Internet of Things: Cognitive Online-Pretest - October-November 2018

Lenzner, Timo; Neuert, Cornelia; Hadler, Patricia; Menold, Natalja

gesis Leibniz-Institut für Sozialwissenschaften

Internet of Things

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GESIS Projektbericht 2018|04

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1 Abstract

English version:

The Pretest lab of GESIS Leibniz Institute for the Social Sciences (Germany) was assigned the task to pretest a module on the Internet of Things (IoT) to be included, if deemed appropriate, in future waves of the Community Survey on ICT Use in Households and by Individuals conducted by the European Commission.

The aim of the cognitive pretest was to optimize the questions prior to their potential administration in the actual survey and thereby to improve data quality. The inclusion of a module on IoT in the Community Survey on ICT Use in Households and by Individuals is of interest to DG CNECT in order to monitor the evolution and adoption of recent technological solutions in this domain.

GESIS tested an English and a German version of the module with British and German respondents (n=120) in a web survey. In total, respondents received open and closed probes for four items. Some of the items do not need to be changed but the results indicate for a few questions that the answer options, the question order, or the German translations need to be improved. The pretest report includes recommendation to further refine the questions of the module.

Version française :

Le Pretest Lab de l'Institut Leibniz pour les sciences sociales GESIS (Allemagne) a été chargé de réaliser un essai préalable sur un module relatif à l'Internet des objets qui, s'il est jugé adéquat, sera inclus dans les futures vagues de l'enquête communautaire sur l'utilisation des TIC auprès des ménages et des particuliers, menée par la Commission européenne.

L'objectif de cet essai cognitif préalable était d'optimiser les questions avant leur intégration éventuelle à l'enquête actuelle et ainsi d'améliorer la qualité des données. L'inclusion d'un module relatif à l'Internet des objets à l'enquête communautaire sur l'utilisation des TIC auprès des ménages et des particuliers comporte un intérêt pour la DG CNECT afin de suivre les évolutions et l'adoption des solutions technologiques récentes dans ce domaine.

Le GESIS a donc testé les versions anglaise et allemande du module auprès de répondants britanniques et allemands (n=120) dans le cadre d'une enquête en ligne. Les répondants ont été interrogés au moyen de questions ouvertes et fermées portant sur quatre items. Certains items ne nécessitent pas d'être modifiés mais les résultats indiquent que pour certaines questions les options de réponse, l'ordre des questions ou la traduction allemande peuvent être améliorés. Le rapport d'essai présente des recommandations afin d'améliorer encore les questions de ce module.

2   Executive Summary

English version:

GESIS tested the following items of the module on the Internet of Things (in English and German):

Question Z1	Have you used any of the following devices or systems that are connected to the internet?
Probe 1 (for respondents who selected one of the answer options a), b) or c))[1]	You indicated that you have used the following devices or systems that are connected to the internet: "[answer option a), b), c)]" Have you controlled these devices remotely (e.g. via an App on a Smartphone or Tablet, voice assistant or another device) or locally (e.g. manually adjusting settings at the device itself)? ❍ Remotely via: _____ ❍ Locally
Probe intention	Probe 1 wanted to test whether respondents control the devices a), b), and c) remotely or locally. Respondents received this probe up to three times, depending on how many of the options a) to c) they had ticked in question Z1.
Results	British and German respondents control each of the three devices both remotely and locally. Those who control the devices remotely do so mainly via an app on a smartphone (UK: n=7, DE: n=6) or a tablet (UK: n=3, DE: n=1.) One German respondent said that he controlled the devices in answer category a) and c) via the virtual assistant "Alexa".
Recommendations	Instruction: We recommend re-wording the German version into "Bitte wählen Sie alle zutreffenden Antwortmöglichkeiten oder k) aus." This holds for questions Z2, Z3, and Z4 as well. Answer option k): We recommend re-wording the German version into "Ich habe <u>bisher</u> keine mit dem Internet verbundenen Geräte oder Systeme verwendet."
Probe 2 (for respondents who selected answer option e))[2]	You indicated that you have used the following devices or systems that are connected to the internet: "[answer option e)]" Which wearable devices did you have in mind when answering this question? Please describe these in more detail.
Probe intention	The goal of Probe 2 was to check whether respondents indeed thought about wearables that are connected to the internet and not about "non-connected"

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[1] a) Solutions for energy management for your home, such as internet-connected thermostat, utility meter, internet connected lights or plug-ins
b) Solutions to ensure the security/safety of your home, such as internet-connected home alarm system, smoke detector, security cameras, door locks
c) Home appliances such as internet-connected robot vacuums, fridges, ovens, coffee machines

[2] e) Wearable devices connected to the internet, such as smart watches, fitness bands, connected goggles or headsets, connected accessories, cloths or shoes

	versions of these devices. In addition, the probe aimed at investigating whether the distinction between answer options e) "Wearable devices connected to the internet" and f) "Internet-connected devices used for health and medical care" is clear to respondents.
Results	Most respondents provided "in scope" examples of wearables, such as "fitness bands", "smart watches", and "headsets" However, a few respondents also provided "out of scope" examples, such as "mobile phone", "tablet", and "laptop". No respondent thought about a device mentioned in answer option f). Hence, it seems that the distinction between answer options e) and f) is clear to respondents.
Recommendations	Consider re-phrasing this answer category so that it becomes clear that devices such as smartphones, tablets or notebooks should not be included.
Probe 3 (for respondents who selected answer option i))[3]	You indicated that you have used a car with built-in internet connection. Was this car equipped with internet access (e.g. in-car wifi) or did you connect to the internet via a smartphone/tablet? ○ Car was equipped with internet access ○ I connected to the internet via a smartphone/tablet
Probe intention	The intention of probe 3 was to assess whether respondents thought about cars which are equipped with internet access (in scope interpretation) or about cars in which they merely accessed the internet via smartphone or tablet (out of scope interpretation).
Results	In total, 10 respondents received this probe (UK: n=4, DE: n=6), of which most (UK: n=4, DE: n=4) said they connected to the internet via a smartphone or tablet. Hence, most of the respondents who selected this option misinterpreted it.
Recommendations	We recommend re-phrasing this answer category so that it becomes clear that situations in which respondents connect to the internet via a smartphone in a car should not be included: "A car with built-in wireless internet connection" // "Ein Auto mit eingebauter WLAN-Verbindung"
Probe 4	Other devices not mentioned above:
Probe intention	Question Z1 included an "Other" answer option so that respondents could type in additional devices or systems that were not mentioned in the answer categories. The goal of this "probe"/answer option was to find out whether the list of answer options is exhaustive and clear.
Results	Neither the British nor the German respondents mentioned any "other devices" that were not already included in the list of answer categories. This result suggests that the list of answer options is exhaustive and clear to respondents.
Recommendations	No changes recommended.

