Smart Survey Implementation

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https://cros.ec.europa.eu/dashboard/trusted-smart-surveys

Q2024, Speed Talk Session 2

Wednesday, 2024-06-05, 12:45 - 1:30 PM

Agenda

1. Smart surveys – what are they?
   Peter Lugtig, University Utrecht

2. Business process in the context of smart surveys
   Remco Paulussen , Statistics Netherlands

3. How does the general population think about smart features?
   Monica Perez, ISTAT

4. When are smart surveys mature?
   Barry Schouten, Statistics Netherlands / University Utrecht

Smart surveys - what are they?

Peter Lugtig, Utrecht University

What is a smart survey?

Three ingredients:

1. A survey
2. A ‘smart’ element
   - Sensors to collect other data: pictures, audio, locations, movements, etc.
3. Integrate the survey and smart element
   - After data collection: e.g. Fitbits with questionnaires on activities
   - During data collection: smartphone apps
     - Sensors help to make task easier
     - Sensor data are often processed on phone
     - Respondents can interact with sensor data

Schouten & Lugtig (in review). Combining surveys and organic data from sensors in Designed Big Data. Three case studies. *Journal of Official Statistics*

Why smart surveys?

- **Push** away from surveys
  - 1. surveys are costly and time-consuming
  - 2. topic: low centrality
  - 3. topic: high burden
- **Pull** towards smart surveys
  - 1. high availability of organic (smart) data
  - 2. costs of collecting and processing low
  - 3. high quality of data

Schouten & Lugtig (in review). Combining surveys and organic data from sensors in Designed Big Data. Three case studies. *Journal of Offficial Statistics*

Potential topics

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  - 1. surveys are costly and time-consuming
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  - 3. topic: high burden
- **Pull** towards smart surveys
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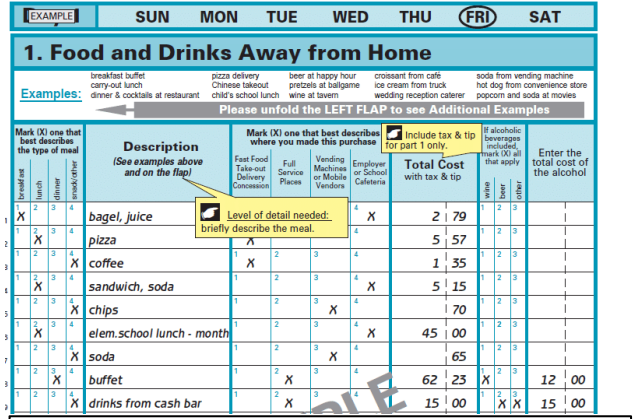
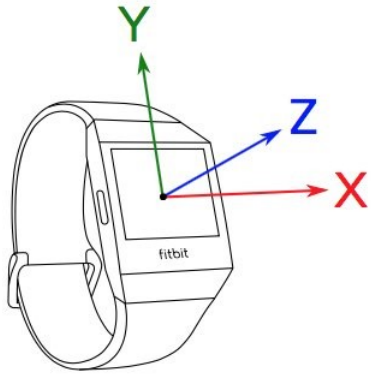


Day	What Did You Do?	For How Long?
Monday	Treadmill training	30 Minutes
Tuesday	Gym at school	45 Minutes
	Played outside	1 Hour
Wednesday	Played outside	2 Hours
Thursday	No activities	
Friday	Sports at school	2 Hours
	Treadmill training	30 Minutes
Saturday	Soccer	30 Minutes
	Played outside	1 Hours
Sunday	Treadmill training	30 Minutes



Schouten & Lugtig (in review). Combining surveys and organic data from sensors in Designed Big Data. Three case studies. *Journal of Offficial Statistics*

Smart Survey Implementation (2023-2025)

- Funded by Eurostat
  - Follows onTrusted Smart Statistics (2020-2022)

- Microservices for handling sensors within apps (IT)
- Methodology
  1. Recruitment
  2. Machine Learning
  3. User Interaction
  4. Mode effects
- Legal/ethical, data lifecycle, governance

