When You Can't Have What You Want
Measuring Users' Ethical Concerns about Interacting with AI Assistants Using MEESTAR

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As new AI technologies emerge, we need to assure these are in alignment with ethical values, standards and goals of individual users as well as society. Ethical implications associated with AI systems have been discussed extensively in the literature, where much theorizing *about* users has taken place but not enough empirical research *with* users has been conducted. In this explorative questionnaire study, I aimed at investigating the extent to which the MEESTAR model (e.g. Manzeschke et al. 2016) originally developed within the context of inclusive assistance systems for the elderly can be applied more generally to users' needs. To this end, sixty-four participants were presented with different AI scenarios in which the ethical values of *autonomy*, *safety*, *privacy, care, justice, participation* and *self-conception* were either violated or not. Ratings of concern in response to violations as well as ratings of the importance assigned to these aspects show that, firstly, *participation* and *care* generally need to be considered in the development of new AI systems whilst *privacy* was largely disregarded by participants. Secondly, the results indicate some mismatches between ratings of concern and importance: participants assigned importance to *safety, justice, autonomy* and *self-conception* but appeared less concerned with violations of these values. This supports the notion of a growing need to strengthen digital literacy by including more information about users' rights and about the consequences of violations in AI interaction. Finally, findings of any impact of gender, technical experience and time perspective on concern and importance ratings are discussed.

1. Introduction

Whenever new media and technologies emerge, they are met with scepticism and concerns by individuals and society. At the beginning of the silent film era, Münsterberg (1916) warned that the audiences could no longer follow realistic processes, since cuts and close-ups in the film would interrupt the natural narrative flow. When television arrived in living rooms, it was met with discussions about the harm it could cause physically or psychologically (Friedmann 1962; Heymann 1962; Rintelen 1962). Empirical evidence eliminated many fears: watching TV did not lead to epileptic seizures, X-ray damage or aggressive behaviour.

In the end, new media and technologies prevailed. No one could imagine living without movies, tv or the internet now! We rely on these media to meet our various needs. There is our need for information (e.g. seeking advice, curiosity), for personal identity (e.g. affirmation of our own identity, identification with others by means of social comparison), for a sense of belonging not only during COVID lockdowns as well as simple entertainment needs (e.g. distraction, escapism, relaxation; Rosengren et al. 1985; Zillmann 1988). Regarding people's core need for belonging or relatedness (Vansteenkiste et al. 2020), media serve to establish and maintain social contacts. They can even act as substitute for direct interpersonal contacts and relationships. Moreover, relatedness is important for our well-being according to Self-Determination Theory (SDT; Ryan/Deci 2000). Here, intelligent assistants such as emotional support robots developed for companionship can serve to meet those needs (Baecker et al. 2020). Humans generally try to avoid or reduce unpleasant states and to prolong pleasant states. Therefore, users prefer media offerings that allow them to be in pleasant states for as long and intensively as possible or that help to reduce (or eliminate) the intensity of unpleasant states (Zillman 1988). Accordingly, AI doesn't need to be a source of distrust, fear, and doom: who wouldn't appreciate a parking assistant when faced with a tight parking space?

However, to understand and successfully use new AI technologies, people need to develop digital literacy (e.g. Jones/Hafner, 2012). Even though different definitions of digital literacy exist, this concept usually entails different forms of literacy necessary to master interaction with technical devices: media literacy, computer literacy, internet literacy and information literacy (Leaning 2019). For instance, media literacy commonly refers to the ability to understand, evaluate and use media critically, independently and

responsibly (cf. Potter 2010). Achievement of media literacy, however, is a life-long process (Baacke 1999).

A consistency motive is also discussed as important cofactor in the acceptance and use of new technologies such as smart home devices (Marikyan et al. 2020; Donsbach 1989, 1991). Humans strive for a balanced state of their worldview, beliefs, thoughts, goals and behaviour. In the event of contradictions between our thoughts, goals and convictions or between our thinking and our acting, we experience cognitive dissonance. This cognitive dissonance is perceived as unpleasant, thus motivating us to reduce this state of tension (e.g. Festinger 1957). In a recent study, cognitive dissonance was observed when the performance of AI such as smart home devices didn't match high user expectations, which led to feelings of anger, guilt and regret (Marikyan et al. 2020). However, cognitive dissonance and dissatisfaction may not only be induced by lacking performance of AI. People will also distrust AI if it violates important values, standards and goals.

