequences reported in the MIMOD survey questionnaire (when present) are listed below:

- **Slovak Republic**, for the LFS wave 1 and 2, uses a different sequence for each sample sub-groups. Specifically, three sequences for three sample sub-groups are used: “group A: CAPI -PAPI; group B: PAPI-PAPI group C: CAPI/PAPI-CATI”. For HBS, two sequences and two sample sub-groups: “group A: CAPI -PAPI; group B: PAPI-PAPI. It can be noticed that for both surveys mixed-mode is not used for all sub-groups (for group B, only PAPI is used).
- **Latvia**, for the EU-SILC wave 2, uses different sequences according to the household’s availability of Internet for private use. In more details, Latvia reported that: “Sample is divided in two parts:
1) if the household had internet for private use (according to data of previous survey), then we use CAWI/CATI (February) and then CAPI/CATI (March - June/July);
2) if the household had not internet for private use, then we use CAPI/CATI (March - June/July).
- **Austria**, for the EHIS, is planning the use of different sequences of mode on the base of the ‘propensity’ to CAWI mode. Specifically: “The main sequence is planned to be CAPI then for non-respondents CAWI, but a special selected population (based on variables that have a positive effect on CAWI probability-still to be defined) is planned to get the sequence CAWI-CAPI”.
- **Spain**, for the ICT, uses two different sequences that have CAWI as first mode, specifically, “CAWI is the first mode for all the sample and the second mode is CAPI for the sub-group A and CATI for the sub-group B”.

The choice of data collection modes: a respondents’ choice or a decision from the NSI?

As to the choice of modes, general results, reported in Table 7, showed a slight preference, among the European NSIs, to let respondents choose the mode instead of assigning it. This prevalence is confirmed and even stronger in “partly sequential-partly concurrent” mixed-mode designs that apply the same sequence of modes to all sample units. On the contrary, in case of different mode sequences for different sample sub-groups, the majority of NSIs does not give respondents the chance to choose the mode (Table 14).

Table 14. Respondent’s chance to choose the mode in “partly sequential-partly concurrent” mixed-mode designs

Mode chosen by respondents	Partly sequential-partly concurrent mixed-mode designs					
	Absolute values			% values		
	Same sequence	Different Sequences	Total	Same sequence	Different sequences	Total
Yes	22	1	23	76.0	10.0	59.0
No	2	8	10	6.8	80.0	25.6
Yes, but under certain conditions (<i>e.g. from Non-respondents or from response in previous waves</i>)	5	1	6	17.2	10.0	15.4
Total surveys	29	10	39	100.0	100.0	100.0

³ For the sake of knowledge, Norway ended-up in using the same sequence; the use of a different sequence was part of an experiment that was stopped due to organisational and cost problems.

Mode choice from respondents

Among those NSIs that allow respondents to choose the mode, three reported in detail how this choice is managed. These countries are Finland, Austria and Germany:

- **Finland** reported that for the AES, which is conducted using CAWI-CAPI, "...the original strategy was to have a CAWI period of three weeks for all respondents and then continue with CAPI for all non-respondents. During this three weeks two advance letters and an SMS text reminder were sent. However, after this we experienced some technical problems with our interview system which caused a delay in the data collection. Therefore the strategy was modified and web was offered as an alternative mode all the way to the end of the data collection period. This means that the interviewers could use this possibility to motivate respondents who were reluctant to CAPI".

The Finnish strategy is one of many examples of the use of an interviewer-administered mode in a second phase of data collection to push respondents to the CAWI mode that is used as the first method and available throughout the collection period.

- Another way of managing the choice of mode from respondents is that used by **Austria** for the EU-SILC wave 2. Austria firstly assigns the mode according to the availability of landline/mobile telephone numbers, but then uses Christmas cards to ask respondents whether they have some preferences in contact channels for the next wave. Specifically, "On Christmas - between the waves - we send Christmas greeting letters to our respondents. With the greeting card we ask them to check their contact data and also to tell us which mode they would like to receive in the next wave. So the respondents are able to choose the mode in this way, but because it is an extra effort to send us the answer card back, not many mode switches happen this way".

Austrian experience suggests that the chance of choosing modes given to all respondents, which is applied in this case in 'partly sequential-partly concurrent designs', can be managed also for other types of mixed-mode designs. Specifically, cards of greetings on special events that happen close to the survey start or informative cards, for example about the results of the previous survey edition, can be sent to all sample units. Through these cards, respondents can be asked to express their mode preferences by either sending cards back, or to avoid this extra effort, by email or toll free number

- Only in **Germany**, three modes are used: CAPI, CATI and PAPI, but there is no choice since the beginning of the data collection phase. "The first mode is the CAPI and, only if people reject to participate or cannot be contacted, the NSI offers paper. Last offer, and for to be helpful, is the proposal of the interviewer to do a CATI (using the CAPI instrument, but phoning). First contact is done by the interviewer. If he is not successful, he leaves a paper questionnaire in the mail box with the invitation to fill in. There is a contact phone number of the regional statistical offices for further requests".

Some countries let respondents choose the mode, but only under certain conditions. These conditions are, for example, the availability of phone numbers before the fieldwork starts or the respondents' willingness to provide their phone contacts during the fieldwork; another frequently mentioned condition is 'being non-respondent' to a mode, regardless of having received reminders or not. Below is the descriptions of these strategies as reported in the MIMOD questionnaire:

- **Austria**, for the LFS wave 2, asks for the availability of phone numbers: "We tell respondents to please provide us with their telephone numbers so that we can do CATI in the follow up. If respondents choose not to provide us with their telephone numbers they will be contacted with CAPI in the follow up".

- **Spain**, for the AES, offers the chance of choosing the mode not to all sample units, but only to non-respondents to the first mode that are also invited to fill in the questionnaire with it: “CAWI is offered to respondents as the first mode, using CATI to encourage respondents to use CAWI or to conduct the interview, if they prefer this mode” (push-to web strategy, like the Finnish one).
- **France** and **Croatia**, for the ICT, use two independent samples; the choice of mode is allowed only to non-respondents of the sub-sample that has CAWI as first mode. In more details the strategies used by the two countries are the following ones:
 - **France**: “The ICT survey relies on two independent samples, one with a sequential CATI/ CAWI-PAP and the other with only CAWI-PAP. For the CAWI-PAP sample, respondents can choose between CAWI and PAP answer mode after the first reminder”.
 - **Croatia**: “Availability of land line and mobile phone numbers is a prerequisite for sampling for ICT survey. Mode sequence for ICT survey is as follows: CAWI mode starts first, while CATI and CAPI are executed simultaneously:
 - CAWI mode starts first and covers roughly 80% of sample, respondents who do not answer to CAWI are forwarded to CATI interviewing;
 - CAPI mode is independent from CAWI/CATI subgroup, about 20% of the sample is pre-reserved for CAPI mode only”.

Assigning modes to respondents

Some countries - The Netherlands, Austria, Norway, Slovak Republic and United Kingdom - prefer not to let respondents choose the mode, but to assign it at the start of the fieldwork. The decision on how to make this allocation is quite often based on auxiliary variables, such as demographic variables, the availability of mobile or land line phone numbers or the respondents’ preference from last wave for multi-wave surveys (see Deliverable 1 of WP1 - Figure 3). In particular, the NSIs mentioned above assign modes using auxiliary variables, as follows:

- **The Netherlands** uses demographic variables (household size) to assign the mode for the LFS wave 1 and uses the ‘availability of phone numbers’ for the other mixed-mode surveys, as reported in the MIMOD questionnaire: “Household size is used to determine which sample units go to CAPI in the LFS. For the other surveys, only availability of telephone numbers determines which subsequent mode is”.
- Also **Austria**, for the EHIS that adopts CAWI-CAPI, uses demographic variables : “Based on demographic variables we plan on selecting a sub-group of the sample which will receive CAWI”.
- **Norway**, for the AES which is based on the mix CAWI-CATI, assigns the mode according to the ‘availability of mobile phone numbers and of e-mail addresses’.
- **United Kingdom** uses respondents’ preference from last edition.

In some cases, no auxiliary variables are used to assign the mode. This is the case of the **Slovak Republic**, for the two waves of the LFS, and **Norway**, for experimental designs where modes are randomly assigned to respondents, as reported in the MIMOD questionnaire: “Random distribution for experimental purposes”.

Partly sequential-partly concurrent mixed-mode designs: summary

Experiences above described show that for “partly sequential-partly concurrent” mixed-mode designs, the first mode on the field is generally self-administered (CAWI) while interviewer-administered modes, like CATI or CAPI, are used at a later stage. For these designs, the main adopted strategy is to let non-respondents (to the first mode) to choose the mode they prefer to participate to the survey. This means that interviewers are involved not only in conducting interviews, but also in informing respondents about

the possibility of choosing among the various modes offered, stressing the fact that they can still use the CAWI mode (the characteristic of this design is, in fact, that the first mode remains 'on the field' when the second ones are offered). This 'pushing to CAWI' approach can be considered as a way to reduce the interview cost, thus balancing the cost of interviewers employed as a 'reminder'. Having an in-house fieldwork seems, anyway, to be a pre-condition for adopting this strategy and for limiting the organizational complexity that an outsourced fieldwork might imply.

This strategy seems aimed at reducing response burden by allowing respondents to choose the mode they prefer and, consequently, at improving participation. It implies an easier survey organisation and management than the concurrent mixed-mode strategy, especially in the case of an in-house fieldwork.

Furthermore, offering CAWI as first method and 're-offering' it during the CAPI or CATI contact might be useful to collect data on sensitive topics. Last but not least, giving the possibility to choose the mode only to non-respondents to the first mode is a way to limit costs as well as the organizational complexity of the data collection phase. The impact of selection effect, anyway, has to be evaluated.

1.2.3 Sequential mixed-mode designs

In sequential mixed-mode designs, modes are in the field at different periods of time. A data collection mode is used for all sample units at first; after a pre-established period of time it is followed by a different mode for non-respondents to the first one.

The table below shows for which surveys sequential mixed-mode designs are used by each NSI and which are their main features. The 'Type of sequence' column indicates if the same sequence of modes is used for all sample units or if different sequences are applied for different sample subgroups.

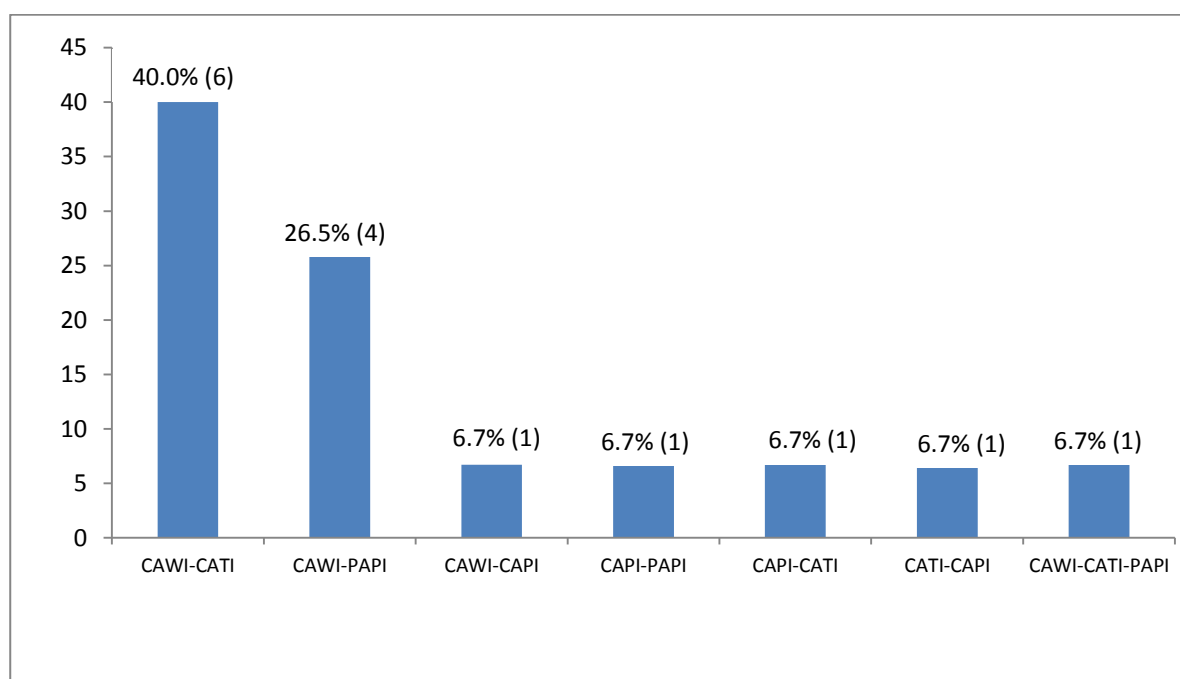
Table 15. Features of sequential mixed-mode strategies adopted by EU NSIs

Survey	Country	Data collection modes	Type of sequence	Modes chosen by respondents (*)	Fieldwork: in-house, outsourced, partially in-house and partially outsourced
LFS1/2	Poland – LFS1	CAPI-PAPI	different	no	In-house
	Poland – LFS2	CATI-CAPI-PAPI	different	no	In-house
EU-SILC 1	Poland	CAPI-CATI	same	no	In-house
EU-SILC 2	The Netherlands	CAWI-CATI	same	no	In-house
EHIS	Germany	CAWI-PAPI	same	yuc	Partially
	Iceland	CAWI-CATI	same	yes	In-house
	Portugal	CAWI-CAPI	different	yuc	In-house
AES	Austria	CAWI-PAPI	same	no	In-house
	Slovenia	CAWI-CATI-PAPI	same	no	In-house
	The Netherlands	CAWI-CATI	same	no	In-house
	Poland	CAPI-PAPI	same	no	In-house
ICT	Slovenia	CAWI-CAPI	same	no	In-house
	Sweden	CAWI-CATI	same	no	Partially
	Finland	CAWI-CATI	same	yes	In-house
	Italy	CAWI-PAPI	same	no	Partially
	Poland	CAWI-PAPI	same	yuc	In-house
HBS	Iceland	CAWI-CATI	same	yes	In-house
HETUS/TUS	Sweden	CATI-CAPI	same	no	In-house
Total surveys	18 - 15 same mode sequence to all sample units - 3 different mode sequences to different sample sub-groups				

(*) YUC: Yes, but under certain conditions

Considering only those mixed-mode strategies where the same sequence of modes is applied to all sample units, the mode combinations adopted in sequential designs by the European NSIs are represented in figure 4.

Figure 4. Modes combinations used in sequential mixed-mode designs (same sequence of modes to all sample units) - percentages (absolute values in brackets)



Also in the case of sequential strategies, the ‘cheapest mode first’ rule, devoted to cost reduction, frequently applies. The only exception is Poland that uses the sequence CAPI-CATI for the EU-SILC wave 1 and CAPI-PAPI for AES.

Mode combinations are mainly made of two types of data collection designs: CAWI-CATI and CAWI-PAPI. Considering all surveys adopting a sequential mixed-mode design, it results in fact that CAWI is nearly always used (13 cases out of 18 – 72%) and it is generally followed by CATI or PAPI. PAPI is applied in 7 cases out of 18 (39%) and it is generally combined with CAWI.

Note that PAPI is more used in sequential designs than in “partly sequential-partly concurrent” ones where it is adopted in 8 cases out of 39 (20%). The use of PAPI as a second mode in sequential designs could be explained in two ways:

- 1) It could be a way to increase the use of the web mode in CAWI-PAPI sequential designs. This could be the case, for example, where paper questionnaires must be downloaded from the NSI website or must be requested/retrieved from public offices by respondents who want to use them. This approach is therefore a way to discourage the use of PAPI in favour of CAWI and consequently to reduce cost and improve data quality;
- 2) It could be a way to increase response rate and to limit costs at the same time. A way to reach these two aims is to send paper questionnaires by post only to non-respondents. This is the case, for example, of the French NSI for the ICT survey, which is reported below, and of Sweden for EHIS which is described in the concurrent designs (see Annex 1).