Household budget Survey and microservices

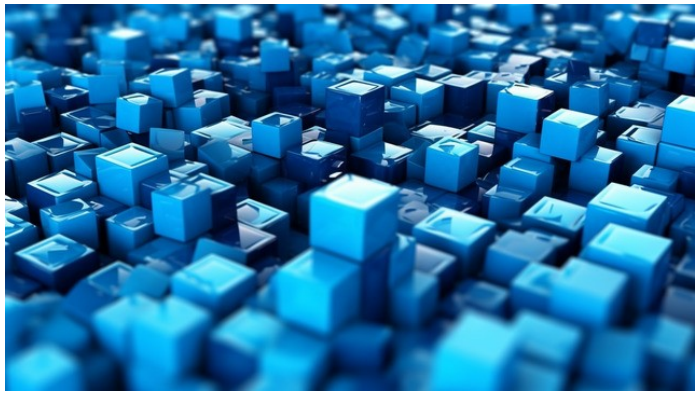
Youtube video:
Hbits (2023)
https://www.youtube.com/watch?v=BvmD5Zqv27s

Business process in the context of smart surveys

Remco Paulussen, Statistics Netherlands

Main objective

Provide concrete guidelines that will help NSI's to extend their business process to adopt smart solutions in their surveys

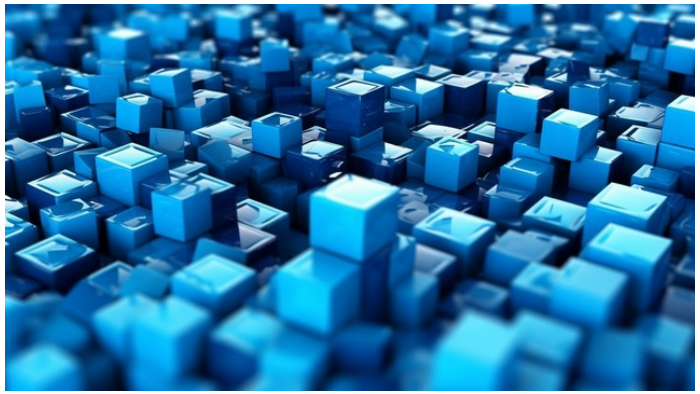


Help NSI's to model their business process and to identify the capabilities needed

Each NSI has its own situation, its own context and has its own ideas of applying smart solutions, and thus has its own process requirements

Process building blocks

So, what we are developing are **process building blocks**. A building block should be seen as a business process activity



The idea is that an NSI can use these building blocks to model their own production process

The focus of the set of building blocks is the statistical production process

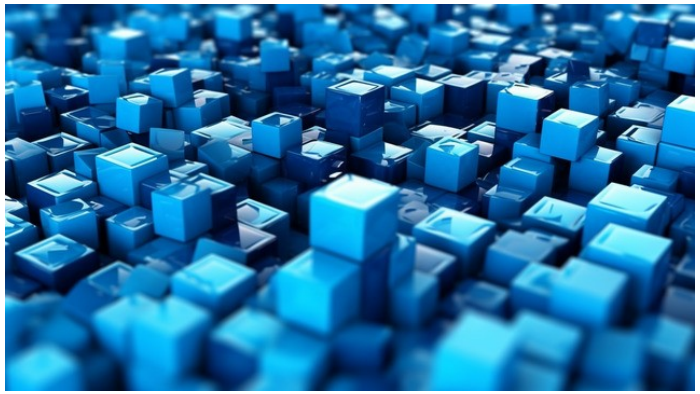
Scope

We only look at building blocks that are relevant for using smart solutions

Building blocks are non-NSI specific and have enough detail to show the ‘smart’ aspects

For now the scope is limited to ‘Internal sensors’ smart solutions (see SSI taxonomy), for now specifically the HBS

(later we will add blocks concerning TUS and maybe Energy data donation)



Example of building block: generic

2.1.4 Build and test app

Based on the design (and related decisions) the app should be build. Some NSI's will build it themselves, others will use an external supplier and others will (re)use an existing app.