1.1 Ethical Implications

To address such ethical implications, Manzeschke (2015, 2014) developed a model to ethically evaluate AI technologies (Weber 2019). Although the MEESTAR model (i.e. *M*odell zur *e*thischen *E*valuation *s*ozio-*t*echnischer *A*rrangements) has been primarily developed for the context of nursing and health care for the elderly (e.g. assistive technologies), these ethical dimensions or values emphasized should also be important for AI users in general: *autonomy*, *safety*, *privacy, care, justice, participation* and *self-conception* (Manzeschke et al. 2016). Table 1 gives an overview over how Manzeschke et. al. (2016) define these ethical values in the context of MEESTAR.

Developed for the evaluation of specific technical applications, the literature suggests that ethical standards are important for our well-being in a variety of contexts. For instance, *autonomy* has been defined as a core psychological need and its importance in designing AI systems has already been emphasized in the theoretical literature (Calvoet al. 2020; Ryan/Deci 2017; Vansteenkiste et al. 2020). From a psychological perspective, *self-conception* is influenced by various identity processes and factors such as social comparison processes aiming at positive distinctiveness, which also entails the need for experiences of competence and mastery. Like *autonomy*, competence has been identified as a core psychological need (Vansteenkiste et al. 2020), which should also influence user experiences with AI. For *privacy*, empirical

evidence is mixed: whilst some studies emphasize user concerns linked to the violation of *privacy*, other findings suggest that users often neglect the implications that a violation of their own *privacy* may have (Acosta/Reinhardt 2020).

Table 1: Definitions of the seven ethical values by MEESTAR (Manzeschke et al., 2016)

Ethical Value	**Definition**
Autonomy	maximum freedom in own decisions or actions; includes acceptance and facilitation of autonomy of people with disabilities by their integration or inclusion
Safety	protection against serious harm (e.g. physically, mentally, financially) and against unethical practices
Privacy	extent to which people can protect their personal beliefs and actions from the public eye; entails the right to bypass observation and regulation; control over the information people are willing to share
Care	extent to which a person (or AI) can care for those partially or not at all able to care for themselves; entails questions about when technically assisted care may become ethically difficult because it opposes the personal beliefs and goals of the person being cared for (e.g. by creating unacceptable dependencies)
Justice	extent to which equal access to AI systems is provided to all humans in a non-discriminatory and unbiased way
Participation	degree to which of access, rights, and services necessary to be part of the community and society are granted to everyone
Self-conception	how we perceive ourselves; often influenced by the images and social narratives about what is a normal, healthy or successful self

For *justice* in terms of perceived fairness and equity as well as for *participation* in terms of inclusion in decision-making processes, impacts on psychological well-being have been demonstrated in the context of organizational processes: perceived procedural injustice in organizations negatively affects em-

ployees' psychological well-being, whilst organizational inclusion enhances employees' psychological well-being (Le et al. 2018; Qin et al. 2014). For *care*, the importance of caregivers enabling care receivers to remain in control of their care has been empirically demonstrated at least in the context of the elderly (Broese van Groenou 2020).

The literature above indicates that these seven ethical values can influence our well-being in a variety of contexts. In this study, I aimed at investigating the extent to which these values may be applied to the AI context. I was also interested in the extent to which individual difference variables will impact users' motivational needs, moral standards and considerations of ethical implications.

1.2 Individual Difference Variables Possibly Affecting Interaction with AI

Technical experience and age influence how people interact with technical devices: in touch interaction, younger participants interacted more intuitively with AI than older participants. Technically experienced participants interacted more intuitively with AI than those with less technical experience (Nowack 2018).

Age and gender have also been shown to influence psychological needs, ethical values, and risk perception (Beutel/Marini 1995). *Autonomy* seems to vary with age: Older participants pursue their goals with greater autonomy than younger participants (Mackenzie et al. 2018). Furthermore, women assign greater importance to the well-being of others (which relates to *care*) and less importance to being competitive (which relates to *self-conception*) compared to men (Beutel/Marini 1995). Women also demonstrated a greater awareness than men for a variety of risks including technological risks (e.g. Cyber Incidents). Here, women showed higher ratings of risk likelihood as well as higher impact ratings in the event of such an incident (Brown et al. 2021). Another individual difference variable linked to risk perception and willingness to engage in risky behaviour is an aspect of individual temporal orientation, namely time perspective (Zimbardo/Boyd 1999).