Experience of **France** for the ICT survey:

“The ICT survey relies on two independent samples, one with a sequential CATI / CAWI-PAP and the other with only CAWI-PAP. For the CAWI-PAP sample, respondents can choose between CAWI and PAP after the first reminder.

CAWI-PAP: April 1- Advance letter with ID + Password to connect to the website

Three weeks later : Reminder letter (reminder of ID + Password) with PAP Questionnaire + prepaid envelop
 Three weeks later : Reminder letter
 CATI: April 1- Advance letter + Flyer
 APRIL-MAY : Extra letter for refusal or household we cannot contact”.

Same or different sequence of modes?

EU NSIs usually apply the same sequential mixed-mode data collection design to all sample units. In two cases, anyway, the sequences of modes is differently applied to different sample sub-groups. These cases are represented by Poland for both waves of LFS and Portugal for EHIS (Table 15).

The different sequences described in the MIMOD survey questionnaire are reported below:

- **Poland**, for the LFS waves 1 and 2, uses respectively CAPI-PAPI and CATI-CAPI-PAPI. The different sequences used by Poland are described in the following sentence: “CAPI method is used for all sample subgroups. CATI method used in the wave 2 for subgroups with only one person at the age of 15 years or more”.
 The design used by Poland can be considered as adaptive, since it uses a simple form of adaptation based on ‘age’ which is similar to that used by The Netherlands, but based on household size (see case study in paragraph 3.3).
- **Portugal** for the EHIS, which adopts a CAWI-CAPI sequential design, describes the different sequences of modes in this way: “For the EHIS 2014, two subsamples have been selected. One subsample was assigned to CAWI and CAPI in sequence. The other subsample was assigned to CAPI all along the data collection”. Besides, for what concerns the mode choice, Portugal specifies that “In EHIS 2014 the respondents of the subsample that was assigned to CAPI could not change to CAWI”.

The choice of data collection modes: a respondents’ choice or an NSI’s decision?

The table below shows that in sequential mixed-mode designs, modes are generally assigned by NSIs; only in few cases respondents have the chance of choosing the mode more suitable for their needs.

Table 16. Respondent’s chance to choose the mode in sequential mixed-mode designs

Mode chosen by respondents	Sequential mixed-mode designs					
	Absolute values			% values		
	Same sequence	Different sequences	Total	Same sequence	Different sequences	Total
Yes	3	0	3	21.4	0.0	17.6
No	9	2	11	64.3	66.7	64.7
Yes, but under certain conditions	2	1	3	14.3	33.3	17.6
Total surveys	14	3	17	100.0	100.0	100.0

Mode choice from respondents

The chance of choosing the mode is given to respondents by Iceland for EHIS and HBS and by Finland for ICT. Also Portugal and Poland offer this possibility, but only under certain conditions:

- In **Portugal** only those respondents of a certain sub-sample can choose the mode: “In EHIS 2014 the respondents of the sub-sample that was assigned to CAPI could not change to CAWI” while those belonging to the CAWI-CAPI sub-sample can choose the web mode;
- In **Poland**, instead, respondents can choose the mode, depending on the time left before the end of data collection (answer from Poland: “Limited time of data collection”).

Assigning modes to respondents

The main auxiliary variables used to assign modes to respondents are the ‘availability of mobile or land line numbers’ when CATI mode is used. Since CATI is used as the ‘second’ mode, this means that non-respondents to the first mode (which is in general CAWI) are contacted by phone if this information is available.

Only in one case the design is made of three subsequent steps: this is the case of Slovenia that for the AES uses a CAWI-CATI-CAPI sequence, meaning that the most expensive mode is offered only to non-respondents to the first two modes, thus recovering non-response due to lack of internet or inability to use it and the lack of phone numbers.

Sequential mixed-mode designs: summary

Data reported above show that also for sequential mixed-mode designs, the first mode on the field is generally self-administered (CAWI), but differently from “partly sequential-partly concurrent” designs the second mode offered is either PAP(I) or CATI while CAPI is rarely used. The adoption of PAP(I) can be explained by the fact that in sequential mixed-mode designs, the first mode closes after a certain period of time and there is no need to use the second mode to push respondents towards the first one. This also explains why in these designs the mode choice is not generally offered by the NSIs. The use of CATI interviewers may be explained by the need of limiting costs (printing costs), reducing the data collection period and improving data quality.

It seems, therefore, that sequential mixed-mode designs are more aimed at cost reduction than at increasing participation by leveraging the burden reduction that the mode choice might induce. Moreover, they are used when the aim (or the need) of keeping the organisation complexity low, has to be met. They are in fact the simplest designs, since all respondents are assigned to the first mode and only non-respondents are switched to the second one(s).

1.3 Adaptive/responsive design

Adaptive mixed-mode survey design refers to differentiation in the allocation of modes to sample units based on auxiliary information on these units. Auxiliary information either consists of information available at the start of the survey, called baseline data covariates, or information recorded during data collection, termed paradata covariates. Baseline covariates consist of auxiliary variables from the sampling frame or from administrative data linked to the sample, or respondent answers to earlier waves of the survey. A design using only baseline covariates is called static. A design using (also) paradata is termed dynamic. Paradata covariates may be a mix of automatically logged process data variables, such as number of calls, reminders or break-offs, and interviewer observations on the sample unit or sample unit's environment. For a general reference, see Schouten, Peytchev and Wagner (2017).

In this section, we describe the relevant outcomes of the WP1 survey among NSIs for mode choice and mode allocation. We start with a summary of mode design and then move to adaptation.

The survey among NSIs contained a separate section on mode design, Section 1- Data collection strategies (see Annex 1 of WP1-Deliverable 1). Part of Section 1 questions referred indirectly to adaptive survey designs (questions Q15 to Q18 and question Q21) and two questions Q31 and Q32 were specifically about adaptive survey design⁴. The block on adaptive survey design only asked for a contact person to ask additional questions in case the NSI applies adaptive survey designs.

Eight countries responded that they were unsure whether they employ adaptive survey designs. These countries received an additional email with clarification and the following additional questions:

- Does your institute for one or more person surveys differentiate the mode of contact based on baseline information, and if so how?
- Does your institute for one or more person surveys differentiate the starting mode(s) of administration based on baseline information, and if so how?
- Does your institute for one or more person surveys differentiate follow-up modes of administration based on baseline information, and if so how?
- Does your institute for one or more person surveys differentiate follow-up modes of administration based on paradata, and if so how?

The outcomes of the survey are useful; having read the clarifying email, only CBS and Stat Portugal indicated that they had implemented adaptive mixed-mode designs in part of their surveys. To these questions, all answers were negative, implying that no differentiation is applied within a single wave. Some NSIs do apply differentiation in future panel waves, e.g. the LFS, based on first wave outcomes. These

⁴ Q15. Considering those surveys where modes are assigned to respondents, can you please indicate which auxiliary variables you use for mode assignment?

Q16. In case different surveys use different auxiliary variables, please specify which auxiliary variables are used for each survey;

Q17. During data collection respondents might be switched from one mode to another. If you also follow this strategy, please indicate the factors generally used in your decision making process and their priorities;

Q18. Do you use a uniform communication strategy for all your mixed-mode social surveys, or do you have different communication strategies for different surveys? We refer to advance letters, invitations, reminders to non-respondents and to break offs, etc.;

Q21. Please indicate which communication means you use for your tailor made communication strategies;

Q31. Do you apply adaptive/responsive survey design in mode strategies to any of your ESS surveys?;

Q32. Could you please provide us the contact details of the person, including yourself, we can ask for more details?

designs may be termed static adaptive mixed-mode given the first wave data as baseline covariates. We do not consider these here, however.

CBS applies static adaptive mixed-mode survey designs in the Health Survey/EHIS, in two non-ESS surveys and is exploring application in the ICT and LFS.

From the MIMOD survey, we can conclude that adaptive mixed-mode survey design is applied by a small minority of ESS countries.

1.4 Communication strategy and the use of incentives

Communication strategies are a fundamental part of the survey design and are, in general, planned to be compliant with aims and constraints of the data collection design. They are therefore a component/factor to be taken into account in the decision process (paragraph 2.2) aimed at defining the 'optimal data collection' strategy. In this paragraph some 'ingredients' of the communication strategies that might be used in the decision process are described in paragraph 1.4.1 (for a detailed description of communication strategies used by the EU NSIs see WP4-deliverable 2).

Incentives are a way to increase survey participation. Whether they are effective or not should be evaluated survey by survey. In this deliverable some examples on the way they are managed by the NSIs are reported in paragraph 1.4.2.

1.4.1 Communication strategy

Communication strategies are devoted to inform respondents about a survey in order to increase their participation. Though there are various channels to reach individuals (direct to respondents, or to a more vast audience, institutional website, advertising campaigns on TV/radio stations/social networks), the MIMOD survey only took into account direct communication with respondents. Specifically, advance letters, reminders to non-respondents and to break-offs are the investigated subset of communication instruments.

Advance letters and reminders can be sent in different ways: using the "traditional" contact means (postal or through interviewers) or "digital" ones (e-mail or SMS). Usually the advance notification/invitation is a paper letter while reminders, that have in general shorter contents, can be sent by e-mails or by SMS. Text messages are still not frequent, mainly because of non-availability of mobile phones numbers; moreover, some NSIs prefer to use them only for smartphone designed surveys. Only Ireland tried SMS before the CATI call-back, but found it ineffective in reducing non-response.

The different tools (paper letters, e-mails, text messages, etc.) have a different impact on the survey costs and on the scheduling of shipments; the latter, in turn, depends on the duration of the fieldwork. Moreover, the number and timing of reminders may also depend on the type of survey design -sequential or concurrent or both - and need to be tailored with it.

From the NSIs experiences the following evidences have been found:

1. The **advance letter** is always sent, despite cost constraints. It is in fact used to inform sample units not only about the survey, but also about the data collection modes, and eventually on whether these can be chosen. It has therefore an extremely important role in raising participation and promoting the success of a survey.

Paper letters look like the most suitable means, even though also flyers are used sometimes.

As to timing, advance letters need to arrive close to the start of data collection and, if possible, on specific days of the week, those that appear to be the most effective in terms of survey participation. The choice of which days of the week depends on the culture and habits of each country (for example: beginning of the week for Slovenia, Friday for the Netherlands).

To capture respondents' interest, the advance letter may contain an incentive (or the notice that this will be received or raffled after questionnaire completion) or may be sent along with an information brochure, where there are detailed information on the survey and some interesting results from previous surveys.

2. **Reminders** to non-respondents, that include also break-offs, are generally sent by post (paper letters), whatever data collection mode is used. E-mails are mostly used when CAWI is involved. In general, no more than one or two reminders are used; usually the second one depends on the duration of data collection. More than two reminders are rarely used. Generally, reminders are sent after seven days since the beginning of the survey or, for CAWI break-offs, since the last access to the questionnaire has occurred.

Reminders scheduling shows some differences according to the data collection designs: in general, for sequential design, the "7 days rule" is often used; for concurrent designs when modes can be chosen by respondents, reminders are sent after a longer period of time (10-14 days): this better allows to give respondents enough time to express their preference and to the NSI to organise the data collection accordingly. Besides, for sequential or 'partly sequential-partly concurrent' designs, reminders are used to inform non-respondents about the availability of new data collection modes.

CAWI break-offs receive an higher number of reminders than other modes break-offs because of availability of e-mail addresses. When CAWI is used, the last reminder is sometimes sent just few days before the close of the survey.

To facilitate the reading of this paragraph, some examples of communication strategies are reported in Annex 2 (for a wider list of strategies reported by the NSIs, see WP4 - Deliverable 2).

1.4.2 The use of incentives

As mentioned in Section 1, nearly half of the European NSIs (14 out of 31) offers incentives to increase response rates and to thank respondents for their time. Five of these 14 countries, usually apply this strategy for almost all the ESS surveys, while the remaining ones only to specific situations (one or two surveys)⁵.

⁵ Austria, Estonia, The Czech Republic, The Netherlands and Hungary offer incentives to the majority of the ESS surveys. Countries offering incentives to respondents of specific ESS surveys are: Germany (EHIS), Finland (AES), Poland (AES and HBS), Slovak Republic (LFS1 and HBS), Sweden and Belgium (HBS and HETUS), Switzerland and Denmark (EU-SILC 1 and 2), United Kingdom (ICT and HBS)

Incentives typically comes in two main forms: monetary, in general voucher, and, more frequently, non-monetary. Examples of non-monetary incentives are: calculators, pens, shopping bag, books of stamps, etc. Sometimes respondents are proposed to participate to lotteries of iPads, Tablets or gift cards.

Whatever the form, the common practice is to give incentives only to those households/individuals that have completed the questionnaire. This is in fact a way of containing costs and, at same time, to stimulate the participation in the survey. In few cases incentives are offered unconditionally.

In general, incentives are offered to all respondents with no diversification. In two cases different strategies are used for specific sub-groups of sample units. Specifically, Germany and Austria for EHIS differentiate the incentives according to the different propensity to participate in the survey, in order to try to reduce differences among strata. Specifically:

- In Germany, “younger participants were offered a 10€-voucher after completing the questionnaire. This was done because participation rates in younger age groups are remarkably lower than in older age groups. Older age groups were offered to participate in a lottery (50€-voucher), once the questionnaire was filled out”.
- In Austria, “Up to 30€-vouchers are planned after finish. There is currently an internal discussion about paying different amounts depending on hard to reach areas. This was necessary during last data collection period in order to get equal regional distribution”.

The use of incentives seems to be strongly linked with the data collection technique. In fact, as figure 5 shows, among surveys giving an incentives, there is a prevalence of mixes with self-administered modes, among which CAWI is more frequently used. Moreover, the habit of offering incentives is more common in concurrent or ‘partly concurrent- partly sequential’ designs respect to sequential ones (Figure 6).