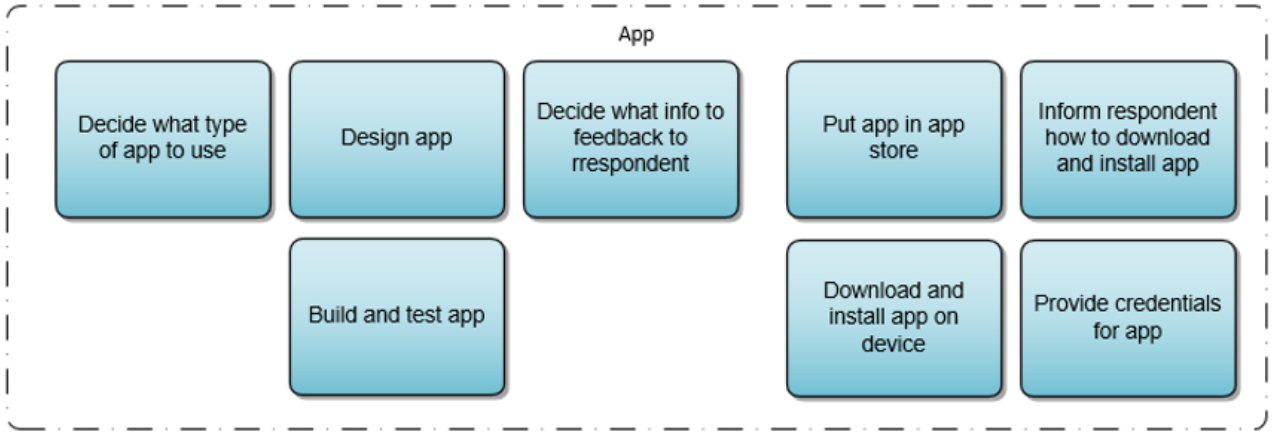
In the first case an NSI should have app-developers and app-testers available. Also you need specific development tools. This can have quite an impact on the organisation. E.g. do you see these actors as 'IT personnel' or as 'data collection instrument personnel'[4].

Regardless of the choice your NSI makes, you need to think about the governance / the application management. How you shape this largely depends on the maturity level you are in (see SSI Maturity model).

Also functionality and usability testing is within this activity.

Actors: app-developer, UI/UX-designer, app-tester, application manager

Other building blocks concerning apps:



Example of building block: specific (HBS)

2.3.1 Provide photo of a receipt

In this activity, the respondent uses the photo camera on his device. The goal is to obtain a photo good enough to OCR. That includes e.g. taking the photo, detecting of contrast, changing the contour of the receipt, cropping the receipt, removing the background, checking the quality of the photo, etc.

An Image Processing algorithm (a machine learning algorithm)
from a photo.

Having the complete receipt is important because it contains m
product/service rows.

Actor: Respondent

2.4.2 OCR/NLP the receipt

The goal of this activity is to read the text on the receipt and to apply the correct metadata to the different parts of text. The latter means that data must be linked to the correct variables: 'Aldi' is e.g. a shop name and 'Milk' is e.g. a product name.

This activity can be done at two moments in your process:

- On de smart device when the respondent is scanning the receipt.

'Receipt scanning'.

rocessing phase'.

fed back to the respondent,

ack in real time to the

eceipts.

2.10.2 Classify to COICOP (manually)

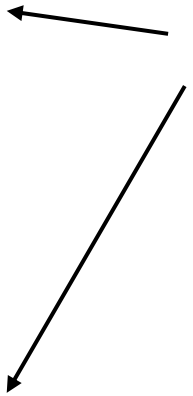
In this case classifying is not done automatically, but manual by a coder. Normally this activity is done next to the automatic classifying. Probably only articles that cannot be classified automatically are classified manually.

As input the result of the OCR/NLP activity is used and/or the actual photos/e-receipts (see 'Make photos / e-receipts available for manual classifying').