The construct of time perspective denotes a preference to rely on a particular temporal frame (i.e. past, present or future) for decision-making processes and behaviour. Individuals differ in the extent to which they emphasize one time perspective over the others (Zimbardo et al. 1997). For instance, present-oriented people tend to base their decisions and actions

on the immediate rewards a present situation offers. Future-oriented people focus on expected consequences that a present behaviour may have for the future. Past-oriented people mainly base their present actions on previous outcomes and events they recall from their past. The concept of time perspective has not only been investigated within the context of psychological time such as relationships with other aspects of temporal orientation or temporal event knowledge (Nowack/van der Meer 2013; 2014; Nowack et al. 2013). Time perspective has also been linked to general well-being, consumer behaviour, environmental engagement as well as risk perception (Klicperová-Baker et al. 2015; Milfont et al. 2012; Mooney et al. 2017). Whilst future-oriented individuals show a greater anticipation of consequences that a present behaviour may have for the near and distant future (Strathman et al. 1994), present time perspective has been linked to a low consideration of future consequences, sensation seeking, aggression, impulsivity and risk-taking behaviour (Zimbardo/Boyd 1999). For instance, present-oriented people show more risky driving behaviours and more often report the use of alcohol, tobacco and drugs (Keough et al. 1999; Zimbardo et al. 1997). Recent research also links past negative as well as present fatalistic time perspectives to increased risky driving behaviours, and future time perspective to low risky driving behaviour (Măirean/Diaconu-Gherasim 2021). Here, future time perspective appeared to facilitate risk perception with a mediating effect on risky driving behavior. The extent to which time perspective may influence user concerns, risk perception and ethical standards in an AI context, however, has not been investigated yet.

Based on the MEESTAR model (Manzeschke et al. 2016) and the literature cited above, I tested the following three hypotheses:

1. In line with the MEESTAR model, I expected that people are concerned with violations of the ethical values of *autonomy*, *privacy*, *self-conception*, *care*, *participation*, *safety* and *justice*. I also expected participants to rate these ethical values as important when interacting with AI.
2. I expected an impact of individual difference variables on ratings of concern when AI violates ethical values: age, gender, technical experience and time perspective should influence the extent of concern and, thus, median and agreement rates with the MEESTAR model (i.e. MEESTAR strength).
3. I expected an impact of individual difference variables on the extent to which people assign importance to these ethical values: age, gender,

technical experience and time perspective should influence importance rates (i.e. median and MEESTAR strength).

2. Method

2.1 Participants

Sixty-four German adults (28 women, 36 men) aged between 19 and 72 years (M = 36,7 years; SD = 14,9 years) took part in this study. All were German native speakers. All procedures performed in the study were in accordance with the ethical principles stated in the 1964 Helsinki Declaration. Informed consent was obtained from all individual participants included in the study.

2.2 Materials and Procedure

2.2.1 Technical Experience

All participants were asked to indicate the frequency with which they used a variety of technical devices at home (e.g. *smartphone*, *laptop*, *tablet pc*) as well as in public (e.g. *ticketing machine*, *self-service banking*) on a short paper-and-pencil questionnaire. For a total of seventeen items, participants simply had to select one of the following response options: 0 – *I don't know this device*, 1 – *never*, 2 – *rarely*, 3 – *once per month*, 4 – *once a week*, 5 – *almost daily*, 6 – *once per day* and 7 – *more than once per day*. The mean of all responses was calculated for each participant with a higher score indicating greater technical experience.