Figure 5. The use of incentives by mix of modes: interviewer-assisted only or interviewer-assisted and self-administered

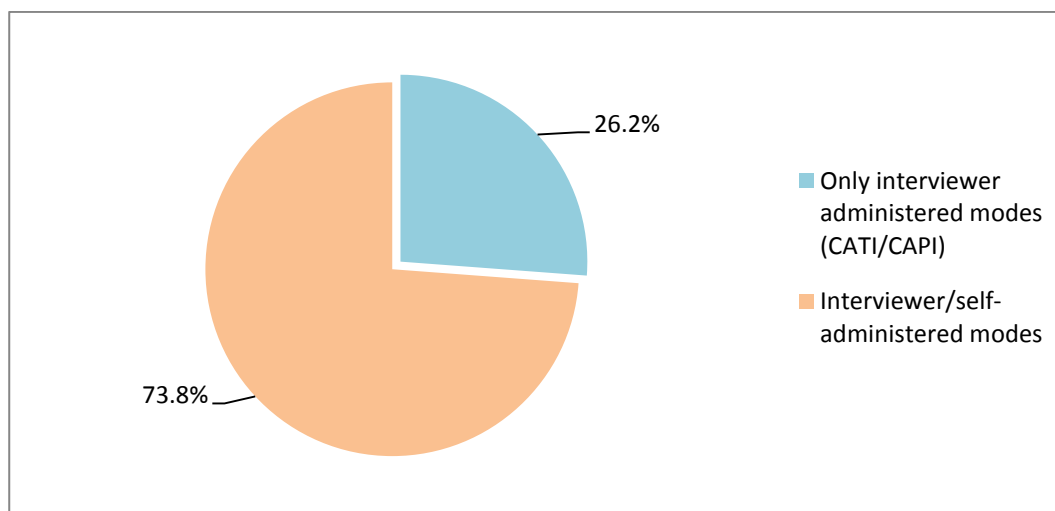
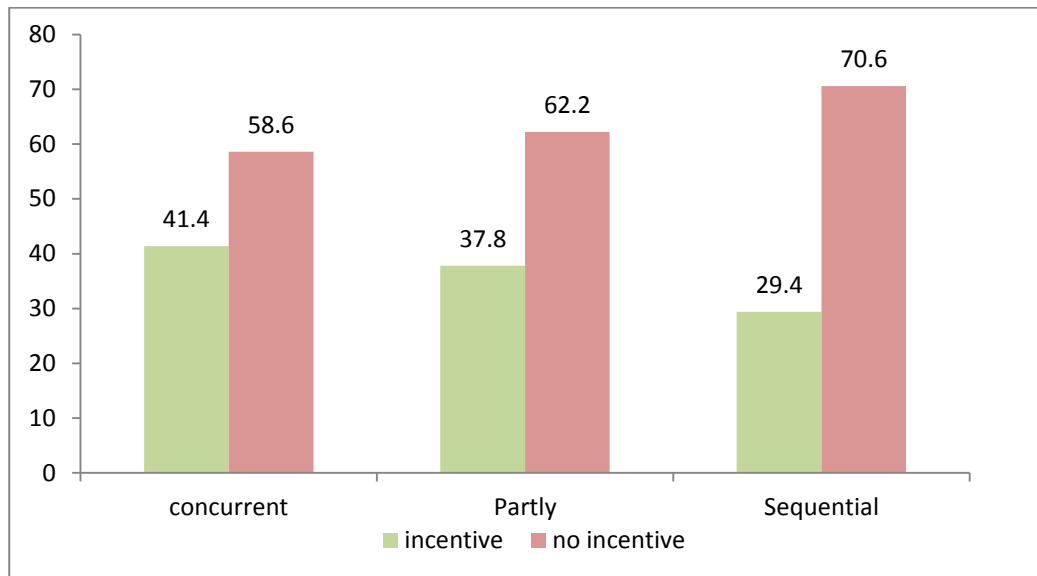


Figure 6. The use of incentive by mixed-mode strategy



Some conclusions can be drawn from the EU NSIs experiences in the use of incentives:

- The use of incentives divides the NSIs in two almost equal parts: those offering and those not offering incentives. Moreover, the majority of NSIs that offer incentives prefer to do it for some specific surveys especially those with a high response burden. This might suggest that i) their efficacy in enhancing response rates is not given for granted by all NSIs and ii) incentives might have a high impact on costs and, therefore, in case of budget constraints, they are limited to those surveys where respondents cooperation is more difficult to obtain (i.e. high burden);
- Incentives can be differentiated per sub-groups of sample units, in order to reduce differences in participation rates or proposed only to specific groups of respondents to limit costs;
- Whatever mixed-mode strategy is used, incentives are more frequently offered when self-administered modes are adopted. This is probably because of the absence of interviewers who generally boost respondents' cooperation.

A detailed description of the management of incentives from the MIMOD survey can be found in Annex 3.

1.5 Summary

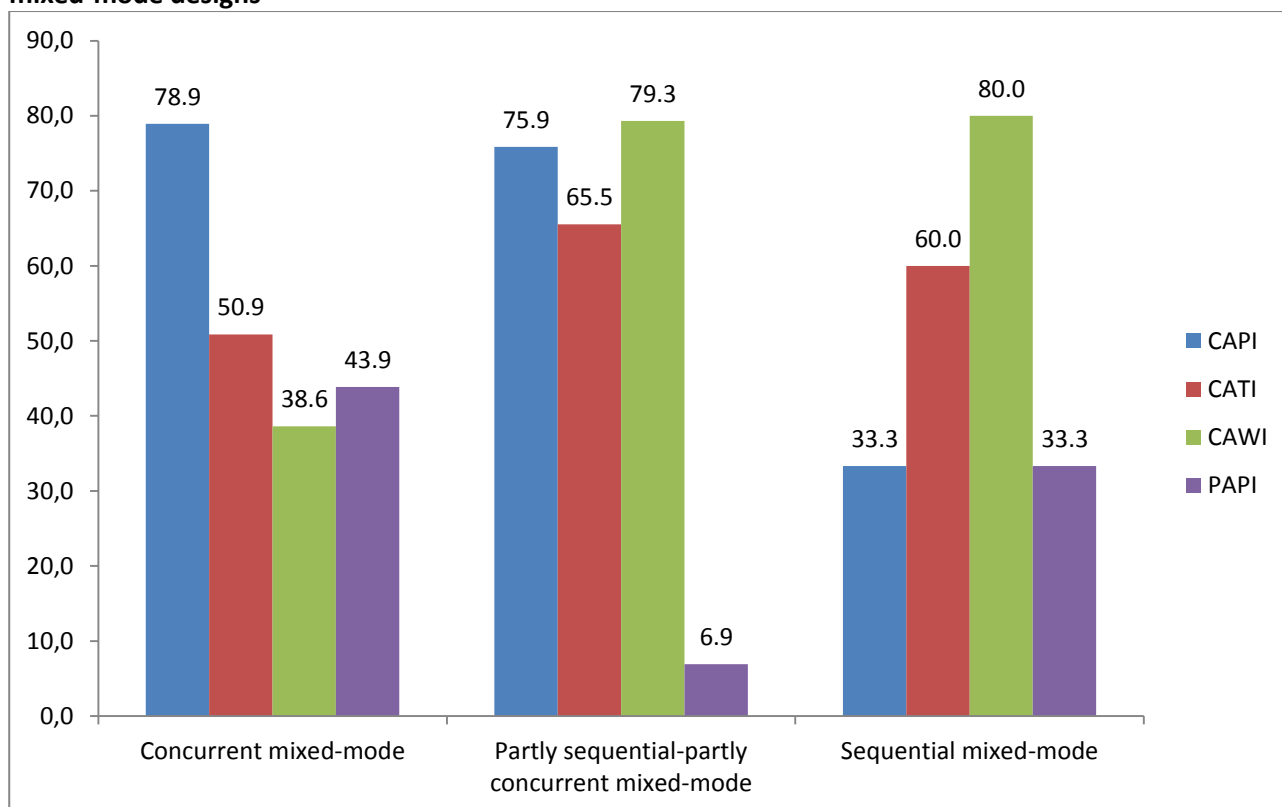
The European experiences show that adaptive mixed-mode survey design is still very seldom applied by the ESS countries. At the same time they tell us that concurrent mixed-mode designs are the most frequently used and, to its opposite, sequential designs are the least frequently used; 'partly sequential-partly concurrent' designs are in between.

Each of these strategies is associated to specific data collection modes, used with a specific aim. In particular:

- The concurrent strategy is more frequently characterised by interviewer-administered modes (CATI or CAPI): high response rate are then likely to be reached, but with an higher impact on costs;
- The sequential design is characterised by CAWI as first method: cost savings is in general the main goal;
- The 'partly sequential-partly concurrent' strategy is characterised by both types of modes, self-administered (CAWI) and interviewer-assisted (CAPI and CATI), trying to balance response rate and costs. These strategies are less complex than concurrent designs, but more expensive than the sequential ones: on one side, the adoption of mixed-mode design is limited to the non-respondents of the first mode (and this simplify the organization); on the other side, a more intensive use of CAPI/CATI as second modes implies higher costs.

Modes characterising each strategy can be observed in the figure below that shows the use of the different data collection mode(s) per data collection design.

Figure 7. Data collection modes used in concurrent, sequential and 'partly sequential-partly concurrent' mixed-mode designs



Analysing mode combinations in each strategy (Table 17), similar conclusions can be drawn. Specifically:

- in concurrent mixed-mode designs, there is the tendency to combine interviewer-administered modes; anyway to limit costs, they are also often associated with the CAWI mode. Cost saving is also made possible by the presence of an in-house fieldwork (as it is the case for the majority of the NSIs);
- in 'partly sequential-partly concurrent' mixed-mode designs, the first mode is usually CAWI, that is generally combined with CATI/CAPI as second modes. Interviewers are necessary to increase response rate and 'push-to-web' to limit costs. Still, an in-house fieldwork is an essential feature to minimize the complexity of this design, to better estimate interviewers' workload and to avoid that response rate per mode are dependent on interviewers' earning worries;
- in sequential mixed-mode designs, CAWI is the main actor. In order to prevent low budget strategies from failure, CATI is mainly use as second mode. The combinations with PAPI and CAPI are less frequent. In these cases, to avoid an increase of costs due to the questionnaires printing or the visit from an interviewer, a push-to-web strategy is used in the communication with respondents via advance letter and/or reminders.

Table 17. Modes combinations per mixed-mode strategy

	Number of surveys <i>Absolute values</i>
Concurrent	
CATI-CAPI	19
CAPI-PAPI	14
CATI-CAWI	7
CAPI-CAWI	5
PAPI-CAWI	5
CAPI-PAPI-CAWI	4
CATI-CAPI-PAPI	2
CATI-CAPI-CAWI	1
Total	57
Partly sequential-partly concurrent (same sequence to all sample units)	
CAWI – CATI and CAPI	12
CAWI – CATI	5
CAWI – CAPI	3
CATI – CAPI	4
CAWI and CATI- CAPI	2
CATI – PAPI	1
CAPI – CAWI	1
CAPI- PAPI and CATI	1
Total	29
Sequential (same sequence to all sample units)	
CAWI- CATI	6
CAWI- PAPI	4
CAWI- CAPI	1
CAPI- PAPI	1
CAPI- CATI	1
CATI- CAPI	1
CAWI-CATI-CAPI	1
Total	15

The above reported experiences confirm that mixed-mode strategies form a '*plethora of designs*' and that 'there is not such a thing as the best mixed-mode design', as already concluded by the ESSnet DCSS. However, it is important to look for the optimal mixed-mode design, that tries to balance costs and quality and that is related to data collection techniques a specific survey intends to use. Indications on the steps to follow to find the optimal design for a survey are provided in section 2.

To summarise the findings of the MIMOD survey, some design options are more frequently used than others and, although interviewers are necessary to reach adequate response rates and good data quality levels, in a not far future, where the 'digital divide' is bound to be reduced, they are likely to be more and more often associated with the CAWI mode.

Whether they should be mixed concurrently or sequentially cannot be stated here. Further analyses that evaluate the most frequently used mode combinations options in terms of costs and errors are therefore advisable.

Section 2 – The decision making process

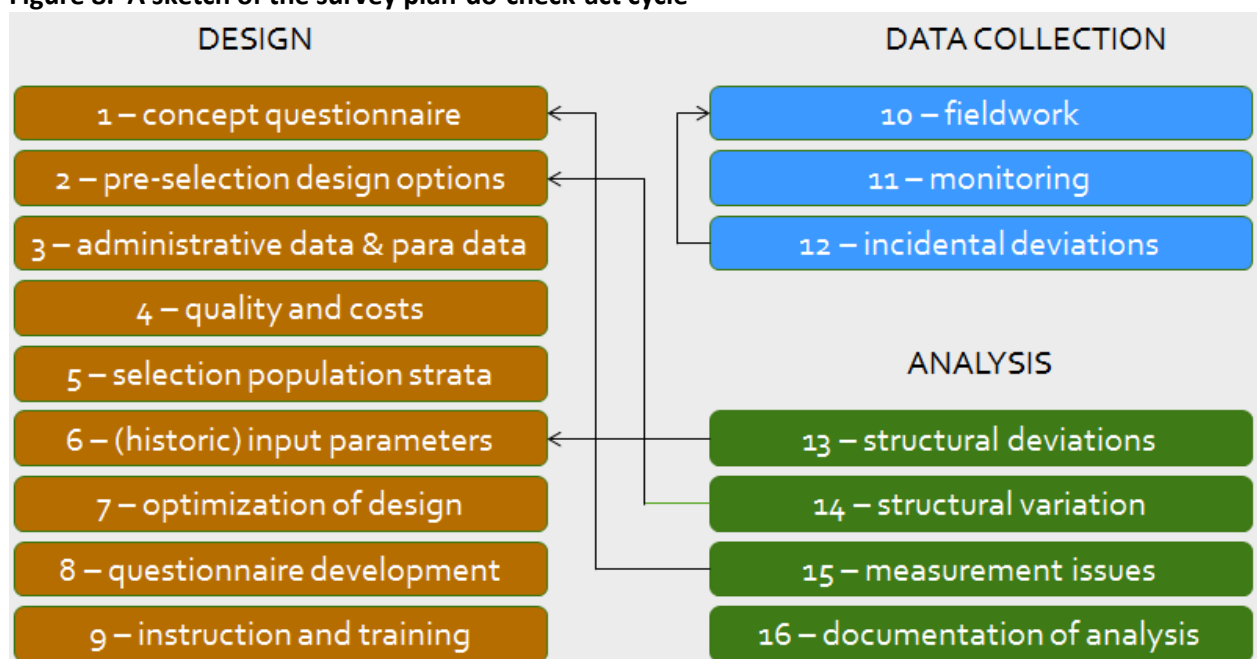
2.1 Introduction

The survey mode is the design feature that has the strongest impact on survey errors and survey costs. In addition, modes often have their own logistics and infrastructure and combining modes in one design is challenging for survey case management, monitoring and analysis. Consequently, a discussion of mode choice and mode allocation is a discussion of virtually all aspects of survey design and analysis. Obviously, this would go too far for this deliverable and we restrict ourselves to the main elements. References to general discussions of survey errors and costs are Groves (1989), De Leeuw, Hox and Dillman (2008), Bethlehem (2009), Groves et al (2009) and Dillman et al (2014).

Figure 8 depicts the plan-do-check-act (PDCA) cycle of survey design, where the “act” phase is represented as feedback arrows to the “plan” phase of survey design. Mode choice is part of steps 2 and 7 but influences also design steps 3, 4, 6, 8 and 9. Mode allocation through adaptive survey design depends on steps 3, 5 and 6 in static designs, and, additionally, on steps 11 and 12 in dynamic designs.

An important message from any PDCA cycle, as represented by figure 8, is that any design option is not fixed but change over time. Mode choice and mode allocation are no exceptions to this rule. Gradual changes in survey errors (population coverage, response rates, response representativeness, measurement) and survey costs (both fixed and variable), represented by steps 13, 14 and 15 alter the business case of modes in mode design. During data collection and from one wave to the other, response rates may decrease (and costs go up) and/or contributions of modes to the overall response may change, altering also the overall measurement characteristics and comparability. Good examples are the emergence of web as a survey mode, the more recent diversification of devices that allow access to web and the decreasing coverage of landline phones. Apart from the omnipresence of modes and preferences that respondents may have to use them, there is also the general tendency of decreasing response rates, see De Leeuw, Hox and Luiten (2018) that has changed trade-offs in survey errors and costs. These changes, themselves, imply that mode choice and mode allocation cannot have absolute viewpoints.

Figure 8. A sketch of the survey plan-do-check-act cycle



Nevertheless, it is possible to determine the strongest influences of modes on survey errors, costs, and operations.

From the survey error perspective, modes strongly influence: 1) population coverage, 2) survey response and 3) survey measurement. Upcoming modes and vanishing modes, typically, have a lower coverage of the population. Coverage of modes is country-dependent, so that trade-offs become country-dependent as well. Survey response rates vary greatly between modes and could differ as much as 30 to 40% between online and face-to-face modes. As response rates do not have a direct relation to nonresponse bias, also contrasts/variation in response rates over relevant population subgroups need to be considered. Here, the picture is less clear, but modes do also affect variation, although less strongly as overall rates. Cornesse and Bosnjak (2018) concluded, for example, that web response rates vary more than mixed-mode response rates based on a meta-analysis. Obviously, survey response is conditional on mode coverage, so that part of the difference in level and variation of response rates is due to varying coverage. Measurement error also varies between modes. Modes vary on a number of administration features, the most prominent being intimacy, interaction, assistance, presentation, speed/pace of the interview, and timing. The first three all relate more or less to the presence of an interviewer: Interviewers create a form of intimacy that may affect answers for certain types of questions. Interviewers naturally lead to interaction, which gives the survey a face or voice and a spokesperson. Interaction can also be simulated in web surveys. The interaction may increase motivation and concentration. Interviewers also help respondents by navigating through the questionnaire and/or by explaining context. Presentation of the modes refers to aural or visual questionnaires, which affect the cognitive effort and skills to answer questions. Modes influence the speed and pace of an interview. In self-administered modes respondents can choose their own speed and pace, allowing them to think more carefully but also less carefully. Finally, the timing of the interview is affected by the mode. Again self-administered modes offer more freedom; respondents can choose the time and place. Measurement error follows response and coverage and it is often hard to remove confounding of the errors without experimental designs.