Actor: Coder

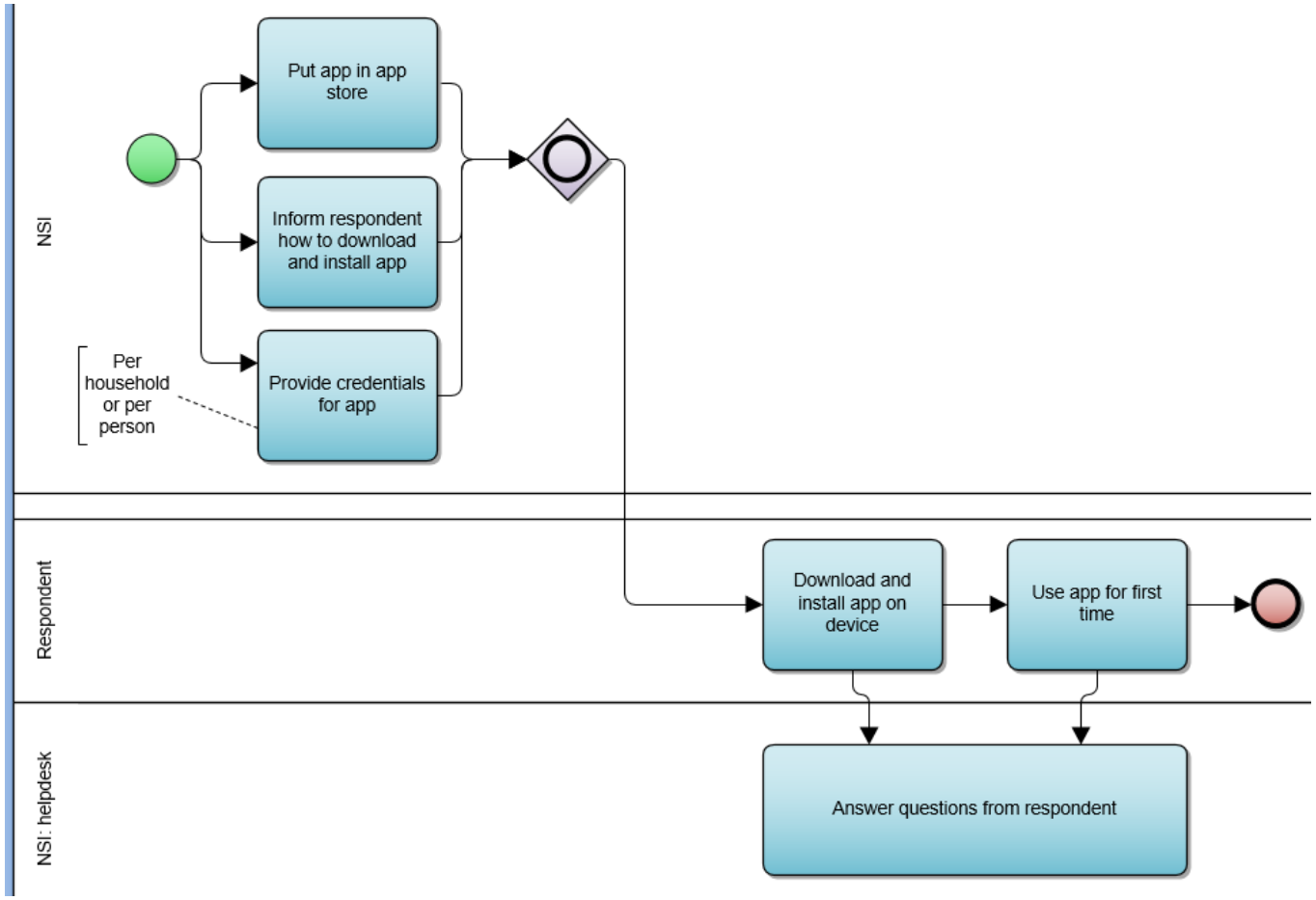
Grouped into logical groups

Group	Comprises process activities concerning…
App	…designing, building, downloading and installing an app
Collection strategy and communication strategy	…designing strategy and inform respondent about consent and privacy
Providing receipt	…scanning / uploading a receipt and entering additional information
OCR/NLP	…deploying the micro service, OCR/NLP the receipt, involvement of the respondent in this
OCR/NLP model	…the training / updating of the OCR/NLP model
Shop and product lists	…maintaining shop and product lists
Diary	…filling the diary with the individual receipt information, determining the moment of respons
Interviewer	…the role of the interviewer
Data processing	…processing activities
COICOP	…classifying to COICOP
COICOP model	…the training / updating of the COICOP model
Helpdesk	…the role of the helpdesk
Monitoring	…the monitoring of the process and the app usage



Link to PDCA-cycle
(also something we are going to describe in the SSI project)

Comprise your own process



With these building blocks you (NSI) can model your own smart process.

We will provide an example in the deliverables of the SSI project

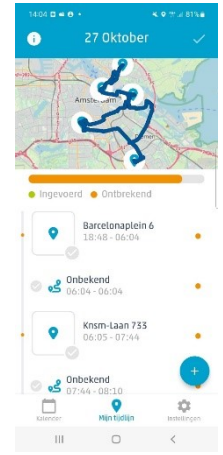
How does the general population think about smart features?