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[3] i) A car with built-in internet connection

Question Z2	What were the reasons for not using any of the aforementioned devices or systems that are connected to the internet?
Probe 5	Other reasons:
Probe intention	Question Z2 included an "Other" answer option so that respondents could type in additional reasons that were not mentioned in the answer categories. The goal of this "probe"/answer option was to find out whether the list of answer options is exhaustive and clear.
Results	Neither the British nor the German respondents mentioned any "other reasons" that were not already included in the list of answer categories. This result suggests that the list of answer options is exhaustive and clear to respondents.
Recommendations	Answer category c):
	Given that the phrase "and my family" does not apply to respondents who live alone, we suggest deleting it: "Concerns about the privacy and protection of data about me generated by those devices or systems."
	Answer category d):
	Given that answer option d) is double-barreled, we recommend splitting this answer category into two:
	1) Concerns about security, for example that the device or system will be hacked
	2) Concerns about safety, for example that the device or system could become harmful for other objects or for people

Question Z3	You have mentioned before that you have used wearable devices connected to the internet. What have you used them for?
Probe 6	Other purposes:
Probe intention	Question Z3 included an "Other" answer option so that respondents could type in additional purposes that were not mentioned in the answer categories. The goal of this "probe"/answer option was to find out whether the list of answer options is exhaustive and clear.
Results	Neither the British nor the German respondents mentioned any "other purposes" that were not already included in the list of answer categories. This result suggests that the list of answer options is exhaustive and clear to respondents.
Recommendations	No changes recommended.

Question Z4	Have you encountered any of the following problems when using the devices or systems that are connected to the internet?
Probe 7 (for respondents who also received question Z3)	When answering the previous question ("Have you encountered any of the following problems when using the devices or systems that are connected to the internet?"), did you only think about wearable devices, only about other devices or systems, or about both wearable devices and other devices/systems?
	❍ I thought only about wearable devices
	❍ I thought only about other devices or systems
	❍ I thought about both wearable devices and other devices/systems

Probe intention	The intention of Probe 7 was to examine whether there is a question order effect if respondents receive both question Z3 and question Z4. We wanted to find out whether they thought about all devices/systems they had used (intended interpretation) or only about wearable devices (unintended interpretation).
Results	Almost half of the respondents (48.3%) who received this probe said they had only thought about wearable devices when answering question Z4. This finding suggests an order effect in the way that many respondents who receive Z3 before Z4 interpret question Z4 as referring only to wearable devices instead of referring to devices or systems in general.
Recommendations	Question: We recommend asking question Z4 before question Z3 in order to reduce the likelihood of respondents interpreting question Z4 as referring only to wearable devices. Answer category a): Given that the phrase "and my family" does not apply to respondents who live alone, we suggest deleting it: "Problems with the privacy and protection of information about me generated by those devices or systems."
Probe 8	Other problems:
Probe intention	Question Z4 included an "Other" answer option so that respondents could type in additional problems that were not mentioned in the answer categories. The goal of this "probe"/answer option was to find out whether the list of answer options is exhaustive and clear.
Results	Two additional problems were mentioned by the respondents ("financial resources" and "problems with the speech recognition"), however, these do not seem to tap exactly into the construct that question Z4 intends to measure. Hence, the list of answer options may not need to be extended.
Recommendations	No changes recommended.

Version française :

Le GESIS a testé les items suivants du module relatif à l'Internet des objets (en anglais et en allemand) :

Question Z1	**Have you used any of the following devices or systems that are connected to the internet?**
Probe 1 (pour les répondants qui ont sélectionné l'une des options de réponse a), b) ou c)) [4]	You indicated that you have used the following devices or systems that are connected to the internet: "[answer option a), b), c)]" Have you controlled these devices remotely (e.g. via an App on a Smartphone or Tablet, voice assistant or another device) or locally (e.g. manually adjusting settings at the device itself)? ❍ Remotely via: _____ ❍ Locally
Intention du probe	Le Probe 1 visait à comprendre si les répondants ont contrôlé leurs appareils a), b) et c) à distance ou localement. Les répondants ont pu répondre à ce Probe jusqu'à trois fois, en fonction du nombre d'options a), b) et c) qu'ils ont cochées à la question Z1.
Résultats	Les répondants allemands et britanniques contrôlent chacun des trois appareils à la fois à distance et localement. Ceux qui contrôlent leurs appareils à distance le font principalement via une application sur un smartphone (UK : n=7, DE : n=6) ou sur une tablette (UK : n=3, DE : n=1). Un répondant allemand a indiqué avoir contrôlé les appareils des catégories de réponse a) et c) via l'assistant virtuel « Alexa ».
Recommandations	Instruction : Nous recommandons de reformuler la version allemande comme suit « Bitte wählen Sie alle zutreffenden Antwortmöglichkeiten oder k) aus ». Cette recommandation vaut également pour les questions Z2, Z3 et Z4. Option de réponse k) : Nous recommandons de reformuler la version allemande comme suit « Ich habe <u>bisher</u> keine mit dem Internet verbundenen Geräte oder Systeme verwendet. »
Probe 2 (pour les répondants qui ont sélectionné l'option de réponse e)) [5]	You indicated that you have used the following devices or systems that are connected to the internet: "[answer option e)]" Which wearable devices did you have in mind when answering this question? Please describe these in more detail.
Intention du probe	L'objectif du Probe 2 était de vérifier si les répondants ont bien pensé aux objets portables qui sont connectés à Internet et non aux versions non connectées de ces mêmes objets. De plus, le Probe visait à sonder si la distinction entre les options de réponse e) et f) est claire pour les répondants.