From the survey cost perspective, modes vary, perhaps, even more than for survey errors. The differences in costs per respondent in web and F2F are very large; F2F may be as much as 50 to 100 times more expensive, depending on the implementation. The consequence is that sample sizes can be made much larger for cheaper modes and precision can be greater, despite the lower coverage and response rates. The difference in costs between modes arise mostly from fieldwork, especially travel costs, and not from design or analysis.

From the survey operations perspective, modes are very different. Naturally, self-administered modes are operationally much easier as they do not require planning and management of interviewers. Another main distinction is between computer-assisted and paper-assisted administration. Interviewer modes allow for both, and, naturally, web and paper modes allow only for one type of administration. One type of administration is not necessarily more complex than the other when starting from scratch, but they are different. This points at the most complex part in mixed-mode designs, that of combining mode operations in a single fieldwork. This holds especially true for combinations of self-administered and interviewer-assisted and computer-assisted and paper-assisted.

All in all, mixing modes has been a means to improve survey costs, while not affecting survey errors too much, weighed against the increased complexity of the survey operations. In the next subsections, we will discuss this further.

2.2 Deciding the modes sequence

The choice of a mixed-mode survey design –which modes to use and in which sequence- strongly depends on the purposes of the survey design and on its constraints. Maximizing data quality, that is minimizing the total survey error, is in general the main aim to be reached, taking into account constraints like costs, timing, response burden, etc. (Istat, 2018). Vice versa the aim could be to minimize costs under the constraint of maintaining the same level of accuracy in terms of total survey error.

Modes have a different impact on quality and costs; in mixed-mode strategies these differences depend on modes sequence. In terms of impact of the sequences, there are disparate results in the existing literature (see Wagner et al. 2014). It is, therefore, impossible to provide indications on the best sequence that meets all the requirements, national backgrounds and specific survey features. However, it is possible to define a number of steps to follow, when deciding which mode strategy to use for a specific survey. These steps are listed below:

1. Determine and prioritize aims by estimating the quality-cost trade-off
2. Identify risks
3. Determine the candidate modes
4. Evaluate different mode design options:
 - a) Define the mode sequence/administration
 - b) Define which devices respondents may use to participate if CAWI mode is offered
 - c) Design and test the questionnaire so as to reduce mode-specific measurement effect
 - d) Evaluate the complexity of the logistics and operations, i.e. case management and human resources
 - e) Evaluate the possibility of enhancing the response rate and/or population coverage (incentives, mode choice)
 - f) Design the communication strategy: advance letter, reminders, interviewer instructions and training and survey website
 - g) Test the mixed-mode design(s)
5. Implement the mixed-mode design and collect data
6. Compute estimates
7. Assess the results in terms of the defined aims
8. Document

The eight steps make up the decision process of the entire survey design.

Results of tests (step 4g) and of assessment (step 7) might activate a ‘re-design’ step as part of the PDCA cycle (step2 of figure 8).

Step 1 has already been discussed in section 2.1. Here, the need to prioritize aims is highlighted, since different priorities influence the choice of mode design options (step 4).

Step 2 is about the identification of risks. Generally speaking, the main risks when using mixed-mode strategies, are break in time series, mode and selection effects and budget overruns. Risks are treated in section 2.3.

Once priority of aims is established and risks are identified, then the potential modes to adopt can be determined. It is obvious that mode adequacy for the survey topics is another ingredient to be taken into

account in step 3 (besides costs and errors), as well as the availability of contact information (telephone numbers, postal addresses, e-mails).

The evaluation of the mode design options, step 4, which is the focus of this deliverable, is made of different sub-steps that cover topics also treated in the other WPs of the MIMOD project.

The first sub-step (4a) is about the choice of the sequence of mode administration. Literature is poor about experiments on large scale that provide indications on which mode combinations and sequences to use (concurrent versus sequential). A comparison among different mode administration can be found in Mauz et al. (2018). They describe the results of an experiment where a sequential and a concurrent design are evaluated in terms of costs, response rates and estimates for the main indicators. Results are, anyway, country and survey specific. Wagner et al. (2014) report the results of several studies testing the influence on costs and response rates of different sequences of modalities. All studies agree on the fact that using the cheapest mode as the first one positively affects costs, but show controversial positions about the influence that the mode sequence has on the response rate.

It is, therefore, not possible to define the 'optimal survey design', since it is country and survey specific as literature on this topic shows. To provide some indications on an optimal choice of modes, it would be necessary to evaluate each mixed-mode design adopted by the EU NSIs in terms of total survey error components (errors, response rate, coverage, etc.) and costs. This would need specific analysis to be performed in the future on a set of surveys and countries.

Therefore, in this deliverable, only general rules that are based on the priorities defined in step 1, are provided. Specifically:

- a) If cost reduction has the highest priority, a sequential design where the cheapest mode is offered first can be adopted. However, cost reduction needs to be evaluated overall. If, for instance, CAWI as first method reduces fieldwork costs, the mixed-mode strategy as whole may not. In fact, higher costs may come from the increased complexity of the organisation, questionnaires implementation and testing, monitoring, higher travelling costs for face-to-face interviewers, etc. Therefore, it is important to keep all these factors under control to reach the aim of containing costs.
- b) If the aim is to contain non-response and coverage errors, then the concurrent mix of modes that allow for a higher response rate and/or coverage is advisable; a sequential design with most "effective" mode offered first can be an alternative. Generally, the modes that guarantee this aim are interviewer-administered.
- c) Strategies in between, like partly sequential-partly concurrent designs, can help in balancing costs and errors. An example can be a self-administered mode (cheapest) that is offered first and left open as an option, when an interviewer-administered mode is added to improve coverage and response.

As to sequential designs, it is important to take into account the sequence of modes, because, as literature shows, it could have an impact on the response rate (similar to the 'contamination effect', Wagner et al. 2014): if a mode with an expected lower response rate is offered first in a sequence, this might increase resistance to later attempts in a different and more effective mode(s).

Sub-steps 4b, 4c, and 4d are analysed in detail by WP5, WP4, WP3 respectively. As to step 4d (evaluate the complexity of organisation based on CMS and human resources), it is important to mention that without a unique IT platform, questionnaire development and testing can be difficult and burdensome. Similarly, monitoring would increase in complexity especially for concurrent designs. For what concerns the human resources, it is necessary: i) to predict the interviewers workload and costs, especially travel expenses, and

ii) to define a payment system that does not influence the response rate per mode, when self-administered and interviewer-administered modes are combined. All this always holds, but it is even more delicate/important in case the fieldwork is outsourced (totally or partially).

Sub-step 4e) is about the possibility of enhancing response rates and/or coverage through the use of incentives and/or by giving respondents the chance of choosing the mode they prefer among those offered.

As to incentives, literature suggests that, in general, incentives may increase survey participation: monetary and especially cash are more effective than non-monetary incentives and unconditional incentives are more effective than conditional ones. Concern has been raised that incentives might reduce data quality, but there appears to be little empirical evidence supporting this. On the contrary, some studies indicate that incentives may influence respondents to put more effort into completing the questionnaire (see Olsen et al., 2012, for a review). However, offering incentives might raise costs. The choice of using them or not depends, therefore, on the priority of aims and on the budget available. A possible way for not affecting budget too much, is to offer incentives only to certain sub-groups of respondents, that are in general those 'harder' to involve in the survey.

The mode choice from respondents could be another way of enhancing response rate. However, literature converges on the fact that doing so does not appear to increase response rate (see Couper, 2011, for a review). Besides, offering this choice could add an additional danger of confounding mode effects and measurement effects with self-selection bias (De Leeuw, 2005). Anyway, many NSIs use this option quite frequently for their concurrent designs, most likely because it reduces respondents burden and better prepares them to do the interview.

Attention should be paid to the potential increase of the operational complexity that mode choice might induce. This is particularly true for concurrent mixed-mode designs. To limit this danger, an "in between" strategy may be used, that is to manage the choice of mode concurrently, but then to perform data collection sequentially. To do this, the choice of the preferred mode can be proposed to sample units in the invitation letter, in which different, sequential, time periods of data collection for each mode are also announced.

Sub-step 4f) is about the communication strategy. Decisions on communication strategy depend on survey modes and their sequence (steps 3 and 4a). This topic is widely treated in the deliverable 2 of WP4. As far as the decision process is concerned, particular attention should be given to the advance letter to increase respondents participation and eventually to push them toward a specific mode (e.g. push to web strategy). Besides number and timing of reminders, as well as the communication means, should be decided carefully, paying attention to contain costs and harassment of respondents. Helpful indications can arise from testing.

In general, all decisions taken from step 3 to 4f should be tested in order to establish whether they are in line with the expectations. Evaluation of mode and selection effects should be part of the analysis (methods are described in WP2 deliverables).

Step 5 follows with the implementation of the mixed-mode design and data collection. During this phase, two viewpoints have to be taken into account: that of respondents and that of interviewers (if they are involved). As to the first it is important to always facilitate respondents tasks by setting a contact centre not only to provide respondents with technical and thematic assistance, but also to assure them about the confidentiality of the data they provide. For what concerns interviewers, training and motivation are essential. This is particularly true in mixed-mode surveys using web as first mode, where it can happen that

the “easiest” respondents participate to the online questionnaire and the “most difficult” cases are left to interviewers.

Steps 6 to 8 conclude the survey process. Step 7 about the assessment has the purpose to evaluate the design performance in terms of data quality and therefore to provide indications for future survey editions.

2.3 Adaptive mixed-mode survey design

Adapting the allocation of modes to different subgroups is a next step to mixing modes. It offers more flexibility in making trade-offs between survey errors and survey costs; a non-adaptive, i.e. uniform, design is just a special case of an adaptive design. It also demands for (even) more flexibility in survey operations.

In the literature, there is a distinction between adaptive and responsive survey designs. Here, we will avoid the distinction and simply refer to adaptive survey design. Survey designs can be measured along two dimensions: the extent to which a sample is stratified and treated differently, and the extent to which design decisions are postponed to the actual data collection. If a survey design does not stratify the sample and treats strata differently before or during data collection, then we do not call the design adaptive. So the first dimension needs to be present to a minimal extent. There are five levels of adaptive survey designs:

0. Uniform design, i.e. no stratification in any way;
1. The sample is stratified at the moment a sample is drawn based on administrative data, frame data or data from previous surveys/waves in a panel;
2. The sample is stratified based also on paradata that will become available during data collection but the treatment allocation is decided beforehand. In other words, at the start of data collection it is known what treatment a sample unit will get for each possible realization of paradata;
3. Like 2, but the treatment allocations are not (fully) known at the start of data collection and are decided upon at pre-defined phase points during data collection. In other words, even if paradata is available, it is not known in advance what treatments are employed. However, the set of possible treatments is specified beforehand;
4. Like 3, but also the set of treatments itself is not yet specified at the start of data collection;

It must be clear that each level introduces complexity. Level 1 is usually called static and levels 2 to 4 are dynamic. Levels 3 and 4 are sometimes referred to as responsive.

In steps 2 to 4, paradata are included. Examples are automated process data such as number and timing of reminders, calls and visits, type of online device that was used and whether a break-off occurred. Other examples are interviewer observations on the sampled persons and/or their dwellings and neighbourhoods.

To date, adaptive survey designs have focussed almost entirely on survey response. There are a few exceptions in the literature where also measurement error is considered (Calinescu and Schouten 2015 and 2016). For adaptive survey designs that focus on mode, measurement error is, however, an important component of quality, as we have explained in section 2.1. This is yet a topic of future research, but we will address it in the LFS case study, section 3.3.

So how to make design decisions in adaptive mixed-mode surveys? Given that these designs inherit all the complexity of mixed-mode surveys, there are again no absolute viewpoints. However, guidelines have been developed.

The four main ingredients to adaptive survey design are 1) quality-cost objectives, 2) stratification of the population/sample, 3) design features to vary, and 4) an optimization strategy. These ingredients correspond to steps 4, 5, 2 and 7 in figure 8. In the context of mixed-mode surveys, ingredient 3, design features, is the choice of modes and sequences of modes.

Wagner and West (2016) developed a checklist for adaptive survey design, in which the four ingredients come up. The checklist consists of the following steps, which are further elaborated:

1. Identify priorities
2. Identify major risks
3. Define quality and cost indicators
4. Define decision rules
5. Modify the survey design and monitor the outcomes
6. Compute estimates
7. Document

The first three steps concern quality and cost indicators, the fourth and fifth step concern the design features and optimization strategy, and the last two steps involve future changes and replication. The choice of strata is implicitly included in step 3. The first two steps are critical and imperative; without a consensus on the priorities and risks, it will be impossible to set explicit quality and cost criteria, which in turn are necessary to make decisions.

Priorities have been discussed in sections 2.1, but risks have not. The major quality risks in mixed-mode surveys are incomparability in time and incomparability between population subgroups. To most users, comparability is as important as accuracy of survey statistics. Mode-specific biases in selection and measurement may create such mode effects in time or between subgroups. Adaptive designs, therefore, have to account for mode effects in time series. In practice, as we will demonstrate in the LFS case study, this may imply that a constraint is added on the size of mode effects caused by modes relative to a benchmark/ Alternatively, minimization of method effects due to modes could be the objective itself, subject to constraints on budget and precision. The major cost risks are budget overruns and/or heavy workloads on interviewers. In fact, dynamic adaptive survey designs, in particular the levels 3 and 4 designs, mainly arose in order to manage costs during data collection. These designs keep a constant watch on effort and costs. In adaptive designs, it means that costs are included as constraints, usually in a conservative way. Interviewer workloads are another imminent risk in sequential mixed-mode designs where interviewer modes follow self-administered modes. Due to sampling variation in the first mode(s), the workload becomes to some extent unpredictable. At CBS, this issue is overcome by introducing subsampling of nonresponse to fixed workloads.

Adaptive survey design typically use dashboards to monitor data collection, e.g. Kreuter (2013). Quality indicators to make decisions focus on nonresponse and employ estimated response propensities in relevant subgroups. Examples are CV (Coefficient of variation) and R-indicators (Schouten, Cobben and Bethlehem 2009) that transform response propensity variation to a top-down metrics. It would go beyond the scope of this paper to give an account of indicators. Chapter 10 of Schouten, Peytchev and Wagner (2017) provides a detailed discussion and explains the links between indicators. As costs for one survey are often hard to

separate from other surveys, dashboards often consider indirect indicators, such as number of calls, visits, reminders, and so on.