Monica Perez, ISTAT

A survey on perceptions about smart features

Why a survey?

- Willingness to go smart is a key requisite and a methodological challenge
- Country differences may affect comparability



Ambition:

- Find clues for ‘push-to-smart’ strategies (materials, interviewer tactics)
- Provide background to legal/ethical boards on GDPR decisions

Specific goals:

- Get input for tailoring and addressing respondent concerns in smart survey data collection strategies, in particular instructions, introduction materials and interviewer training;
- Get input for addressing the need to offer alternative modes to respondents next to apps;
- Learn how respondents like to keep control over data and what minimal respondent involvement during data collection is needed;
- Inform legal-ethical officers about respondent perceptions, in particular proportionality of the smart tasks and trade-offs in data minimization;
- Learn if and in what way achieving the above goals depends on the topic

The surveys in a glance

Fielded in Italy, the Netherlands and Slovenia between Sept 2023- Feb 2024

Survey design: a two-step survey including a (self-administrated) **paper questionnaire** (NWM-G) **followed by an online** 'smart' **survey** (NWM-S) including **four smart tasks.** The two questionnaire are sequential but offered to the respondents simultaneously

Paper questionnaire contains questions on device ownership and digital skills, perceptions and requirements towards the use of smart features of these devices in statistical surveys (3 blocks of questions)

Online questionnaire combines questions and measurements in short modules on four themes: travel, physical activity, consumption and energy

Same questionnaires in all countries, but differences between the countries in **sampling and data collection design**, mainly:

- Incentives strategies in NL and SL
- Face-to-face interviewers in IT (without admin. interview) and SL (interview by CAPI)

Overview of persons that completed NWM-G, partially completed NWM-G, completed NWM-S and broke-off in NWM-S; nonresponse

IT	NWM-G complete	NWM-G incomplete	NWM-G Nonresponse	Total
NWM-S complete	23%	0%	1%	23%
NWM-S Break-off	2%	0%	0%	2%
NWM-S nonresponse	43%	1%	31%	75%
Total	68%	1%	31%	3667
NL	**NWM-G complete**	**NWM-G incomplete**	**NWM-G Nonresponse**	**Total**
NWM-S complete	13%	0%	5%	18%
NWM-S Break-off	1%	0%	2%	3%
NWM-S nonresponse	9%	2%	67%	78%
Total	23%	2%	75%	4000
SI	**NWM-G complete**	**NWM-G incomplete**	**NWM-G Nonresponse**	**Total**
NWM-S complete	16%	NA	1%	17%
NWM-S Break-off	1%	NA	0%	2%
NWM-S nonresponse	33%	NA	49%	82%
Total	50%	NA	50%	2000

- **Participation rate** of the **NWM-G** survey varied greatly across the countries, from 23% in NL to 68% in IT. The differences likely reflect the different choices in the survey designs , mostly in the recruitment modes

- **Participation rate** of the **NWM-S** was very similar, it varied from 17% in SI to 23% in IT.

Hypothetical participation in smart tasks

Would you participate in a ISTAT/CBS/SURS survey which ask you to…?

SMART TASK	IT		NL		SL	
	Yes	Maybe	Yes	Maybe	Yes	Maybe
Share location	9%	16%	25%	25%	21%	23%
Share pictures of your house	7%	9%	12%	18%	7%	13%
Share data on energy use	24%	18%	41%	25%	18%	23%
Use an air quality monitor	29%	16%	47%	20%	33%	22%
Give your step counts	21%	14%	39%	23%	30%	22%
Wear an activity tracker from NSI	12%	14%	20%	20%	19%	19%
Take pictures/upload receipts	8%	13%	14%	19%	9%	14%

- NL respondents are the most willing in all task; SL willingness is usually between NL and IT
- **sharing data on 'use of energy'** and '**air quality monitoring**' reach the highest majority of respondents who would do it; highest in NL (66%; 67%), following SL (41% and 55%) and IT (42%; 45%)
- **'Sharing step counts'** turns out the willingness of one third of respondents in IT, much higher in SL (52%) and NL (62%); willingness in **wearing tracker activity** is quite aligned between countries
- **'Taking photos'**, especially photos of the house, is the task that respondents are less willing to do it
- **'Share location'** turns out a lower availability in IT in comparison to NL and SL