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[4] a) Solutions for energy management for your home, such as internet-connected thermostat, utility meter, internet connected lights or plug-ins
b) Solutions to ensure the security/safety of your home, such as internet-connected home alarm system, smoke detector, security cameras, door locks
c) Home appliances such as internet-connected robot vacuums, fridges, ovens, coffee machines
[5] e) Wearable devices connected to the internet, such as smart watches, fitness bands, connected goggles or headsets, connected accessories, cloths or shoes

Résultats	La plupart des répondants ont donné des exemples pertinents d'objet portable, comme des « bracelets de fitness », « montres intelligentes » et « casques audio ». Cependant, certains répondants ont également fourni des exemples « hors sujet » comme un « téléphone portable », une « tablette » et un « ordinateur portable ».
	Aucun répondant n'a pensé à un appareil mentionné à l'option de réponse f). Il apparaît donc que la distinction entre les options de réponse e) et f) est claire pour les répondants.
Recommandations	Envisager de reformuler cette catégorie de réponse pour indiquer clairement que les appareils tels que les smartphones, les tablettes ou ordinateurs portables n'entrent pas dans cette catégorie.
Probe 3 (pour les répondants qui ont sélectionné l'option de réponse i)) [6]	You indicated that you have used a car with built-in internet connection. Was this car equipped with internet access (e.g. in-car wifi) or did you connect to the internet via a smartphone/tablet? ❍ Car was equipped with internet access ❍ I connected to the internet via a smartphone/tablet
Intention du probe	L'intention du Probe 3 était de vérifier si les répondants ont pensé aux voitures équipées d'un accès à Internet (dans le champ d'interprétation) ou aux voitures dans lesquelles on peut accéder à Internet simplement avec un smartphone ou une tablette (hors du champ d'interprétation).
Résultats	Au total, 10 répondants ont été interrogés sur ce Probe (UK : n=4, DE : n=6), parmi lesquels la plupart (UK : n=4, DE : n=4) ont indiqué se connecter à Internet via un smartphone ou une tablette. Il apparaît donc que la plupart des répondants qui ont sélectionné cette option l'ont mal interprétée.
Recommandations	Nous recommandons de reformuler cette catégorie de réponse de telle façon qu'il devienne clair que les situations dans lesquelles les répondants se connectent à Internet avec un smartphone ou une tablette ne doivent pas être prises en compte : "A car with built-in wireless internet connection" // "Ein Auto mit eingebauter WLAN-Verbindung"
Probe 4	Other devices not mentioned above:
Intention du probe	La question Z1 comprenait une option de réponse « Autre » afin que les répondants puissent ajouter des appareils ou systèmes supplémentaires qui ne sont pas déjà inclus dans les catégories de réponse. L'objectif de ce probe/cette option de réponse était de savoir si la liste des options de réponse est exhaustive et claire.
Résultats	Aucun des répondants britanniques ou allemands n'a mentionné un « Autre » appareil qui n'était pas déjà inclus dans la liste des catégories de réponse. Ce résultat montre donc que la liste des options de réponse est exhaustive et claire pour les répondants.
Recommandations	Aucune modification recommandée.

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[6] i) A car with built-in internet connection

Question Z2	**What were the reasons for not using any of the aforementioned devices or systems that are connected to the internet?**
Probe 5	Other reasons:
Intention du probe	La question Z2 comprenait une option de réponse « Autre » afin que les répondants puissent ajouter des raisons supplémentaires qui ne sont pas déjà mentionnées dans les catégories de réponse. L'objectif de ce probe/cette option de réponse était de savoir si la liste des options de réponse est exhaustive et claire.
Résultats	Aucun des répondants britanniques ou allemands n'a mentionné une « Autre raison » qui n'était pas déjà incluse dans la liste des catégories de réponse. Ce résultat montre donc que la liste des options de réponse est exhaustive et claire pour les répondants.
Recommendations	Catégorie de réponse c) :
	Etant donné que la partie de la phrase « et ma famille » ne s'applique pas aux répondants vivant seuls, nous suggérons de la supprimer : « Inquiétudes concernant la vie privée et la protection des données me concernant générées par ces appareils ou systèmes. »
	Catégorie de réponse d) :
	Etant donné que l'option de réponse d) est composée de deux éléments, nous recommandons de la scinder en deux :
	1) Inquiétudes concernant la sécurité, par exemple, le fait que l'appareil ou le système soit piraté 2) Inquiétudes concernant la sécurité, par exemple que l'appareil ou le système puisse devenir dangereux pour d'autres objets ou les personnes

Question Z3	**You have mentioned before that you have used wearable devices connected to the internet. What have you used them for?**
Probe 6	Other purposes:
Intention du probe	La question comprenait une option de réponse « Autre » afin que les répondants puissent ajouter d'autres types d'utilisation de ces appareils qui n'étaient pas déjà mentionnés dans les catégories de réponse. L'objectif de ce probe/cette option de réponse était de savoir si la liste des options de réponse est exhaustive et claire.
Résultats	Aucun des répondants britanniques ou allemands n'a mentionné un « Autre » type d'utilisation qui n'était pas déjà inclus dans la liste des catégories de réponse. Ce résultat montre donc que la liste des options de réponse est exhaustive et claire pour les répondants.
Recommendations	Aucune modification recommandée.