Schouten and Shlomo (2017) distinguish different optimization strategies and decision rules:

- Trial-and-error: There is no explicit set of quality and cost indicators and mode allocations would be based on expert knowledge and historic survey data. An example is Luiten and Schouten (2013), where web, paper and telephone are allocated to different subgroups. The advantage of this approach is its simplicity. The disadvantage is its unpredictable outcome and subjective nature;
- Case prioritization: Response propensities are estimated and sorted in ascending order. The lowest response propensities are allocated first to follow-up modes. This approach will be demonstrated in the HS/EHIS case study. The advantage of this approach is the link to response propensities. The disadvantage is the risk of allocating effort to unsuccessful follow-up and the lack of an explicit quality criterion;
- Stopping rules based on quota: Follow-up in strata is based on quota, say 50% or 60% stratum response rates. When thresholds are met follow-up is stopped. Implicitly, the approach attempts to obtain equal stratum response rates. The advantage is again its relative simplicity. The disadvantage is the unpredictable fieldwork effort. This approach is simulated by Lundquist and Särndal (2013) for the Swedish EU-SILC;
- Mathematical optimization: The most advanced but also demanding approach is to formulate an optimization problem in which mode allocation probabilities are decision variables. The optimization problem chooses a quality or cost indicator as objective function and optimizes subject to constraints on other indicators. The advantage of the approach is its transparency and link to indicators. The disadvantage is the requirement to estimate all components in quality and cost functions. This approach is demonstrated in the LFS case study;

Adaptation of mode allocation is completely dependent on the possibility to link relevant auxiliary data, either from frame data, linked administrative data or paradata. In settings where frame data and/or linked administrative data are rich, such as in many Nordic countries, stratification may even require parsimony in choosing strata. In settings where there are barely any frame or administrative data, it may simply not be possible to employ static designs. In the US, this has been the case for a long time, and focus has been on dynamic designs, therefore. Paradata is less setting- or country-dependent than frame data and administrative data, but has limitations when the survey mode is the main design feature. One reason is that self-administered modes offer very little paradata for non-respondents; thus, giving little opportunity to adapt in follow-up waves. Furthermore, paradata are mode-specific, so that designs that have concurrent mode elements may offer different paradata for use in follow-up modes.

Given auxiliary data, the main question is how to stratify the population. Basically, there are three approaches. The first is to model nonresponse and choose strata that explain nonresponse best. The second is to model one or a few main survey variables and choose strata that explain these variables. The third is to model costs and choose strata that are most heterogeneous in costs. The approaches may also be combined. At CBS, the practice is to pre-select auxiliary variables from the weighting model, i.e. that relate to survey outcome variables, use this set to model nonresponse and then form strata.

As a guide to adaptive mixed-mode survey designs, the checklist of Wagner and West (2017) can be elaborated to:

1. Identify priorities
2. Identify major risks:
 - a. Consider risk of incomparability in time
 - b. Consider risk of incomparability between subgroups
 - c. Consider risk of budget overrun and heavy interviewer workloads in follow-up modes
3. Define quality and cost indicators:
 - a. Consider nonresponse indicators
 - b. Consider measurement error indicators
 - c. Consider cost indicators
4. Define decision rules from:
 - a. Trial-and-error
 - b. Case prioritization
 - c. Quota
 - d. Mathematical optimization
5. Modify the survey design and monitor the outcomes:
 - a. Develop a dashboard for survey errors
 - b. Develop a dashboard for survey costs
6. Compute estimates
7. Document

In the case studies, steps 1 to 5 will be considered.

Section 3 – Case studies

In this section, three ESS case studies are elaborated; one study by ISTAT and two by CBS.

3.1 Case study 1 – Italian EU-SILC survey

In Italy, since 2016, EU-SILC survey is carried out by a concurrent CATI-CAPI mixed-mode design.

The decision of adopting this strategy was taken after several subsequent steps, each devoted to reach specific aims (step 1: prioritize aims).

From 2004 to 2010 the survey was conducted with the PAPI mode. The need of a more standardized data collection process that allows to reach more efficiently better data quality level, drove the decision of substituting PAPI with CAPI. In 2011, CAPI was then adopted, outsourcing the fieldwork and the development of the electronic questionnaire to a private company (Istat, 2014).

The structure of the CAPI questionnaire was the same of PAPI but, obviously, the CAPI mode made it possible to exploit all potentialities of a computer assisted mode: the answers were collected directly on the personal computer, thus eliminating some steps of the process phase (scanning and data entry, for example) and introducing the chance of editing and checking data through soft and hard controls during the interview. Furthermore, interview's paths were automatically managed. Moreover, the fieldwork management became easier and the interviewers monitoring more efficient.

Nonetheless, some disadvantages, proper of face-to-face interviews, still remained. Specifically, difficulties in achieving an adequate territorial coverage and the lengthening of fieldwork. To limit these risks (step 2: identify risks) and to meet the aim of reducing costs, Istat decided to evaluate the introduction of CATI. In 2013, therefore, a CATI pilot survey was carried out, also with the aim of testing the applicability of this mode to a survey as complex as EU-SILC (step 3: determine candidate modes)

It is well known that CATI technique has many advantages if compared with CAPI: it ensures costs reduction and a more widespread territorial coverage. Furthermore, it guarantees a more efficient management of fieldwork, that becomes faster and can be more efficiently monitored, and it is certainly less intrusive than receiving an interviewer at home. Anyway, the use of CATI represents also some risks, due to the higher difficulty in captivating the trust of households, especially in the first survey wave⁶, and to the absence of the personal presence of an interviewer that may help respondents in providing complex information, as those required by EU-SILC (income components and living conditions). The pilot CATI survey was therefore also aimed at testing the impact of these further risks.

3.1.1 Testing the CATI mode in EU-SILC

The use of the CATI mode required few adaptations of both the survey design and the questionnaire in order to face some already known critical aspects. One of these was the length of the interview that needed to be shortened to prevent from break-offs and to allow interviewers to keep respondents' attention high during the whole interview, especially when complex and sensitive questions were

⁶Households are followed-up and enlisted for the interview for four years.

administered. Particular attention was committed to reduce the number of questions, mainly cutting the information already available from administrative registers. The other critical aspect was represented by proxy interviews (to be used in case a household member is unable to answer due to illness or incapacity) that should be limited (EUROSTAT, 2017).

The questionnaire used in the pilot survey was developed by an external company, that also provided the fieldwork staff and a toll-free number for households. The call centre guaranteed assistance to the households during the whole data collection period for any questions or doubts about the survey.

Taking into account the rotational panel design used in EU-SILC, the sample drawn for the pilot survey was made of two sub-groups:

- 1) A new sub-sample of households drawn from the population register, with the following characteristics: either single component or two components with the household reference person aged 65 or more.
- 2) A sub-sample of households already interviewed in EU-SILC in the last four years editions, composed by a maximum of two income earners.

The aim of these two sub-samples was to evaluate the CATI performance among new households and among those already interviewed. Moreover, the choice of small household size and elderly people was aimed to reduce the complexity and the length of the CATI interview.

The analysis of the results was carried out by comparing the CATI pilot survey with the most recent EU-SILC survey (2013 edition) carried out with CAPI, but selecting only the households with the same characteristics of those included in the CATI sample.

In general, the CATI pilot survey produced satisfactory results. Anyway, it showed a smaller proportion of completed interviews than EU-SILC 2013 (Table 18), despite the use of three substitutions for each households (substitutions were used only for the pilot since they are not allowed in the official survey). This may be due to several aspects: the participation to the pilot was not compulsory, as it was for the official survey; it was easier for respondents to refuse their cooperation by phone than in a face-to-face interview; the households already interviewed in the last four editions of EU-SILC were more likely to refuse to cooperate again; postal addresses archives are in general more reliable and updated than telephone directories.

Table 18. Contacts results by wave and technique

	PILOT (CATI)			EU-SILC 2013 (CAPI)		
	Wave 1	Wave 2+	Total	Wave 1	Wave 2+	Total
Complete interviews	48.7	56.4	53.2	64.9	85.6	80.0
Non response reasons:						
- refusal to cooperate rate	36.9	27.5	31.4	22.6	11.3	14.3
- wrong number/address rate	12.0	12.4	12.2	4.1	1.0	1.9
-Other reasons for non-response rate	2.4	3.7	3.1	8.3	2.2	3.8
Number of households	702	985	1,687	4,385	12,029	16,414

The CATI technique shows a shorter mean interview duration for small households size (i.e. 1 or 2 household members eligible for personal interview) and a slightly higher duration, in the first wave, for households composed by 3 or more eligible individuals (Table 19).

Table 19. Mean interview duration by wave, households size⁷ and technique (minutes)

Household size	Pilot (CATI)			EU-SILC 2013 (CAPI)		
	Wave 1	Wave 2+	Total	Wave 1	Wave 2+	Total
1 member	31	29	30	36	34	35
2 members	40	42	41	47	46	46
3+ members	67	54	55	62	54	54
Total	40	42	41	41	43	43

In order to be compliant with the EU-SILC “Methodological Guidelines and Description of EU-SILC Target Variables” which indicates that the proxy rate shall be kept as limited as possible for the income personal variables and for any variables required for at least one household member aged 16 or over, the pilot survey also focused on the effect of the use of CATI on proxy rates. As expected, the overall proxy rate of CATI is slightly higher than CAPI, and it is particularly higher in the first wave with a difference of 8 %age points (Table 20).

Table 20. Proxy rate by wave, household size and technique

Household size	Pilot (CATI)			EU-SILC 2013 (CAPI)		
	Wave 1	Wave 2+	Total	Wave 1	Wave 2+	Total
2 members	32.3	32.8	32.6	26.2	29.8	29.1
3+ members	56.7	43.1	44.9	43.0	48.5	48.4
Total	35.0	37.3	36.4	27.2	37.3	36.0

The results of the pilot study and the need of reducing costs suggested to adopt both CATI and CAPI and to mix them concurrently starting from the 2016 survey edition (step 4a: Define mode sequence).

In order to set up the mixed-mode data collection, a unique questionnaire, suitable for both telephone and personal interviews, was implemented. The new questionnaire included the major changes introduced with the pilot survey (step 4c: questionnaire adaptation):

- 1) wording changes, to make the interview smoother and to increase the comprehensibility of questions, taking advantage of the effort made during the pilot survey to obtain clearer and shorter questions, also suitable for telephone aural conversation;
- 2) shortening of the questionnaire, through a larger use of administrative registers, by adopting the same strategy used in the pilot survey of not asking for some income components, such as information on pensions and other social benefits, since they were already available in the administrative registers.

The new design does not give households the chance of choosing their preferred mode. This is because the fieldwork is totally outsourced and an estimate of the number of households to be interviewed by technique has to be defined in advance to properly organize the fieldwork (steps 4e and 4e).

Telephone numbers availability is very poor for the sample households drawn from the population register (about 30%) and higher, but not complete, for households already interviewed. Due to the lack of telephone numbers and the budget constraints, the CATI mode is not used only for a selected sub-sample

⁷ In terms of individuals aged 16+, i.e. eligible for the individual questionnaire

of households, as it was in the pilot, but for all the households with an available telephone number, in the first or following waves, regardless the household size. The only exception is represented by households with a foreigner reference person that are interviewed by CAPI. Furthermore, to reduce the lack of telephone numbers, they are collected during the CAPI interviews and made available for following survey editions.

Results of 2016 to 2018 editions show that the households interviewed by CATI in the first wave, are about 25-30% of the effective sample size. This %age corresponds to that of households listed in the population register that provide a land line telephone number in the public telephones archive (Table 21).

Since households present in the public telephones archive may differ from those not listed in it with respect to some characteristics, the sample has to be drawn in such a way as to obtain the same %age of telephones observed in the population among the interviewed households.

This constraint, together with the difficulties in collecting correct telephone numbers during the CAPI interviews and the CATI specific non-response reasons, results in a decreasing trend of the %age of CATI interviews from 56% in 2016 to 43.7% in 2018.

Table 21. Completed interviews by wave, technique and survey edition

	2016			2017			2018 ⁸		
Wave	CAPI	CATI	%CATI	CAPI	CATI	%CATI	CAPI	CATI	%CATI
1	6,703	2,514	27.3	4,951	2,339	32.1	4,397	1,551	26.1
2+	2,163	10,037	82.3	5,303	9,692	64.6	7,525	7,701	50.6
Total	9,217	12,200	57.0	10,254	12,031	54.0	11,922	9,252	43.7

The new survey design shows similar performances along the three years 2016-2018. For the sake of simplicity, we refer to the most recent available data (2018). As expected, CATI response rates are higher than those observed for the CATI pilot survey, because, as previously mentioned, the pilot survey was not mandatory while the official survey is.

The response rate by technique shows that CAPI has a better performance than CATI (higher %age of completed interviews in all waves) (Table 22). Concerning the first wave, both CAPI and CATI have similar levels of refusal to cooperate (14.1% and 16.9% respectively). CATI specific non-response is due to wrong telephone numbers (16.5%) and unsuccessful contacts during the fieldwork (18.1%), that is households who do not answer the calls or do not participate to the interview even if a first phone contact took place. CAPI specific non-response is due to the end of fieldwork without any contact attempts (12.9%), showing the difficulties in the territorial coverage of this technique.

From the second wave on, most of the non-response rates sharply decrease for both techniques, although CATI non-response due to wrong phone numbers remains high (12.7%). It is worth noting that the telephone numbers used in the first wave derive from the public archive, while in the following waves they are collected during the previous survey years. Poor quality of the telephone numbers clearly represents an issue in the use of this technique in the Italian context.

⁸ Preliminary data, minor changes may occur due to data editing

Table 22. Response rate by wave and technique (fieldwork 2018⁹)

	CAPI			CATI			Total
	Wave 1	Wave 2+	Total	Wave 1	Wave 2+	Total	
Complete interviews	63.5	86.7	76.4	48.4	75.0	68.7	72.8
Non response reasons:							
- refusal to cooperate rate	14.1	4.7	8.8	16.9	3.2	6.5	7.7
- wrong number/address rate	1.6	0.9	1.2	16.5	12.7	13.6	6.9
- end of fieldwork with a contact attempt rate	4.2	0.8	2.3	18.1	8.7	11.0	6.3
- end of fieldwork without contact attempts rate	12.9	5.0	8.5	0.1	0.1	0.1	4.6
- other reasons for non-response rate	3.7	1.9	2.7	0.1	0.3	0.2	1.6
Number of households	6,923	8,681	15,604	3,203	10,268	13,471	29,075

Mean interview duration is shorter in CATI than in CAPI (25 minutes and 39 minutes respectively) whatever the household size (Table 23). Conversation by phone is expected to be quicker than face-to-face interview. However, considering that the EU-SILC questionnaire is devoted to collect many variables, including several income components and housing costs, telephone interviewing may have an impact on the accuracy of the information provided. The respondent, for instance, may not have the chance to look at bills or pay slips. Mean durations are shorter for the second and following waves. This is due to the use of dependent interviewing: using information already collected in previous years, respondents are requested only to confirm some variables, as demographic characteristics, educational level and main occupation. This also allow to check and correct the variables already collected and to reduce the respondents' burden.

Table 23. Mean interview duration by wave, technique and household size^{(*)10}

Household size	CAPI			CATI		
	Wave 1	Wave 2+	Total	Wave 1	Wave 2+	Total
1 member	35.1	29.0	31.1	21.0	17.5	18.0
2 members	47.7	40.1	43.1	30.4	23.4	24.5
3 members	55.7	47.1	50.4	35.5	30.2	31.2
4+ members	68.3	53.5	59.6	44.0	35.2	37.0
Total	44.1	35.9	38.9	30.3	23.9	25.0

(*) In terms of individuals aged 16+, i.e. eligible for the individual questionnaire

3.1.2 CAPI-CATI mixed-mode implementation in the next future

EU-SILC is foreseeing relevant changes in the next future, to meet the requirements defined in the "Framework regulation for the production of European statistics on persons and households (Integrated European Social Statistics - IESS)", which is still under discussion and is expected to enter into force from 2021 or 2022.

⁹ Preliminary data, minor changes may occur due to data editing

¹⁰ Mean duration is computed taking into account the time to complete the household register, the household questionnaire and all the individual questionnaires. Since the time to complete the household register is not released in EU-SILC micro-data, data users are not able to replicate the contents of this table.

In this context of transformation, a new sample design and the CATI-CAPI mixed-mode strategy are currently under study at Istat (step 7: assessment).