Hypothetical versus real willingness

Respondents were asked 4 smart tasks in the online 'smart' questionnaire **that mached to 4 of the hypothetical tasks in the paper questionnaire**

NWM-G hypothetical	*NWM-S observed willingness*								
	Shares			Is not able to			Not share		
	IT	NL	SI	IT	NL	SI	IT	NL	SI
Share location									
Yes	63%	62%	49%	23%	30%	23%	14%	9%	28%
Maybe	39%	56%	43%	36%	19%	21%	26%	24%	36%
No	17%	28%	20%	63%	22%	12%	20%	51%	68%
Don't know	32%	47%	9%	46%	18%	27%	23%	35%	64%
Share step count									
Yes	47%	66%	84%	42%	33%	14%	11%	1%	2%
Maybe	42%	58%	85%	55%	40%	15%	3%	2%	0%
No	20%	24%	80%	68%	75%	4%	13%	1%	16%
Don't know	21%	29%	100%	67%	71%	0%	12%	0%	0%
Share receipt									
Yes	18%	48%	22%	63%	47%	66%	19%	5%	12%
Maybe	18%	32%	20%	66%	56%	67%	17%	12%	13%
No	7%	16%	13%	46%	48%	43%	47%	36%	44%
Don't know	9%	24%	24%	43%	59%	53%	47%	18%	24%
Share meter reading									
Yes	15%	63%	8%	16%	8%	42%	69%	29%	50%
Maybe	5%	42%	12%	15%	10%	35%	81%	48%	54%
No	5%	8%	4%	9%	12%	36%	87%	80%	60%
Don't know	2%	22%	0%	10%	17%	30%	88%	61%	70%

- There is a **positive relation** between hypothetical and actual willingness, those who consented hypotethically turn out an higher rate of really sharing. For NL the relation it is true in all tasks. However, **the strength** of the relation **varies between countries a**nd **per smart task**
- Only **sharing location** has a **clear pattern** for all countries, thought it has unrealistic high rate of 'not able' that could hide refusals of respondents in doing the task
- **Share receipts** and **meters reading** shows **different patterns** between countries:
  - while most of NL willing to do it really **share receipts**, IT and SL more often are not able to do it
  - while most of NL willing to do it really **share meter reading photo**s, IT and SL more often do not share (meter reading not confortable, dark room; too much effort or unclear relevance of the task)

Perceptions

In general, how concerned are you about **your data being stolen and misused** by others?

	Did not go smart			Did go smart		
	IT	NL	SI	IT	NL	SI
Not	12%	25%	21%	16%	31%	26%
Somewhat	26%	34%	31%	33%	48%	37%
Quite	29%	26%	30%	29%	17%	26%
Very	33%	16%	17%	22%	5%	12%

When you are invited to participate in a study that collects data through smart devices, how important would it be for you **to be informed about what data will be collected**?

	Did not go smart			Did go smart		
	IT	NL	SI	IT	NL	SI
Not	8%	7%	6%	5%	1%	2%
Somewhat	8%	8%	7%	8%	9%	10%
Quite	22%	29%	37%	24%	36%	36%
Very	48%	55%	40%	59%	55%	51%
DK	18%		9%	4%		2%

How important would it be for you **to be able to control what data** will be collected?

	Did go smart			Did not go smart		
	IT	NL	SI	IT	NL	SI
Not	8%	8%	8%	6%	4%	3%
Somewhat	8%	8%	7%	10%	11%	10%
Quite	22%	33%	38%	26%	45%	46%
Very	41%	43%	36%	51%	39%	40%
DK	21%	9%	11%	7%	1%	2%

Factors influencing online smart participation and performing tasks

Background characteristics like age, educational level, country of origin and household size turn out to be factors influencing the propensity to the online smart response in all contries, thought with different strenght

In Italy, the propensity to the **participation to the online smart** suvey increases with the **educational level** and respondents turn out to be:

- more reluctant if they are **aged** >65 years
- more likely to be **Italians** (OR= 3.77) than foreigner
- more likely to live in a municipality with **less than 50,000 inhabitants** (OR = 1.52);
- more likely to live in the **northern regions** of the country (OR = 1.29);
- more likely to live in a household with **at least two components** and the propensity increases as the size of the household increases (OR = 1.41 and 2.14 for households with two to three components and with more than three components, respectively)

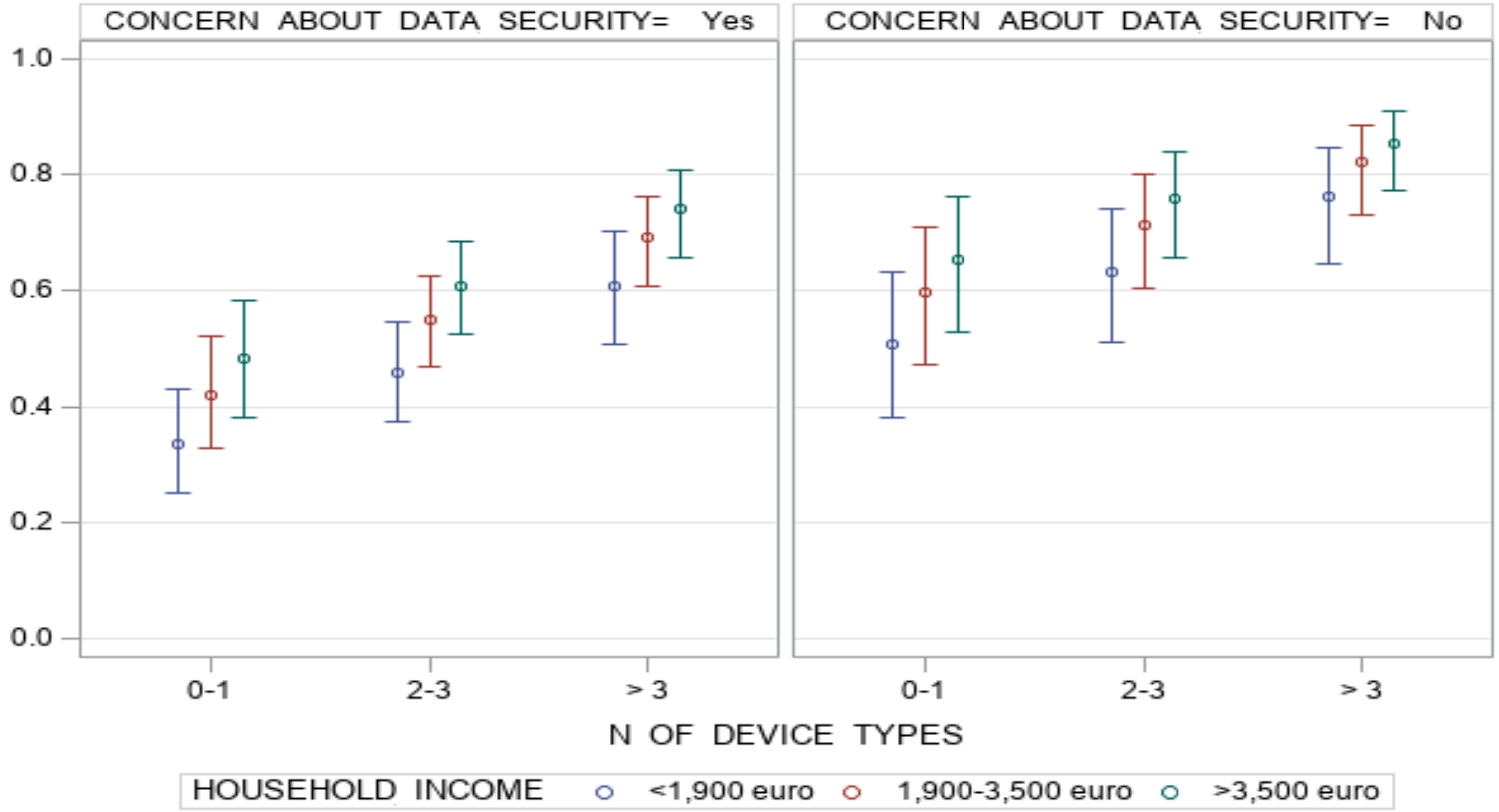
In contrast, background factors turn out to be weak predictors for smart task performance

Probabilities of performing at least one smart tasks

The Italian respondents using **more than 3 types of devices** and with a **household income above 3,500** euro are more likely to perform at least one smart task

Probability is higher for those **who are not concerned** that their data may be stolen or misused

Model-predicted probabilities for "At least one smart task performed" with 95% confidence intervals, by Concern about data security, Number of device types and Household income (*) (Italy)



(*) Model-predicted probabilities are calculated at *Geographical area* = "North", *Nationality* = "Italian".