Question Z4	Have you encountered any of the following problems when using the devices or systems that are connected to the internet?
Probe 7 (pour les répondants qui ont également été interrogés sur la question Z3)	When answering the previous question ("Have you encountered any of the following problems when using the devices or systems that are connected to the internet?"), did you only think about wearable devices, only about other devices or systems, or about both wearable devices and other devices/systems? ❍ I thought only about wearable devices ❍ I thought only about other devices or systems ❍ I thought about both wearable devices and other devices/systems
Intention du probe	L'intention du Probe 7 était de comprendre s'il existe un effet lié à l'ordre des questions dans le cas où les répondants sont interrogés sur les questions Z3 et Z4. Nous avons souhaité vérifier s'ils pensent à tous les appareils/systèmes qu'ils ont utilisés (interprétation voulue) ou seulement aux objets portables (interprétation non voulue).
Résultats	Près de la moitié des répondants (48,3 %) qui ont été interrogés sur ce probe ont indiqué avoir pensé seulement aux objets portables en répondant à la question Z4. Ce résultat montre qu'il existe un effet d'ordre qui a pour conséquence que les répondants interrogés sur la question Z3 avant la question Z4 pensent que cette dernière fait uniquement référence aux objets portables et non aux appareils ou systèmes en général.
Recommandations	Question : Nous recommandons donc de poser la question Z4 avant la question Z3 afin de réduire la probabilité que les répondants interprètent à tort la question Z4 comme faisant référence uniquement aux objets portables. Catégorie de réponse a) : Etant donné que la partie de la phrase « et ma famille » ne s'applique pas aux répondants vivant seuls, nous suggérons de la supprimer : « Inquiétudes concernant la vie privée et la protection des données me concernant générées par ces appareils ou systèmes. »
Probe 8	Other problems:
Intention du probe	La question Z4 comprenait une option de réponse « Autre » afin que les répondants puissent ajouter des problèmes supplémentaires qui ne sont pas déjà mentionnés dans les catégories de réponse. L'objectif de ce probe/cette option de réponse était de savoir si la liste des options de réponse est exhaustive et claire.
Résultats	Deux problèmes supplémentaires ont été cités par les répondants (« ressources financières » et « problème avec la reconnaissance vocale ») ; cependant, ces réponses ne correspondent pas exactement au champ que la question Z4 cherche à mesurer. Il n'est donc pas nécessaire de compléter la liste de réponses.
Recommandations	Aucune modification recommandée.

3   Sample

Number of web respondents:	120.	
Target population:	This online pretest was fielded in Great Britain and Germany. Half of the respondents were British (n=60), the other half were German (n=60).	
Selection of target population:	Quota sample.	
Quotas:	The selection of the target population was based on the following quota scheme:	

	UK		DE		Total
Age	**Male**	**Female**	**Male**	**Female**	
18–29	10	10	10	10	40
30–49	10	10	10	10	40
50–64	10	10	10	10	40
TOTAL	30	30	30	30	120

Question Z1 was answered by each of the 120 respondents. Whether respondents then received question Z2, Z3, or Z4 depended on their answers to question Z1. Therefore, we additionally aimed at the following number of cases per question in each country:

Question	
Z1 (Use of internet-connected devices)	Yes: 40; No: 20
Z2 (Barriers)	20
Z4 (Problems)	40
Thereof **Z3** (Wearables)	min. 15

Realized sample:

British respondents:

Age	Female	Male	Total
18 – 29	10	10	20
30 - 49	10	10	20
50 - 64	10	10	20
TOTAL	30	30	60

Question	
Z1 (Use of internet-connected devices)	Yes: 40 No: 20
Z2 (Barriers)	20
Z4 Problems	40
Thereof Z3 (Wearables)	19

German respondents:

Age	Female	Male	Total
18 – 29	10	10	20
30 - 49	10	10	20
50 - 64	10	10	20
TOTAL	30	30	60

Question	
Z1 (Use of internet-connected devices)	Yes: 40 No: 20
Z2 (Barriers)	20
Z4 Problems	40
Thereof Z3 (Wearables)	15

4   Methods

Field time:	15th to 17th of October 2018
Number of survey respondents:	120
Procedure:	Usage of an online questionnaire with additional open-ended and closed-ended probing questions (Web Probing)
Survey mode:	Web
Cognitive techniques:	Specific Probing
Incentive for respondents:	0.70 €

5 Results

Tested question:

English version:

Z1. The following questions concern the use of internet connected devices or systems for private purposes. These devices or systems can also be connected to each other in order to enable advanced services; e.g. remotely controlling the device, adjusting settings, giving instructions for tasks to be performed, receiving feedback from the device etc.

Have you used any of the following devices or systems that are connected to the internet?
Tick all that apply or k).

❏ a) Solutions for energy management for your home, such as internet-connected thermostat, utility meter, internet connected lights or plug-ins
❏ b) Solutions to ensure the security/safety of your home, such as internet-connected home alarm system, smoke detector, security cameras, door locks
❏ c) Home appliances such as internet-connected robot vacuums, fridges, ovens, coffee machines
❏ d) A virtual assistant in the form of a smart speaker or of an app, such as Google Home, Amazon Alexa/Echo/Computer, Google Assistant, Siri, Cortana, Bixby
❏ e) Wearable devices connected to the internet, such as smart watches, fitness bands, connected goggles or headsets, connected accessories, cloths or shoes
❏ f) Internet-connected devices used for health and medical care, for example, devices for monitoring blood pressure, sugar level, body weight (e.g. smart scales)
❏ g) Entertainment devices connected to the internet, such as smart TVs, smart speakers, game consoles etc.
❏ h) Toys connected to the internet, such as, robot toys (including educational) and dolls
❏ i) A car with built-in internet connection
❏ j) Other devices not mentioned above:_____
❏ k) I have not used any connected devices or systems

German version:

Z1. Die folgenden Fragen betreffen die Nutzung von mit dem Internet verbundenen Geräten oder Systemen für private Zwecke. Diese Geräte oder Systeme können auch miteinander verbunden sein, um erweiterte Funktionen zu ermöglichen; z. B. Fernsteuerung des Geräts, Anpassung der Einstellungen, Erteilung von Anweisungen zur Durchführung von Aufgaben oder Erhalt von Feedback von dem Gerät.