Particularly, the rotational sample design, currently based on four rotational groups, is expected to be increased to six groups, lengthening the panel duration (i.e. the sample individual observation) to six years. Furthermore, the overall cross-sectional sample size is expected to increase. Both changes aim at meeting the new precision requirements defined at national cross-sectional and longitudinal level and at regional cross-sectional level, besides providing information about longer life-course dynamics at household and individual level.

The increase of the sample size has clearly an impact on fieldwork costs, while the increase of the panel duration has an impact on the respondents' burden. As a consequence, the use of CATI interviews together with CAPI aims at decreasing the costs and at reducing the burden, especially from the second interview on, because households are already aware of the information required and may consider the phone interview less intrusive than the presence of an interviewer at home.

Some changes in the mixed-mode CAPI-CATI strategy are likely to be implemented from 2020, on the base of the results of the previous experiences.

Firstly, response rates by wave show that CATI has a much lower performance than CAPI in the first wave, in terms of response rate. From the second wave onwards, instead, CATI and CAPI show similar response rates. For this reason, Istat is planning to use CATI for a smaller sub-sample of households in the first wave and to increase it for the following waves. Specifically, CATI is expected to be assigned to 20% of the households in the first wave, 40% in the second wave and to 60% of households in the third and following waves.

The decision about the selection of the 20% households is consistent with the current strategy where about 25% of households are interviewed by phone in the first wave. Moreover, it is based on the fact that from 2020, first wave households are expected to be selected from the "Master Sample" which is developed in the framework of the permanent census of population and housing, and represents the base for social surveys sampling design (Brogi et al., 2018). This means that the selection of households to assign to the CATI mode in the first wave of EU-SILC will be done on the basis of auxiliary information, such as the availability of telephone numbers, the household willingness of being contacted by phone, the household size, etc. that have been collected during the census.

This would reduce the risk of using wrong numbers and would allow to assign the CATI technique to those households in favour of being contacted by phone. A lower non-response rate is then expected although the impact of self-selection bias should be taken into account.

Provided that the information about telephone numbers and households willingness of being interviewed by phone will be collected also during each wave of the EU-SILC survey, the %age of CATI completed interviews is likely to increase. However, as in the actual design, households will not be completely free to choose the mode, because the fieldwork will be outsourced and an estimate of interviews by mode is needed to properly organize the fieldwork.

The percentage of completed CATI interviews in the second and following waves are similar to those observed for the CAPI. This allows to increase the use of CATI from the second wave by taking advantage of the households previous experience with the survey and the adoption of dependent interviews, as mentioned in the previous paragraphs.

Even though CATI performance in terms of completed interviews after the first wave is satisfactory, some drawbacks still hold. Specifically, the duration of the interview increases with the number of households eligible respondents, reaching an average length of 30 minutes (Table 23), that definitely represents an element of burden.

For this reason, the use of CATI will be capped to 40-60% of the households after the first wave and will be preferably confined to households with no more than 3 eligible members. Anyway, the use of dependent interviews may allow to 'relax' this constraint, thus increasing the proportion of CATI interviews necessary to meet eventual budget constraints and/or households mode preferences.

In summary, both interview modes have pros and cons. CAPI shows worse performance in terms of timeliness and territorial coverage and may be perceived as more intrusive than CATI. At the same time the face-to-face 'contact' with sample units allows for better data quality. CATI shows worse performance in terms of successful contacts during the fieldwork (it is easier not to answer a phone call than refusing a visit at home) and may provide less accurate data since the phone communication has to be quick and this hampers the consultation of documents useful to provide exact values of income components or households' costs. On the other side, it allows for a better territorial coverage, an easier fieldwork management and for cost savings. A compromise with the use of both techniques is expected to maximize the advantages of each mode, to reduce the respondent burden by allowing households to express their mode preference and to limit the costs of the data collection.

3.2 Case study 2 – Dutch Health survey/EHIS

The EHIS is conducted once every five years and in those years extends the Dutch Health Survey (HS) at Statistics Netherlands. Since 2018, the HS employs a static adaptive survey design in which CAPI follow-up to online nonresponse is varied. We describe the various steps in the HS design.

The HS is a repeated, cross-sectional survey with monthly samples, but statistics are produced on an annual basis only. Main survey estimates closely resemble the EHIS, but the HS is shorter and less elaborate and there are subtle differences in definitions and wording of questions. The monthly samples follow a simple random sampling without replacement design and vary in size between 1000 and 1500 persons. The HS employs two modes in sequence, web followed by CAPI. All sample units are invited to participate online through a paper invitation letter containing a web link. Two paper reminders are sent to those that do not respond. After four weeks, online participation is no longer possible and non-respondents can be forwarded to CAPI. CAPI interviews start on the first day of the month after the next month, e.g. if a person does not respond online in January then he/she is approached by CAPI beginning of March. The target population consists of all registered persons except those in institutions. For persons below 16 years, parental consent is required. For persons below 12 years, a parent needs to be present at CAPI interviews

The design feature of interest in the adaptive survey design is the CAPI follow-up. A pre-selected part of the online non-respondents receives a follow-up by CAPI. We now follow the first five steps of section 2.3: priorities, risks, indicators, decision rules and monitoring.

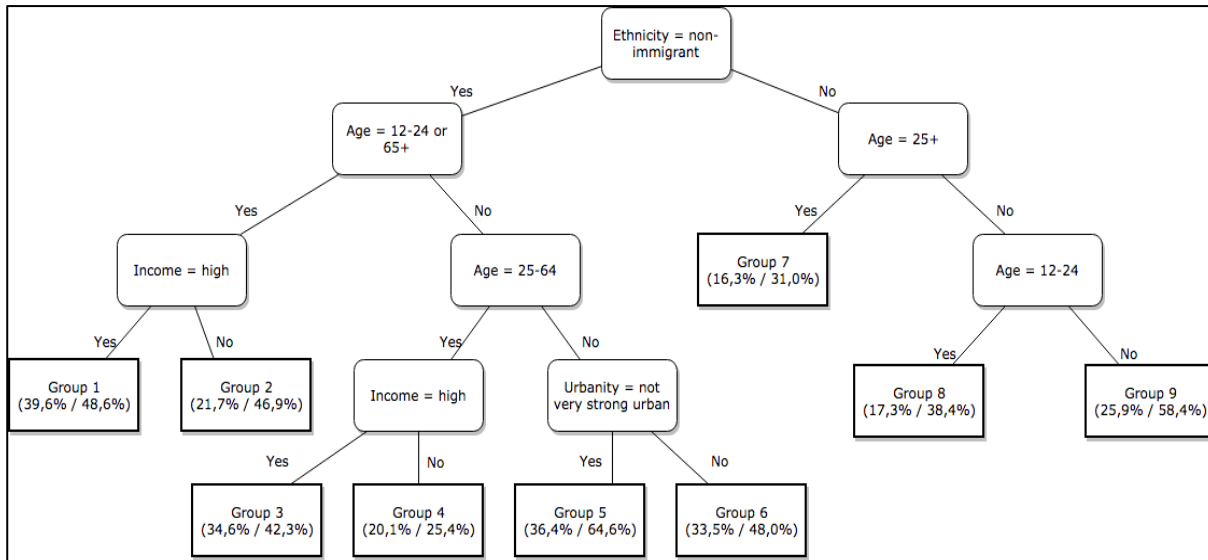
The main priorities in the HS are acceptable and similar response rates among relevant population subgroups, sufficient precision on annual survey estimates and costs satisfying a specified budget. In 2010, Statistics Netherlands decided to cut budget and a single mode CAPI HS was no longer feasible. In 2011,

web was introduced as a sequential mode, preceding CAPI. Over all Statistics Netherlands' surveys, CAPI workload has decreased over the last ten years due to the introduction of web, leading to higher travel costs per sample unit. The increased costs raised the question whether a CAPI interviewer force, covering the whole country, is sustainable on the longer run. The CAPI discussion formed one of the main starting points for the consideration of adaptive survey designs. Since CAPI is relatively expensive, it was deemed imperative to more carefully weigh the benefits against the costs. The HS is the first survey for which adaptation has been introduced.

Three risks have been put forward. The first risk is that of incomparability in time, i.e. time series breaks in survey estimates. These breaks can be caused by a change of mode choice and mode allocation. Since the HS focusses on time change in survey estimates rather than on absolute levels of the estimates, such breaks can be devastating to the utility of the survey. The second risk is an unpredictable CAPI workload due to varying monthly and annual web response rate. This risk was not identified at first but followed after implementation. It is, therefore, a good example of the PDCA cycle in which it turned out that structural variation in response and costs was too volatile. The third risk concerns incomparability between different population subgroups of interest. The shares of web response and CAPI response vary for example for age groups, ethnicity groups and income groups. When mode impacts measurement error, then differences in survey estimates between subgroups may (partially) be the result of mode effects.

At the start of the HS redesign, a range of quality and cost constraints were imposed. All quality indicators were directed at nonresponse and precision. Mode-specific measurement error was not considered for the first migration to an adaptive survey design, but remains a subject of discussion and a risk. As the main quality objective, the coefficient of variation (CV) of response propensities was chosen, see e.g. Schouten, Cobben and Bethlehem (2009). The CV is defined as the ratio of the estimated design-weighted standard deviation of response propensities over the design-weighted response rate. The CV has an indirect relation to nonresponse bias, e.g. Schouten, Cobben and Bethlehem (2009); the smaller the CV, the better. A smaller CV may be achieved by a higher response rate and/or a smaller variation in response propensities. Importantly, the CV depends on the set of auxiliary variables that are used to estimate response propensities. As a precision constraint, a minimum total number of about 9500 respondents was requested. A second constraint was set on costs. An upper limit of 8000 was imposed to the number of non-respondents that are sent to CAPI, as a proxy for a budget constraint. This number was roughly 10000 in the original design. A third practical upper limit of 18000 persons was set to the sample size in order not to deplete the Dutch sampling frame. As mentioned, the CV depends on the stratification of the population. The exact stratification was created by running a classification tree on historic HS online response using age, ethnicity, urbanization and income as explanatory variables. Nine strata were formed. They are shown in figure 9 and are taken from Van Berkel, Van der Doef and Schouten (2018).

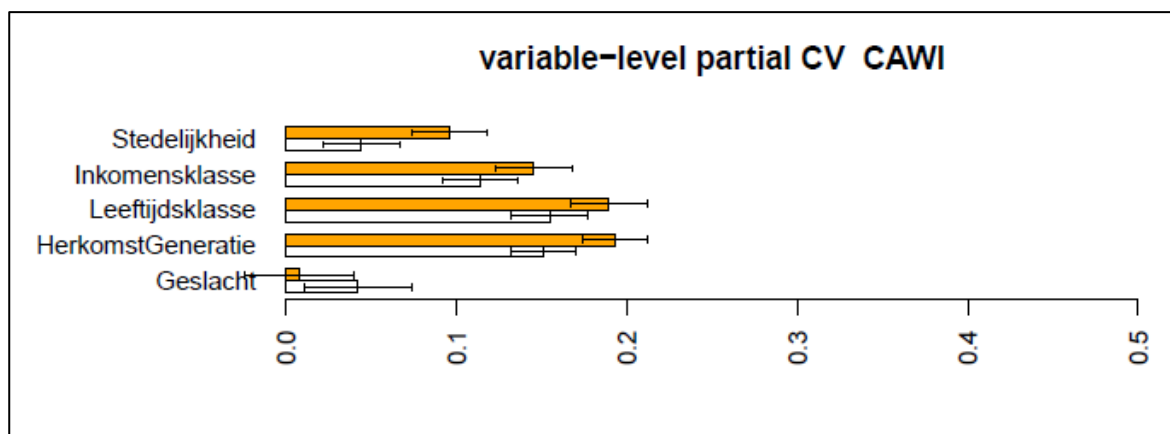
Figure 9. Classification tree for online response in the HS. The nodes also give the web-CAPI response rates when the whole stratum nonresponse is allocated to CAPI.



The next step is the set of decision rules or optimization approach. A mathematical optimization problem was formulated with the CV as objective function and subject to the three constraints on response size, CAPI workload and sample size. The nine population strata of figure 9 were sorted based on their web response propensities. Subsequently, the expected CV was estimated while moving the strata to CAPI one by one starting with the stratum with the lowest propensity. Doing so, a range of CV's was estimated and the best allocation was selected. Since in real data collection the web response rates vary and the CAPI workload is fixed, the allocation of strata to CAPI varies slightly from one month to the other. The resulting adaptive survey design has an average CV of 0.116, whereas the original uniform design had a CV of 0.158. It must be noted, however, that the optimization does not account for measurement bias differences between web and CAPI. In the adaptive survey design, non-respondents in some subgroups are never allocated to CAPI and are fully observed through web, while non-respondents in others are always allocated to CAPI.

Finally, a dashboard has been developed using a shiny app in R in which response and costs of monthly data collection can be monitored at any given time per mode and per subgroup. At the end of each month the web subgroup response rates are computed and form the basis for allocation of the strata to CAPI one month later. Figure 10 shows variable-level partial CV's for web and for web plus CAPI. Variable-level CV's measure the contribution to the total CV by one variable in analogy to a variance decomposition in ANOVA. It is clear that all variable-level CV's are smaller when CAPI response is added.

Figure 10: Variable-level partial CV for web and web plus CAPI^(*)



(*) Variable names are in Dutch: Stedelijkheid= Urbanization, Inkomensklasse= Income, Leeftijdsklasse= Age, Herkomstgeneratie= Ethnicity, Geslacht Gender. Yellow and white bars represent, respectively, unconditional and conditional partial CV. 95% confidence intervals are shown based on normal approximation.

3.3 Case study 3 – Dutch LFS

Currently, at Statistics Netherlands, a redesign of the LFS is prepared in which also adaptation is considered. Since 2012, the first wave of the Dutch LFS uses a mixed-mode design with web, CATI and CAPI. Web is offered as the first mode and web non-respondents are sent either to CATI or to CAPI. Households for which a phone number is available and that have at most four registered persons between 15 and 65 years are allocated to CATI. All other households go to CAPI. Hence, the LFS has a simple form of adaptation based on household size. In the redesign, more variables are included and stratification will be more advanced. The design features of interest are CATI and CAPI follow-up.

The Dutch LFS is a monthly household survey. It has a rotating panel design with five waves with time lags of three months. The second to fifth wave use only CATI interviews based on phone numbers provided in the first wave. We consider only the first wave in this example. The sampling design of the LFS is a stratified simple random sample without replacement of addresses. Addresses with persons registered between 15 and 25 years, with persons registered unemployed and persons registered as non-western non-native are oversampled, while addresses with persons registered of 65 years and older are under-sampled.

In 2012 and 2013, extensive research was conducted into an adaptive survey design for the LFS (Calinescu and Schouten 2013). Since the main survey statistic of the LFS is the unemployment rate, the research was focussed on this statistic. At the end of the study, an adaptive survey design was recommended, but implementation was postponed due to demands on logistics and case management. We describe again the five steps as they were taken in the study: priorities, risks, indicators, decision rules and monitoring.

The main priorities of the Dutch LFS are high precision of estimates, high response propensities across all relevant population subgroups, low bias towards true population values and a specified budget. LFS statistics are published monthly for six age and gender groups and annually for municipalities. Required precision is very high, around 0.5% on monthly statistics. Since statistics are used for various policy reasons, a high coverage of the population is imperative, i.e. high overall response propensities are requested. Both absolute values and changes in time of LFS statistics are deemed very important. With the high precision in

mind, these priorities demand a very high accuracy (mean square error) and comparability. Mode effects need to be avoided at all times and need to be quantified if they are conjectured to exist.

Given these priorities, the LFS faces the risk of mode effects in time series due to mode-specific selection and/or measurement biases. Furthermore, when such biases occur, also comparability of age and gender groups and of regional estimates are at stake. As for the Health Survey in section 3.2, the LFS may suffer from varying CATI and CAPI workloads due to variation in the web response. Unlike the Health Survey, the LFS produces monthly statistics and a problem in a particular month may immediately affect statistics.