Conclusions and next steps

Conclusions:

- While participation in the general survey varied across the three countries, the participation rate in the smart survey was very similar (around 20%)
- Both hypothetical and actual willingness vary across the countries and are not always consistent (NB: Survey was experimental by nature)
- Willingness to do smart tasks depends on the context and logic of the request
- Strongest hesitations come from concerns about data security, and, consequently, privacy
- Background characteristics turn out to be weak predictors in influencing smart task performance

Next steps:

- ✓ Elaborate analyses for open-ended questions
- ✓ Review and revise interviewer tactics, recruitment materials and in-survey help options for
  - Feelings of incompetence given digital skills
  - Concerns/uncertainty about data security/protection
  - Life cycle of smart data within the NSI and beyond
- ✓ Inform legal officers

When are smart surveys mature?

Barry Schouten, Statistics Netherlands / University Utrecht

Why a maturity framework and model?

Why a framework in the first place?

Smart surveys require considerable investments in methodology, IT and logistics. Knowing how investment paid off and knowing how much is still needed, is paramount information in making decisions (across the ESS).

Going smart only has a positive business case when ‘non-smart’ implementations score relatively weak with respect to smart implementations.

Concrete objectives:

- To determine whether smart solutions/services developed by SSI are (indeed) mature;
- To determine whether an NSI reached the maturity level that it strives for;
- To understand what steps are need to reach that desired maturity level;

The maturity framework

Going ‘smart’ requires maturity on five design dimensions:

- IT/technology: Handling of the smart features in frontend and backend
- Methodology: Push-to-smart, AI-ML, UI-UX
- Organization: General mindset, investment in a ‘smart’ data collection channel
- Legal-ethical: Risk assessments, proportionality and subsidiarity decisions, pen tests
- Logistics: Case management, interviewer involvement, monitoring, human-in-the-loop/active learning

Maturity levels:

1. Idea (mock-ups)
2. Pilot (proof-of-concept)
3. Production (stovepipe)
4. Managed (platform)
5. Optimized (expandable platform)

Focus area: Statistical business process regarding smart solutions					
Baseline / level 0: Prerequisites to use the model					
Maturity level	1 Awareness	2 Pilot	3 Production	4 Managed	5 Optimized
Focus aspects	*Maturity criteria*				
Methodology					
IT					
Logistics					
Legal					
Organization					

Maturity of SSI cases – preliminary Autumn 2023

SSI case studies: shop receipt handling (HBS), geotracking (TUS/Passenger Mobility), data donation energy meters (Energy statistics)

Design dimension	Receipt handling	Geo-tracking	Energy data donation
IT			
Methodology			
Organization			
Legal-ethical			
Logistics			

Maturity of receipt processing – Stat NL Spring 2024

Ten Stat NL employees from different departments involved in the Household Budget Survey were interviewed after their opinion on maturity of the app-assisted (‘smart’) HBS.

	DK	Level 1	Level 2	Level 3	Level 4	Level 5
Overall	0	1,33	5,83	2,83	0	0
Organization	0	2	5,5	2,5	0	0
Methodology	1	0,33	6,33	2,33	0	0
Logistics	0	3	4,5	2,5	0	0
IT	0	2,5	5,5	2	0	0
Legal	6	2	1	1	0	0

Conclusions and next steps

Conclusions:

- Framework and model are useful within the NSI but more elaboration and explanation is needed
- Employees vary in their opinions; partly a matter of different prior knowledge and involvement
- Still some steps to make

Next steps:

- Revise and elaborate the framework, in particular the criteria being used
- Evaluate for multiple NSI's and for multiple platforms using the solutions
- Perform and report another benchmark in Spring 2025 (perhaps a presentation at NTTS25)

The full framework and model can be found at:
https://cros.ec.europa.eu/book-page/report-logistics-41

Q&A

Thank You Thank You
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