Haben Sie schon einmal die folgenden mit dem Internet verbundenen Geräte oder Systeme verwendet?
Mehrfachnennungen oder Option k) möglich.

❏ a) Lösungen für das Energiemanagement bei Ihnen zu Hause, z. B. mit dem Internet verbundene Thermostate, Stromzähler, Lampen oder Plug-ins
❏ b) Lösungen zur Gewährleistung der Sicherheit Ihres Zuhauses, z. B. mit dem Internet verbundene Alarmsysteme, Rauchmelder, Überwachungskameras oder Türschlösser
❏ c) Haushaltsgeräte, z. B. mit dem Internet verbundene Roboter-Staubsauger, Kühlschränke, Öfen oder Kaffeemaschinen
❏ d) Einen virtuellen Assistenten in Form eines intelligenten Lautsprechers oder einer App, z. B. Google Home, Amazon Alexa/Echo/Computer, Google Assistant, Siri, Cortana oder Bixby

> ❑ e) Mit dem Internet verbundene tragbare Geräte, z. B. intelligente Armbanduhren, Fitness-Armbänder, Brillen oder Headsets, Accessoires, Kleidung oder Schuhe
> ❑ f) Mit dem Internet verbundene Geräte für die Gesundheit und medizinische Vorsorge, z. B. Geräte zur Überwachung des Blutdrucks, des Blutzuckerspiegels, des Körpergewichts (z. B. intelligente Waagen)
> ❑ g) Mit dem Internet verbundene Unterhaltungsgeräte, z. B. intelligente Fernseher, Lautsprecher oder Spielekonsolen
> ❑ h) Mit dem Internet verbundenes Spielzeug, z. B. Roboter-Spielzeug (auch für pädagogische Zwecke) und Puppen
> ❑ i) Ein Auto mit eingebauter Internetverbindung
> ❑ j) Andere, oben nicht genannte Geräte:
> ❑ k) Ich habe keine mit dem Internet verbundenen Geräte oder Systeme verwendet

Z1: Table 1. Frequency distribution (N=120)

	UK (n=60)		DE (n=60)	
	n	%	n	%
a) Solutions for energy management for your home, such as internet-connected thermostat, utility meter, internet connected lights or plug-ins	11	18.3	7	11.7
b) Solutions to ensure the security/safety of your home, such as internet-connected home alarm system, smoke detector, security cameras, door locks	12	20.0	5	8.3
c) Home appliances such as internet-connected robot vacuums, fridges, ovens, coffee machines	4	6.7	7	11.7
d) A virtual assistant in the form of a smart speaker or of an app, such as Google Home, Amazon Alexa/Echo/Computer, Google Assistant, Siri, Cortana, Bixby	19	31.7	12	20.0
e) Wearable devices connected to the internet, such as smart watches, fitness bands, connected goggles or headsets, connected accessories, cloths or shoes	19	31.7	15	25.0
f) Internet-connected devices used for health and medical care, for example, devices for monitoring blood pressure, sugar level, body weight (e.g. smart scales)	6	10.0	3	5.0
g) Entertainment devices connected to the internet, such as smart TVs, smart speakers, game consoles etc.	29	48.3	26	43.3
h) Toys connected to the internet, such as, robot toys (including educational) and dolls	6	10.0	3	5.0
i) A car with built-in internet connection	4	6.7	6	10.0
j) Other devices not mentioned above:	-	-	-	-
k) I have not used any connected devices or systems	20	33.3	20	33.3
Nonresponse	-	-	-	-

Cognitive techniques: Specific Probing.

Respondents who selected one of the answer options a), b), c), e), or i) received (one or more) specific probes. Thereby, we wanted to find out whether they interpret these answer options in the intended

way. Additionally, question Z1 included an "Other" answer option so that respondents could type in additional devices or systems that were not mentioned in the answer categories. The goal of this "probe"/answer option was to find out whether the list of answer options is exhaustive and clear.

Findings:

Question Z1 asked respondents whether they had used any of the internet-connected devices or systems listed in the answer options. In accordance with the quotas defined, 20 respondents in each country answered that they had not used any connected devices or systems (answer option k)). The remaining respondents selected one or more of the other answer options a) to j). Due to the possibility to select multiple answer categories, percentages do not add up to 100 percent.

In both countries, the most frequently selected answer options were "Entertainment devices..." (UK: 48.3%, DE: 43.3%), "Wearable devices..." (UK: 31.7%, DE: 25.0%), and "A virtual assistant..." (UK: 31.7%, DE: 20.0%). Neither the British nor the German respondents mentioned any "other devices or systems" that were not already included in the list of answer categories. This result suggests that the list of answer options is exhaustive and clear to respondents.

Respondents who selected one of the answer options a), b), or c) received a probe which asked them to indicate whether they have controlled these devices/systems remotely or locally. Respondents received this probe up to three times, depending on how many of the options a) to c) they had ticked in question Z1. The results of this probe are shown in table 2:

Z1: Table 2. Frequency distribution of Probe 1.