In the 2012 and 2013 study, the main quality indicator was the absolute weighted mode effect of the unemployment rate relative to a single mode CAPI LFS. This means that the weighted unemployment rate was estimated for a candidate design and compared to the CAPI estimate. This was possible as various parallel runs had been conducted in 2010 and 2011. As a hard constraint, a maximum was set to the overall budget. Another hard constraint concerned precision; lower limits were set to the numbers of respondents per age and gender group. As a soft constraint, in order to ensure comparability between subgroups, absolute mode effects between relevant subgroups were allowed to differ at most a specified value, say 1%. This was operationalized as follows: For a candidate design, the subgroup unemployment rates were estimated and the corresponding CAPI subgroup estimates were subtracted. The resulting differences were forced to be constant over subgroups with a margin of 1%, e.g. all subgroups show a downward effect between 0% and 1%. As another soft constraint, the sample size was given an upper limit in order not to deplete Statistics Netherlands' sampling frame. Relevant subgroups were formed based on a mix of age, gender, household size, ethnicity and registered unemployment. A regression tree was conducted to predict unemployment using these five variables, leading to nine strata. For the nine strata, response propensities, costs per sample unit and method effects relative to CAPI were estimated for a range of designs with or without CATI and CAPI.

Table 24 shows the estimated weighted mode effects relative to CAPI. For example, for stratum 1 there is an estimated 1.5% higher unemployment rate in web relative CAPI and for stratum 5 there is a 4.5% lower unemployment rate. Since CAPI is the benchmark, obviously, mode effects of CAPI are 0%. In general, the web-CAPI sequential strategy is closest to CAPI, which is not surprising as about half of the answers are CAPI.

Table 24. Estimated mode effects for nine strata based on age, ethnicity, household size and registered unemployment relative to CAPI for a range of designs. Standard errors between brackets.

	<i>Stratum</i>								
	1	2	3	4	5	6	7	8	9
Web	1.5 (1.3)	0.0 (0.0)	-2.3 (1.4)	-4.5* (1.8)	0.9 (1.9)	-0.4 (1.3)	-2.2* (0.8)	0.6 (1.0)	-0.4 (0.9)
CATI	-0.1 (0.7)	-0.1 (0.2)	-2.3* (0.9)	-4.9* (1.2)	-0.6 (1.1)	-1.0 (0.9)	-0.8 (1.2)	-0.2 (1.4)	-1.2 (0.6)
CAPI	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
web-CATI	0.9 (1.2)	-0.1 (0.0)	-3.7* (1.4)	-1.7 (2.3)	0.5 (1.8)	-0.7 (1.3)	-3.0 (1.6)	0.6 (2.0)	-0.4 (0.9)
web-CAPI	0.9 (1.3)	0.0 (0.0)	-1.2 (1.4)	-2.0 (1.8)	0.6 (1.9)	-0.3 (1.3)	-1.2 (1.6)	0.4 (2.0)	-0.2 (0.9)

Table 25. Optimal stratum allocation probabilities for the LFS adaptive survey design.

	<i>Stratum</i>								
	1	2	3	4	5	6	7	8	9
Web									
CATI			0.3	0.3	0.5				
CAPI	0.4		0.7	0.7			0.7		
web-CATI		1.0			0.5	0.4		1.0	1.0
web-CAPI	0.6					0.6	0.3		

The adaptive survey design was optimized by formulating it as a mathematical optimization problem and then by searching the global minimum in weighted method effect towards CAPI through numeric optimization routines. As the optimization problem is non-linear and non-convex due to the absolute signs and the constraint on the subgroup methods effects, there is no guarantee of a global optimum. For this reason, several starting values were used in the numeric routines. One way to create starting values was to let them correspond to uniform designs with different modes. Another way to find starting values was to first solve simpler optimization problems in which one of the constraints was omitted. In the study the budget, the subgroup method effect and sample size upper limits were varied in order to explore robustness of optimal solutions. Table 25 shows the solution to the optimization problem where the budget was set at the original level, the subgroup method effect at 1% and the sample size at 10000. For three out of the nine strata, web-CATI is the strategy that is allocated (the allocation probabilities are equal to one). All other strata get a mix of strategy. CATI, CAPI, web-CATI and web-CAPI are allocated. The resulting design has an exotic mix of strategies. In subsequent optimizations, the solution space was restricted. For example by forcing all allocation probabilities to be either 0 or 1.

The strata with a mix of strategies are subject to randomization. For example, for stratum 1 each sample unit has a probability of 40% to be assigned to CAPI and 60% to be assigned to web-CAPI. In order to fix workloads, this sampling can be done with a fixed size, i.e. when stratum 1 consists of 1000 persons, say, then a simple random sample without replacement of 400 is drawn.

In monitoring the LFS, a dashboard has been created that considers response and costs but also survey estimates for various auxiliary variables after web, after web plus CATI and after web plus CATI plus CAPI.

Section 4 – Summary and a look ahead

4.1 Summary

In this deliverable, we set ourselves two main goals. The first goal is to provide an extensive overview of practises for the choice of mode strategy in the ESS surveys by all EU NSIs. This overview gives NSIs a framework in which they can position themselves and evaluate their own choices. It also gives hints as to how they may make such decisions in future (re)designs. The second goal is to introduce checklists for the choice of mode strategy and for mode allocation. With the choice of mode strategy, we refer to the selection of candidate modes for a survey and the strategy in which they are mixed, i.e. concurrent, sequential or a hybrid form. With mode allocation, we refer to adaptive mixed-mode survey designs in which mode strategies may differ for subpopulations.

The overview of current practices is based on the MIMOD survey among NSIs conducted in May 2018. NSIs have responded very well to this survey. As a result, the overview of mixed-mode designs for ESS surveys is quite complete and accurate. From the survey results, we concluded that mixed-mode designs have become the rule rather than the exception. We also concluded that adaptive mixed-mode survey designs are exception rather than rule.

We introduced two separate checklists, one for the choice of the sequence of modes (paragraph 2.2) and one for adaptive allocation (paragraph 2.3). The two checklists share many steps, however. Crucial steps include identification of main quality and cost objectives, identification of main risks, monitoring and evaluation. The two checklists cannot be detailed for the ESS surveys in all NSI based on the MIMOD survey. To do this, we would need an in-depth follow-up survey per NSI and per survey. We did illustrate the checklists for three case studies, one at ISTAT and two at CBS. With the case studies, we show how the checklist steps may be implemented. In general, per NSI and per survey, the main objectives and risks will differ and will lead to different designs.

4.2 Future exploration and research

Mode choice and mode allocation are at the core of survey design and analysis. In fact, all MIMOD WPs address pieces of the complex puzzle, ranging from questionnaire design, case management to estimation and analysis of mode effect. Since survey modes impact both representation errors and measurement errors, mode choice and mode allocation are a complex endeavour that demands for explicit objectives and risks assessment. In general, the focus in setting up mixed-mode designs is on representation errors, i.e. coverage and response. Although, probably all survey designers acknowledge the important role of mode-specific measurement, mode choice and allocation rarely involve explicit criteria for data quality in practise. Comparability and equivalence in respondent answers are usually restricted to the questionnaire design stage. However, in recommendations for mode choice and allocation, mode-specific measurement biases must be accounted for, even after careful questionnaire design. Given this incomplete picture of objectives and risks, we restrained ourselves from general recommendations, but limited ourselves to structuring mode choice and allocation.

The MIMOD survey gave valuable insight into current practices at ESS NSIs and may form the starting point for an additional inventory. In order to go a step further, we recommend to ‘translate’ the two checklists in

this deliverable into short follow-up questionnaires that evaluate each of the checklist steps in the ESS. These questionnaires would then identify main objectives and risks as viewed by NSIs, and, most importantly, would make clear how well actual implementations meet the objectives and avoid risks. Potentially, the checklists may also identify population subgroups for which adaptation is promising. Such a follow-up survey could be done for a sample of surveys and NSIs in a smaller project.

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Annex 1 - Examples of concurrent mixed-mode strategies used in the ESS

Mode combinations and mode choice are managed in different ways in the nine ESS surveys. This annex contains a description, survey by survey, of the main concurrent strategies used by NSIs.

Labour Force Survey (LFS)

Labour Force Survey is a multi-wave survey and the questionnaire is generally administrated by an interviewer. CAPI and CATI are the most frequent modes, sometimes in combination with PAPI or CAWI.

LFS Wave 1

For the first wave of LFS, Luxemburg, Finland, Czech Republic and Greece use concurrent strategies. Luxemburg and Finland let respondents choose the mode they prefer.

In **Luxemburg**, however, CATI or CAWI technique are initially assigned according to the availability of a phone number: “if a number is found in the phone register, the respondent falls into the CATI group and receives a letter that he will get a phone call. If no phone number is found, the respondent is allocated to the CAWI group and receives a letter as well, with an invitation to fill in an online questionnaire.

Nevertheless, respondents can switch interview modes at any time. After receiving the letter announcing a CATI-interview, the respondent can call the NSI (or send an email) to change to the CAWI mode. A new letter with the login and the password will then be sent to him.

The letters containing the CAWI-mode invitation inform respondents that they can ask to be switched to the CATI mode. The CATI invitation letters do not contain this information, as it is preferable to have a great share of CATI-interviews, at least for the first wave. But if a respondent refuses to participate by phone, he will be informed by the interviewer about the option to switch the interview mode.

Respondents are interviewed during 5 quarters and theoretically they can change the interview mode in each quarter”.

Luxemburg’s experience makes it clear how important communication strategies are for the management of the mode choice and for data quality. On one side respondents are free to choose the mode they prefer and this can have a positive impact on the participation rate, but on the other side, this choice is also guided by the NSI that try to ‘direct’ respondents towards the data collection technique that the NSI prefer for data quality reasons

In **Finland**, the LFS is conducted through a concurrent CATI-CAPI and respondents can choose the mode under certain conditions: “if no telephone number is found, the interviewer sends a letter to the respondent informing that he/she will come by to do a CAPI interview. At this point, the respondent can still contact the interviewer and choose CATI instead. This is done in order to increase survey coverage and reduce respondents’ burden”.

Greece and **Czech Republic** conduct the survey through CAPI and PAPI, but modes are assigned by the NSIs. As to Greece, modes are decided according to demographic variables and the availability of email addresses.

LFS Wave 2

For multi-wave surveys, it is easy to collect respondents' preference during previous waves. A fairly high number of countries – Croatia, United Kingdom, Portugal, Luxembourg, Belgium, Hungary, Germany and Ireland - let respondents choose the mode and this happens at the end of the first wave.

For instance, in the **Croatian** LFS, respondents are asked in wave 1 whether they prefer to be interviewed with CAPI or CATI next time (waves 2-4). The same happens in **United Kingdom**, that declares that “at the end of LFS wave 1 (that is only CAPI mode), the respondent can choose the mode they prefer at wave 2 or plus (still a CAPI or CATI interview).

Portugal – using a concurrent CATI - CAPI strategy – reports that “...at the end of the first wave (CAPI), the interviewer informs that the next interview will be CATI and asks for the best schedule. If a respondent requests CAPI, the initial mode is maintained. The choice of a telephone interview is only possible from second to sixth wave. If a respondent requests a different mode during collection period, he can only change it for the next wave”.

Similarly, in the **Hungarian** LFS, CATI can be chosen instead of CAPI for waves from 2 to 6 by giving the phone number to the interviewer in the first wave.

Belgium and **Luxemburg** let sampled people choose between an interviewer-assisted and a self-administered mode, CATI or CAWI. In Belgium, the mode choice is offered by the interviewer during wave 1 and also CAWI nonresponses are contacted by phone (if available).

However, some countries assign modes using as auxiliary variables the availability of land line or mobile phone numbers. This is the case of **Slovenia**, **Lithuania**, **Estonia** and **Italy** that adopt a concurrent CATI-CAPI strategy for the LFS second wave.

Survey on Income and Living Conditions (EU-SILC)

EU-SILC is another multi-wave survey where the questionnaire is usually administered by an interviewer: CAPI and CATI are the most frequent data collection modes.

EU-SILC Wave 1

For the first wave, most countries do not let respondents choose the mode: **Malta**, **The Netherlands**, **Czech Republic**, **Latvia**, and **Italy** mix concurrently CATI-CAPI, CATI-CAWI or CAPI-PAPI and assign modes using as auxiliary variables the availability of land line or mobile phone numbers and demographic variables.

On the contrary, **Hungary** and **Greece** let respondents choose the mode between CAPI or CAWI and PAPI or CAWI respectively. More in detail:

In **Hungary**, “for all surveys where modes can be chosen, an interviewer goes for a first visit and informs selected people about this possibility. If the respondent wants to choose CAWI instead of CAPI, then the interviewer provides him/her with link, username and password (prepared in advance in a sealed envelope).

Answering the questionnaire by CAWI is allowed for a given time period at the beginning of the data collection (1 month). When the monitoring indicates no response in that time, the interviewer visits the respondent in order to fill out the questionnaire by CAPI”.

Greece adopts PAPI and CAWI for both wave 1 and 2, letting respondents choose the mode.

“In general, an official letter is sent to all households selected in the sample, in order to inform that the survey will take place in a specific time period and that an interviewer will visit the household to collect the data. The (PAPI) questionnaires are not sent in prior to the household; however, they are available on ELSTAT website and reachable to every person interested in accessing them.

In particular, ELSTAT contacts some households via mail in order to inform them about the possibility of completing the survey questionnaire through the new web application. The households contacted are selected on the basis of certain criteria such as the education level of the household members, the age of the reference person and the access to internet connection at home, obtained from previous survey editions. These households are asked to send an e-mail stating their agreement to participate in the online survey in order to receive their personal username and password, as well as the instructions for completing the questionnaire online”.

Greece describes a concurrent mixed-mode design where strategies are varied based on covariates. It may be considered therefore a simple example of an adaptive design.

The strategy used by Greece - not sending the paper questionnaire to respondents but making it available on the website - is also adopted in some sequential CAWI-PAPI mixed-mode designs (described in paragraph 1.2.3). In all cases, this approach aims to promote CAWI and discourage the use of PAPI, being more expensive, more complex and riskier for timely data

EU-SILC Wave 2

Being multi-wave, also EU-SILC wave 2 (or subsequent waves) can easily let respondents choose modes concurrently. **Czech Republic** and **Slovenia**, adopting CAPI in the first wave, use interviewers to ask for mode preference for the next waves: The Czech Republic gives the possibility to be interviewed either by CAPI or by PAPI while in Slovenia respondents are asked whether they want to answer by telephone or face-to-face. Samples of subsequent waves are then divided in two subgroups, one for each mode, to contact concurrently.

Among countries assigning modes, **Malta** and **Cyprus** use a concurrent CATI-CAPI and decide the technique with respect to the availability of land line or mobile phone numbers. Malta uses also demographic variables. **Bulgaria** assigns CAPI or PAPI mode using as auxiliary variable the ‘Propensity to the mode from previous wave/survey edition’ and “data from administrative registers - from register ‘Pensions’, register of benefits and data on insured person”.

European Health Interview Survey (EHIS)

As to the European Health Interview Survey, **The Netherlands** and the **Czech Republic** mix an interviewer assisted mode (CAPI) with a self-administered mode (CAWI or PAPI) and assign them to respondents.

The **Swedish** strategy is worth noting, applying concurrently three modes: CAWI, PAPI and CATI. "Respondents' mode choice is allowed for web and paper while telephone is used as a last chance (web and paper still selectable during the reminder phase). However, if a respondent (for some reasons) would contact the NSI and would like to answer by phone instead, they would most likely accommodate such a request".