	UK		DE	
	remotely	locally	remotely	locally
a) Solutions for energy management for your home, such as internet-connected thermostat, utility meter, internet connected lights or plug-ins	5	6	3	4
b) Solutions to ensure the security/safety of your home, such as internet-connected home alarm system, smoke detector, security cameras, door locks	4	8	3	2
c) Home appliances such as internet-connected robot vacuums, fridges, ovens, coffee machines	1	3	4	3
TOTAL	10	17	10	9

Table 2 shows that the British and German respondents control each of the three devices both remotely and locally. Those who control the devices remotely do so mainly via an app on a smartphone (UK: n=7, DE: n=6) or a tablet (UK: n=3, DE: n=1.) One German respondent said that he controlled the devices in answer category a) and c) via the virtual assistant "Alexa".

Respondents who selected answer category e) "Wearable devices..." received a probe asking them for the wearable devices they had in mind when answering question Z1. A total of 34 respondents received this probe (UK: n=19, DE: n=15). The goal of this probe was to check whether respondents indeed thought about wearables that are connected to the internet and not about "non-connected" versions of these devices. In addition, the probe aimed at investigating whether the distinction between answer options e) and f) is clear to respondents.

Most respondents provided "in scope" examples of wearables, such as "fitness bands" (UK: n=9, DE: n=7), "smart watches" (UK: n=8, DE: n= 5), and "headsets" (UK: n=0, DE: n=2). However, a few re-

spondents also provided "out of scope" examples, namely "iPhone" (TP185_UK), "mobile phone, tablet, laptop" (TP120_DE), and "mobile phone and tablet" (TP121_DE). No respondent mentioned a device that would better fit into answer option f) "Internet-connected devices used for health and medical care...". Hence, it seems that the distinction between answer options e) and f) is clear to respondents.

Respondents who selected answer option i) "A car with built-in internet connection" received a probe asking them whether this car was equipped with internet access (in scope interpretation) or whether they connected to the internet via a smartphone or tablet (out of scope interpretation). In total, 10 respondents received this probe (UK: n=4, DE: n=6), of which most (UK: n=4, DE: n=4) said they connected to the internet via a smartphone or tablet. Hence, most of the respondents who selected this option misinterpreted it.

Comments on question wording/translation:

The German translation of the respondent instruction ("tick all that apply or k)") is suboptimal in the way that it describes a possibility rather than explaining the response task. Therefore, we recommend re-wording it into: "Bitte wählen Sie alle zutreffenden Antwortmöglichkeiten oder k) aus."

The German translation of answer option k) does not exactly match the wording of question Z1. Therefore, we recommend re-wording it into: "Ich habe <u>bisher</u> keine mit dem Internet verbundenen Geräte oder Systeme verwendet."

Recommendations:

Question:	No changes recommended.
Instruction:	We recommend re-wording the German version into "Bitte wählen Sie alle zutreffenden Antwortmöglichkeiten oder k) aus." This holds for questions Z2, Z3, and Z4 as well.
Answer option e):	Consider re-phrasing this answer category so that it becomes clear that devices such as smartphones, tablets or notebooks should not be included.
Answer option i):	We recommend re-phrasing this answer category so that it becomes clear that situations in which respondents connect to the internet via a smartphone in a car should not be included:
	"A car with built-in wireless internet connection" // "Ein Auto mit eingebauter WLAN-Verbindung"
Answer option k):	We recommend re-wording the German version into "Ich habe <u>bisher</u> keine mit dem Internet verbundenen Geräte oder Systeme verwendet."

Tested question:

English version:

> **Z2.** **What were the reasons for not using any of the aforementioned devices or systems that are connected to the internet?**
> *Tick all that apply.*
>
> ❑ a) I didn't know such devices or systems exist
> ❑ b) I had no need to use connected devices or systems
> ❑ c) Concerns about the privacy and protection of data about me and my family generated by those devices or systems
> ❑ d) Concerns about safety and security, for example that the device or system will be hacked, could become harmful for other objects or for people
> ❑ e) Lack of skills to use those devices or systems
> ❑ f) Costs are too high
> ❑ g) Lack of compatibility with other devices or systems
> ❑ h) Other reasons:_____

German version:

> **Z2.** **Was sind die Gründe dafür, dass Sie keine der zuvor genannten mit dem Internet verbundenen Geräte oder Systeme verwendet haben?**
> *Mehrfachnennungen sind möglich.*
>
> ❑ a) Ich wusste nicht, dass solche Geräte oder Systeme existieren
> ❑ b) Ich hatte bisher keinen Bedarf derartige mit dem Internet verbundene Geräte oder Systeme zu verwenden
> ❑ c) Bedenken hinsichtlich der Privatsphäre und des Schutzes von Daten über mich und meine Familie, die durch solche Geräte oder Systeme erzeugt werden
> ❑ d) Bedenken hinsichtlich der Sicherheit, z. B. dass das Gerät oder System gehackt wird oder sich als schädlich für andere Objekte oder für Menschen herausstellen könnte
> ❑ e) Mangelnde Kenntnisse im Umgang mit diesen Geräten oder Systemen
> ❑ f) Zu hohe Kosten
> ❑ g) Mangelnde Kompatibilität mit anderen Geräten oder Systemen
> ❑ h) Andere Gründe:_____

Z2: Table 1. Frequency distribution (N=40; only if Question Z1=k))

	UK (n=20)		DE (n=20)	
	n	%	n	%
a) I didn't know such devices or systems exist	2	10.0	2	10.0
b) I had no need to use connected devices or systems	10	50.0	15	75.0
c) Concerns about the privacy and protection of data about me and my family generated by those devices or systems	5	25.0	7	35.0
d) Concerns about safety and security, for example that the device or system will be hacked, could become harmful for other objects or for people	5	25.0	7	35.0
e) Lack of skills to use those devices or systems	5	25.0	5	25.0
f) Costs are too high	10	50.0	4	20.0
g) Lack of compatibility with other devices or systems	4	20.0	2	10.0
h) Other reasons:	–	–	–	–
Nonresponse	–	–	–	–

Cognitive techniques: No direct probing.

Question Z2 included an "Other" answer option so that respondents could type in additional reasons that were not mentioned in the answer categories. The goal of this "probe"/answer option was to find out whether the list of answer options is exhaustive and clear.

Findings:

Only respondents who said that they have <u>not</u> used any of the devices or systems mentioned in question Z1 received question Z2, which asked them for the reasons for not doing so. In accordance with the quotas defined, 20 respondents in each country received this question. Due to the possibility to select multiple answer categories, percentages do not add up to 100 percent.

The reasons most frequently selected by the British respondents were "I had no need to use connected devices or systems" (n=10) and "costs are too high" (n=10). The reasons most often selected by the German respondents were also "I had no need to use connected devices or systems" (n=15) followed by "concerns about the privacy and protection of data…" (n=7) and "concerns about safety and security" (n=7).

Neither the British nor the German respondents mentioned any "other reasons" that were not already included in the list of answer categories. This result suggests that the list of answer options is exhaustive and clear to respondents.

Comments on question wording/translation:

In answer option c), the phrase "and my family" does not apply to people living alone. Therefore, we suggest deleting it.

Answer option d) is double-barreled. It should be considered to split this answer option into two reasons for not using devices or systems connected to the internet: 1) Concerns about security, for example that the device or system will be hacked; 2) Concerns about safety, for example that the device or system could become harmful for other objects or for people

Recommendations:

Question:	No changes recommended.
Answer category c):	Given that the phrase "and my family" does not apply to respondents who live alone, we suggest deleting it:

"Concerns about the privacy and protection of data about me generated by those devices or systems."

Answer category d):   Given that answer option d) is double-barreled, we recommend splitting this answer category into two:

1) Concerns about security, for example that the device or system will be hacked

2) Concerns about safety, for example that the device or system could become harmful for other objects or for people

Tested question:

English version:

Z3. **You have mentioned before that you have used wearable devices connected to the internet. What have you used them for?**

Tick all that apply.

❑ a) Make or receive phone calls or send/receive messages by connecting with a smartphone
❑ b) Search for information via the internet
❑ c) Health management: measuring metrics such as heart rate and calories burnt
❑ d) Track movement, e.g. distance, number of steps, route/path, etc.
❑ e) Find directions for your drive, ride or walk
❑ f) Track location
❑ g) Detect, report and handle a health incident
❑ h) Detect, report and handle a safety incident
❑ i) Experience virtual reality or augmented reality
❑ j) Controlling home appliances, e.g. air-conditioning, heating, lightning etc.
❑ k) Other purposes:_____

German version:

Z3. **Sie haben zuvor angegeben, schon einmal mit dem Internet verbundene tragbare Geräte verwendet zu haben. Wofür haben Sie diese Geräte verwendet?**

Mehrfachnennungen sind möglich.

❑ a) Um über eine Verbindung zu einem Smartphone Telefonanrufe zu tätigen/zu empfangen oder Nachrichten zu senden/zu empfangen
❑ b) Um im Internet nach Informationen zu suchen
❑ c) Zum Messen von Werten wie Herzfrequenz und Anzahl der verbrauchten Kalorien im Rahmen des Gesundheitsmanagements
❑ d) Zum Aufzeichnen einer Wegstrecke oder Route (z. B. Entfernung, Anzahl der Schritte, etc.)
❑ e) Zur Navigation bei Fahrten, Spaziergängen oder Wanderungen
❑ f) Zur Ortung oder Standortnachverfolgung
❑ g) Um einen Gesundheitsvorfall zu erkennen, zu melden und zu handhaben
❑ h) Um einen Sicherheitsvorfall zu erkennen, zu melden und zu handhaben
❑ i) Um eine virtuelle Realität oder erweiterte Realität zu erleben
❑ j) Zur Steuerung von Haushaltsgeräten, Klimaanlagen, Heizgeräten, Beleuchtung usw.
❑ k) Andere Verwendungen:_____

Z3: Table 1. Frequency distribution (N=34; only if Question Z1=e))

	UK (n=19)		DE (n=15)	
	n	%	n	%
a) Make or receive phone calls or send/receive messages by connecting with a smartphone	10	52.6	7	46.7
b) Search for information via the internet	8	42.1	7	46.7
c) Health management: measuring metrics such as heart rate and calories burnt	11	57.9	9	60.0
d) Track movement, e.g. distance, number of steps, route/path, etc.	15	78.9	11	73.3
e) Find directions for your drive, ride or walk	9	47.4	6	10.2
f) Track location	5	26.3	1	6.7
g) Detect, report and handle a health incident	3	15.8	-	-
h) Detect, report and handle a safety incident	3	15.8	2	13.3
i) Experience virtual reality or augmented reality	2	10.5	2	13.3
j) Controlling home appliances, e.g. air-conditioning, heating, lightning etc.	2	10.5	1	6.7
k) Other purposes:	-	-	-	-
Nonresponse	-	-	-	-

Cognitive techniques: No direct probing.

Question Z3 included an "Other" answer option so that respondents could type in additional purposes that were not mentioned in the answer categories. The goal of this "probe"/answer option was to find out whether the list of answer options is exhaustive and clear.

Findings:

Only respondents who said that they have used wearable devices connected to the internet (question Z1, answer option e)) received this question (UK: n=19, DE: n=15). Question Z3 asked respondents for what purposes they have used the wearable devices. Due to the possibility to select multiple answer categories, percentages do not add up to 100 percent.

In both countries, the most frequently selected answer options were "track movement" (UK: 78.9%, DE: 73.3%), "health management" (UK: 57.9%, DE: 60.0%), and "make or receive phone calls..." (UK: 52.6.9%, DE: 46.7%).

Neither the British nor the German respondents mentioned any "other purposes" that were not already included in the list of answer categories. This result suggests that the list of answer options is exhaustive and clear to respondents.