For EHIS 2014, Sweden also reports that:

- " 1) A pre-notification letter (short "teaser") was sent to the respondents;
- 2) Two weeks later a paper questionnaire was sent, together with an information letter that includes log-in for the web;
- 3) After another two weeks a reminder was sent (with no new questionnaire or log-in opportunities);
- 4) Two weeks after that a new reminder was sent, this time including a new paper questionnaire and log-in for the web;
- 5) Ten days later the telephone interviews started".

The **Estonian** EHIS is conducted through a concurrent CAPI and CAWI. "A pre-notification letter is sent to all sample persons (by email, if email addresses are available, otherwise by post/mail). At the beginning there is a definite period for responding through CAWI and after that CAPI. During the CAWI period, reminder letters are sent twice a week to sample persons' emails.

Information about possible survey modes (CAWI and CAPI) is included in the notification letter. Respondents can choose how to answer, simply by filling in the online questionnaire or communicating that they want to be interviewed by a CAPI interviewer". This make the choice of mode concurrent. "Only a very small %age of respondents inform the NSI about their choices or why they cannot answer CAWI. Mostly they communicate by email or by phone to the custom support".

In **Luxembourg**, sample units receive an invitation letter proposing to participate in the survey CAWI or PAPI. People wishing to participate are asked either to complete an electronic questionnaire on a dedicated website using a token (CAWI) or to send back a response coupon in a pre-paid envelope asking for a paper questionnaire (PAPI). In this second case, the NSI will send the paper questionnaire and a pre-paid envelope to send it back; an accompanying letter informs that the token is then deactivated. "The response coupons asking for paper questionnaires are collected by the study team who sends out an exemplar of the paper questionnaire in the requested language (French, German, English or Portuguese). The letter includes: an accompanying letter, the paper questionnaire and a pre-paid envelope to send back the paper questionnaire to the study team. The accompanying letter informs that the token is then deactivated.

Individuals are reminded through postal mail to reply to the survey (electronic questionnaire or paper questionnaire) in the following cases:

- did not connect to the website (token not activated) or
- did not requested a paper questionnaire or
- was no return mail (for example: incorrect addresses) or
- did not refuse to participate".

Asking respondents to send back a coupon in a pre-paid envelope in order to receive a paper questionnaire is another strategy to discourage the use of PAPI mode. However, it assumes a quite efficient postal system.

Adult Education Survey (AES)

Only three countries use a concurrent mixed-mode strategy for AES: **Belgium, Hungary** and **The Czech Republic**. Belgium and Hungary let respondents choose the mode, while Czech Republic assigns CAPI or PAPI mode to respondents.

In **Belgium** the Adult Education Survey is thoroughly self-completion: CAWI and PAPI are the techniques used. “Respondents are selected from the National Register and contacted by postal mail. The mailing contains an introduction letter, a paper version of the questionnaire, a send back envelope (free of charges) and instructions about participating by CAWI. The introduction letter mentions the two options and all respondents have from the beginning the choice between participating by paper questionnaire or by an online questionnaire”.

In **Hungary**, for AES, as well as for EU-SILC, respondents are informed about the possibility choosing mode by the interviewer at the first visit. If the respondent wants to choose CAWI instead of CAPI, link, username and password (prepared in advance, in a sealed envelope) are provided by the interviewer.

Information, Communication and Technology Survey (ICT)

For the Information, Communication and Technology Survey most countries use a concurrent mixed-mode where respondents can choose the mode. Only The Netherlands, with a concurrent CAWI-CATI, assigns modes in advance.

Some strategies used to let respondents choose the mode they prefer are described hereafter:

The Estonian ICT is conducted through CATI and CAWI. “Just like the EHIS Survey, notification letter is sent to all sample persons. If email addresses are available, then it is sent as an email, if not, by postal mail. Information about possible survey modes (CAWI and CATI) is included in the notification letter. Only a very small %age of respondents informs the NSI about their choices or why they cannot answer CAWI. Mostly they communicate it by email or by phone to the custom support.

At the beginning, there is a definite period for responding through CAWI, and after that CATI. From 2018 it has been tested in ICT the opportunity for CATI interviewers to direct the object back to CAWI (only for a short time), if the respondent so wished. Unfortunately, a very small part of them answered then CAWI. Mostly they were finally interviewed by the CATI interviewer”.

In **Switzerland**, “CAWI and CATI are mixed and participants are informed through the letter of advice that they can choose whether to compile the questionnaire online or by phone. Both modes can be chosen since the beginning of the survey. The letter is configured in a way the CAWI is promoted “a little bit more” (push to web communication strategy, as described in the Deliverable 2 of WP4). “Respondents do not have to communicate their choice. Either they fill out the CAWI or they phone the institute to conduct the interview. If they do not participate during a certain period, they are phoned by the institute which is mandated to conduct the interviews”.

Portugal conducts the national Household ICT survey mixing three techniques: CATI, CAPI and CAWI.

The implementation of CAWI in the ICT survey began in 2018. A push to web communication strategy was used: “the possibility to respond via CAWI was promoted and made available to all selected households for the first 3 weeks; after this period, the possibility to answer by CATI or CAPI was given.

In the advance letter respondents were informed that CAWI was available and the advantages of this mode and the support that could be given were underlined. Whenever no response was received after two months, mode was changed to CATI (if there was a phone number available) or CAPI. Respondents could also contact the NSI to request CATI or CAPI and change mode to the preferred one.

Communication could take place through a toll-free number, email and also through the CAWI electronic questionnaire: after login, in fact, it was possible to choose another mode for the interview, asking for CATI/CAPI interviewers”.

The NSI also reports that: “changing from CAWI to CATI is easy because the questionnaire is online. Changing to CAPI is more complex because the interviews are made offline and because the sample must have some geographical concentration to ensure CAPI working areas. Changing from CATI/CAPI to CAWI is easy, but they (*survey managers –ed.*) have to be very careful with confidentiality, so they chose not to fulfil any data in CAWI in case of break off”.

The Portuguese experience suggests that 1) the CAWI system can be also used as a communication means for respondents to express their mode preference; 2) when switching respondents among modes, attention should be paid to avoid geographical bias, when CAPI is involved, and to preserve from privacy violation data collected with CAWI in case of break-offs.

In **Belgium**, ICT is a totally self-completion survey, using concurrently PAPI and CAWI. “It is organized as a drop-off of the first wave of the Labour Force Survey. The face-to-face interviewer of LFS mentions the two options and delivers a paper version of the questionnaire, a send back envelope (free of charges) and instructions about participating by CAWI. Therefore, all respondents have, from the beginning, the choice between participating by paper questionnaire or CAWI”.

Belgium strategy can be considered a way to reduce costs by limiting the number of interviewer visits. However, involving the same household in more surveys may increase burden and may have consequences on data quality.

Household Budget Survey (HBS)

The Household Budget Survey is a survey providing a quite heavy burden, since respondents have to register their own expenditures for a certain period. Therefore, it may be relevant to let selected people choose the data collection method they consider more convenient.

This is the case of **Belgium**, **Poland** and **Hungary**, who use a concurrent CAPI-PAPI-CAWI where respondents can decide the mode on the base of their preference.

For **Belgium** only two (CAWI and PAPI) of the three modes used are mixed concurrently. “There is a first visit of an interviewer, who informs sample units about the possibility to participate using a paper version of the spending book (PAPI) or a web based tool (CAWI): the face-to-face interviewer, during the visit, delivers a paper version of the spending book and the instructions about participating via web, also specifying that during the data collection period households can switch the mode.

There is then a second visit, where the face-to-face interviewer checks the restarted purchases and conduct a CAPI interview on a different section of the questionnaire (it is also a multimode survey).

Similarly, **Poland** and **Hungary** use CAPI, PAPI and CAWI. During the first visit to the household, the interviewer presents paper and on-line diary and respondents can choose the more convenient method. All communication with respondents is based on contact with interviewer (personal, telephone, e-mail).

Slovenia, Cyprus, Lithuania and the **Czech Republic** adopt a concurrent CAPI-PAPI: they assign the mode to respondents so that it is decided a priori whether they have to fill in the questionnaire by themselves or with the face-to-face interview.

Harmonised European Time Use Survey (HETHUS)

As to the HETHUS Survey, only two countries - **Belgium** and **Estonia** – adopt a concurrent mixed-mode strategy, both with CAPI and PAPI techniques, that are assigned in advance. Belgium does not use auxiliary variables, while Estonia allocates modes on the base of the 'Propensity to the mode from previous editions'. Both countries use an in-house fieldwork.

Annex 2 - Examples of uniform and different communication strategies used by some NSIs

Uniform communication strategy for all surveys:

Country	Used communication means: Paper, email, sms, card or flyers used for advance letters, reminders to non-respondents or reminders break-offs	Strategy details
Slovenia	paper and flyer for advance letter; paper for reminders to non-respondents	<p>General strategy for WEB surveys is that advance letter is sent along with the information brochure, where there are detailed information how to log in the survey and some interesting results from previously conducted surveys. The in-house recommendation is that advance letter and reminders are sent in the beginning of the week (Monday or Tuesday). Selected persons who did not respond to the survey (also break-offs) receive reminders. In the first or second reminder (depends on the duration of the fieldwork and which combination of modes survey has) selected persons are informed on the forthcoming second mode.</p> <p>For instance:</p> <p>ICT (Sequential CAWI-CAPI): Advance letter + 2 reminders (<u>in 7 days intervals</u>). In the second reminder selected persons who have not yet responded are informed about the forthcoming visit of the interviewer (CAPI mode).</p> <p>AES (Sequential CAWI-CATI-CAPI): Advance letter + 2 reminders (in 7 days intervals). In the second reminder selected persons who have not yet responded (and break-offs) are informed about the forthcoming telephone interview (if telephone number was assigned) and the visit of the interviewer (if the telephone number was not assigned, or selected person was not contacted during the telephone interview).</p>
Luxembourg	paper and flyer for advance letter; paper for reminders to non-respondents	<p>Taking as example the LFS (Concurrent CAWI-CATI): if a phone number is found in the phone register, the respondent falls into CATI group and receives a letter that he will get a phone call.</p> <p>If no phone number is found, the respondent is allocated to the CAWI group and receives a letter as well, with an invitation for the survey. If there is no feedback (interview realised) the respondent will receive a reminder letter <u>after two weeks</u>.</p>
Malta	paper for advance letter; email and paper for reminders to non-respondents and breakoffs	First and second reminders are normally <u>sent after 2 weeks</u> (when applicable)
Spain	paper for advance letter; paper and telephone for reminders to non-respondents	Advance letter is sent <u>1 day before CAWI is open</u> . First reminder is sent <u>after 8-10 days</u> . <u>Break-offs</u> are followed up by <u>CATI 10 days after the last access to the questionnaire</u>
Latvia	paper for advance letter; cards for reminders to non-respondents	Advanced letters are sent <u>one week before field work starts</u> . In case of CAWI reminders (cards) are sent <u>one week</u> after field work has been started.

Different communication strategies:

Austria, AES (sequential CAPI-CAWI):

“Reminder letter: Only a special group of CAPI non Respondents (young males) got invitation letter for CAWI. Reminder card: Those people who did not finish CAWI received a post card reminder 2-3 weeks after the CAWI invitation letter.”

Estonia, EHIS (concurrent CAPI CAWI) and ICT (concurrent CATI-CAWI):

“We send a notification letter to all our Sample persons. If we have their email address, then we`ll send it as an email, if not, we`ll send it by post/mail. During the CAWI period, we send reminder letters twice a week to sample persons emails.”

Italy, ICT (sequential PAPI- CAWI):

“Advance letter (one week before the start of the fieldwork). Two reminders to non-respondents (10 days after the start and 25 days after the start of the fieldwork). Four e-mail reminders are sent to CAWI break-offs”.

France, ICT (partly sequential-partly concurrent):

“CAWI-PAPI - April 1: Advance letter with ID + Password to connect to the website. Three weeks later: Reminder letter (reminder of ID + Password) with PAPI Questionnaire + prepaid envelope. Three weeks later: Reminder letter.

CATI - April 1: Advance letter + Flyer. APRIL-MAY: Extra letter for refusal or household we cannot contact”.

Sweden, ICT (sequential CATI-CAWI): for the web survey:

“1)An information letter with log-in for the web is sent.

2)Two weeks later a reminder with new log-in is sent.

3)After further 10 Days the Telephone interviewing starts

4)After another 10 Days a new reminder with log in for the web is sent”

Annex 3 - The use of incentives described by the NSIs in the MIMOD survey

Country	Survey using incentives	Description of the use of incentives
Austria	EUSILC2, EHIS, AES, HBS,	<p>SILC: 15EUR voucher after finish, plus optional publication</p> <p>EHIS: up to 30EUR voucher are planned after finish. There is currently an internal discussion if we pay different incentive amounts depending on hard to reach areas. This was necessary during last data collection period in order to get equal regional distribution.</p> <p>AES: 30EUR voucher for CAPI, 50EUR voucher for CAWI.</p> <p>HBS: Plan: 50EUR voucher after finish. A bag at the beginning of interview. For CAPI only: A pen at the beginning of diary phase.</p>
Sweden	HBS, HETUS	HBS: Calculator unconditionally in advance, vouchers (ten euro) after completing the survey.
Belgium	HBS, HETUS	money if we receive the answers.
Hungary	EUSILC1 and 2, LFS2, AES, HBS	<p>Incentives are given in the 1st wave to those households who complete the questionnaire.</p> <p>In the case of CAPI or PAPI 250 gram of coffee for AES, a pen for the other surveys above.</p> <p>In the case of EU-SILC CAWI a tablet is going to be raffled among those completing the questionnaire.</p>
The Netherlands	LFS1, EUSILC1 and 2, AES, ICT	For most surveys we use a lottery of iPads among respondents. Some surveys give an unconditional incentive of €5. The HBS also gives a promised incentive of €30 in addition to the unconditional incentive. For EU-SILC we raffle iPads in wave 1 and give an unconditional incentive of €5 in later waves. We have experimented with other forms (conditional payment of €10) for EU-SILC and this is the design we chose.
Germany	EHIS	<p>In the EHIS two incentive strategies were used. Younger participants were offered a 10€-voucher after completing the questionnaire. This was done because participation rates in younger age groups are remarkably lower than in older age groups. Following this strategy we tried to increase the participation rates for the younger age groups.</p> <p>Older age groups were offered to participate in a lottery (50€-voucher). This was only possible once the questionnaire was filled out.</p> <p>Both incentive strategies were given conditionally.</p>
Switzerland	EUSILC1 and 2	SILC: unconditionally. rail checks
Czech Republic	LFS1, EUSILC1 and 2, EHIS, AES, ICT, HBS	We do provide small gifts / incentives to respondents, with the choice ideally connected to the topic of the survey / IHS survey module. Due to budget constraints, these are rather small "thank you" types of items. The exception is the HBS, where we provide monetary incentives to participating households.

Estonia	LFS2, EUSILC2, , EHIS, AES, ICT, HETUS	For taking part in conducting a survey, the respondents are intended to get a small present, such as a shopping bag, a reflector or a key-store. After participating in the survey we also send answerers a feedback letter. Most of the time we use email for this, sometimes we send it by post/mail. Starting last year we have organized lotteries to increase the response rate in CAWI. Mainly to respondents answering to surveys online (CAWI), we have sent out gift cards of different shops.
Finland	AES	We have tried out lotteries of gift cards (AES) as well as smaller incentives to all respondents (an online coupon to use in an online meal service in Leisure Survey). The results have not been very convincing; the incentives have not increased the response rate. At the moment we are focusing on developing information-based incentives (feed-back to respondents immediately after the survey).
United Kingdom	ICT, HBS	Unconditional financial incentives are occasionally used; Unconditional books of stamps are occasionally used.
Poland	AES, HBS	Gifts
Denmark	EUSILC1 and 2	For SILC respondents we offer a small lottery of 1 X DKK5000, 2 X DKK2500
Slovak Republic	LFS1, HBS	HBS: only these households which complete questionnaires obtain incentive- money LFS: gift-pen