Recommendations:

Question:	No changes recommended.
Answer categories:	No changes recommended.

Tested question:

English version:

<table>
<tr><td>

Z4.   **Have you encountered any of the following problems when using the devices or systems that are connected to the internet?**

Tick all that apply.

❑ a) Problems with the privacy and protection of information about me and my family generated by those devices or systems
❑ b) Safety and security problems, for example that the device/system was hacked, has become harmful for other objects or for people
❑ c) Lack of skills to use those devices or systems
❑ d) Lack of compatibility with other devices or systems
❑ e) Other problems:_____
❑ f) I have not encountered any problem

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</table>

German version:

<table>
<tr><td>

Z4.   **Sind Sie bei der Nutzung von Geräten oder Systemen, die mit dem Internet verbunden sind, schon einmal auf folgende Probleme gestoßen?**

Mehrfachnennungen sind möglich.

❑ a) Probleme mit der Privatsphäre und dem Schutz von Informationen über mich und meine Familie, die durch solche Geräte oder Systeme erzeugt werden
❑ b) Sicherheitsprobleme, z. B. dass das Gerät/System gehackt wurde oder sich als schädlich für andere Objekte oder für Menschen herausgestellt hat
❑ c) Mangelnde Kenntnisse im Umgang mit diesen Geräten oder Systemen
❑ d) Mangelnde Kompatibilität mit anderen Geräten oder Systemen
❑ e) Andere Probleme:_____
❑ f) Ich bin auf kein Problem gestoßen

</td></tr>
</table>

Z4: Table 1. Frequency distribution (N=80; only if Question Z1=a)–j))

	UK (n=40)		DE (n=40)	
	n	%	n	%
a) Problems with the privacy and protection of information about me and my family generated by those devices or systems	4	10.0	7	17.5
b) Safety and security problems, for example that the device/system was hacked, has become harmful for other objects or for people	7	17.5	8	20.0
c) Lack of skills to use those devices or systems	8	20.0	13	32.5
d) Lack of compatibility with other devices or systems	7	17.5	4	10.0
e) Other problems:	-	-	2	5.0
f) I have not encountered any problem	23	57.5	19	47.5
Nonresponse	-	-	-	-

Cognitive techniques: Specific Probing.

Respondents who answered both question Z3 (wearables) and question Z4 (problems) and who said they used any other device in addition to wearables (question Z1) received a specific probe about the devices they had in mind while answering question Z4. With this probe we wanted to find out if there is a question order effect in the way that respondents who receive Z3 before Z4 think only about wearable devices (and not about devices or systems in general) when answering question Z4. Additionally, question Z4 included an "Other" answer option so that respondents could type in additional problems that were not mentioned in the answer categories. The goal of this "probe"/answer option was to find out whether the list of answer options is exhaustive and clear.

Findings:

Only respondents who said that they have used any of the devices or systems mentioned in question Z1 received question Z4, which asked them for any problems they had encountered when using these devices or systems. In accordance with the quotas defined, 40 respondents in each country received question Z4. Due to the possibility to select multiple answer categories, percentages do not add up to 100 percent.

Most respondents in both countries said that they had not encountered any problem so far (UK: 57.5%, DE: 47.5%). The problems most frequently selected were "lack of skills to use those devices or systems" (UK: 20%, DE: 32.5%) and "safety and security problems" (UK: 17.5%, DE: 20%).

The "other problems" category was only selected by two German (and no British) respondents. These two respondents mentioned "financial resources" (TP83_DE) and "problems with the speech recognition" (TP 84_DE) as other problems. While the first additional problem seems to refer to the (subjectively) high costs involved in purchasing internet-connected devices or systems, the latter seems to refer to the (lack of) technical sophistication of these devices or systems. Given that both problems do not seem to tap exactly into the construct that question Z4 intends to measure, the list of answer options may not need to be extended.

Respondents who answered both question Z3 (wearables) and question Z4 (problems) and who said they used any other device in addition to wearables (question Z1) received a specific probe about the devices they had in mind while answering question Z4. A total of 29 respondents received this probe (UK: n=17, DE: n=12). Of these, 14 respondents (48.3%) said they had only thought about wearable devices (and not about devices or systems in general) when answering question Z4. This finding suggests an order effect in the way that many respondents who receive Z3 before Z4 interpret question Z4 as referring only to wearable devices.

Comments on question wording/translation:

Similar to question Z2, the phrase "and my family" in answer option a) does not apply to people living alone. Therefore, we suggest deleting it.

Recommendations:

Question:	We recommend asking question Z4 before question Z3 in order to reduce the likelihood of respondents interpreting question Z4 as referring only to wearable devices.
Answer category a):	Given that the phrase "and my family" does not apply to respondents who live alone, we suggest deleting it:
	"Problems with the privacy and protection of information about me generated by those devices or systems."

6   Glossary: Cognitive Techniques

Think Aloud
„*Please vocalize everything that comes to your mind while you answer the following question. Please also vocalize things that seem unimportant to you. The question is...*".

Comprehension Probing
„*What would you say is a 'representative democracy'?*"

Category Selection Probing
„*You have just said that you strongly agree with this statement. Why did you select this answer?*"

Information Retrieval Probing
„*How did you remember that you went to the doctor [...] times in the past 12 months?*"

General/Elaborative Probing
„*Can you please explain your answer a little further?*"

Specific Probing
„*You have just answered 'yes' to this question. Does that mean that you have already done [...] or that you principally would do [...] if required, but have not yet done [...]?*"

Emergent Probing
„*I noticed that you frowned when I read out the answer categories to you. Could you please tell me why you did that?*"

Paraphrasing
„*Please repeat the question that I have just read out to you in your own words.*"

Confidence Rating
„*How sure are you that you went to the doctor [...] times in the past 12 months?*"