2.2.2 Time Perspective

To measure individuals' time perspective, a German version of the Zimbardo Time Perspective Inventory (ZTPI; Zimbardo/Boyd 1999) was used. Characterized by high retest-reliability and validity (Milfont/Bieniok 2008; Zimbardo/Boyd 1999), the original ZTPI consists of 54 items measuring time-related attitudes and behaviours on a 5-point Likert scale ranging from 1 (very uncharacteristic of me) to 5 (very characteristic of me) to distinguish between five dimensions: Past Negative, Past Positive, Present Fatalistic, Present Hedonistic and Future. To overcome the difficulty of the time dimension being confounded with valence in some ZTPI-items, a simplified version that excludes highly emotional items consisting of thirteen items for each the

past, present and future dimension was used. This shorter version of the ZTPI has previously been successfully applied in other studies (Nowack et al. 2013; Nowack/van der Meer 2013; 2014).

2.2.3 Ethical Aspects

To investigate the extent to which users may be concerned when ethical values are violated in interactions with intelligent home devices, two paper-and-pencil questionnaires (questionnaire A and questionnaire B) were developed. Each questionnaire consists of seven different scenarios with each scenario focusing on one of the seven ethical aspects of *justice*, *safety*, *participation*, *care*, *self-conception*, *privacy* and *autonomy* that are emphasized by the MEESTAR model. In questionnaire A, the ethical aspects of *justice*, *participation* and *care* were violated. In the remaining four scenarios, the ethical aspects *safety*, *self-conception*, *privacy* and *autonomy* were not violated. In questionnaire B, the ethical aspects of *safety*, *self-conception*, *privacy* and *autonomy* were violated. In the remaining three scenarios, the ethical aspects *justice*, *participation* and *care* were not violated. Please see table 2 for some examples as well as the Appendix for all the scenarios.

Table 2: Example scenarios for the ethical value of care: scenario without violation (left) and scenario with violation of this aspect (right)

***care* – No violation**	***care* – violation**
Marie has multiple sclerosis. Too much heat causes her illness to flare up again. It is therefore important that Marie avoids excessively high temperatures when showering. Since Marie, due to her illness (shaky hands; inability to perform fine motor movements), cannot operate her heating control via the keyboard or the display, her father visits her twice a week to adjust the water to a comfortable temperature for her before showering.	Marie has multiple sclerosis. Too much heat causes her illness to flare up again. It is therefore important that Marie avoids excessively high temperatures when showering. Since Marie, due to her illness (shaky hands; inability to perform fine motor movements), cannot operate her heating control via the keyboard or the display, she uses voice control to adjust the water to a temperature that is comfortable for her before she takes a shower.

After completing the questionnaires ascertaining their technical experience, time perspective and demographic data, participants were presented with either questionnaire A or questionnaire B depending on their participant number (i.e. uneven number – questionnaire A; even number – question-

naire B). After reading each scenario, participants were asked to indicate 1.) the extent to which they felt concerned about how ethical standards were fulfilled in that scenario and, 2.) the importance they generally ascribe to that ethical aspect. Participants rated their concern on a 5-point Likert scale ranging from 1 (*feeling not concerned at all*) to 5 (*feeling strongly concerned*). Likewise, the importance could be indicated on a 5-point Likert scale ranging from 1 (*completely unimportant*) to 5 (*very important*). The experiment was run in German; all items have been translated here into English.

2.3 Design

Age, technical experience and time perspective were considered as continuous independent between-subjects variables, gender as categorical independent between-subjects variable. For every participant, questionnaire responses (ratings of concern and importance) were recorded as dependent variables.

2.4 Data Selection, Cleaning and Reduction

Rates of concern as well as importance rates were calculated from the questionnaire responses and analyzed using the IBM SPSS Statistics Version 28. For Likert Scales, the most appropriate method as measures of central tendency are analyses of the median or mode (cf. Jamieson 2004). Whilst the median denotes the middle value in the list of all numbers, the mode is the value that occurs most often. Kruskal-Wallis-tests were conducted to examine influences of age, gender, technical experience and the violation of ethical aspects on participants rates of concern and on the rated importance of the seven ethical aspects. For a better differentiation, frequencies in per cent were also calculated for the different response options. After testing whether participants' responses significantly differed from random distribution[1], agreement rates (i.e. percentage of answers consistent with the MEESTAR model) were calculated, firstly, for the rates of concern when ethical aspects were violated, and, secondly, for importance rates that participants generally assigned to the seven ethical aspects. Neutral responses were coded as *not conforming* to the theory. An index of MEESTAR strength

1 Pearson's chi-square test showed that the five response options were not equally preferred (i.e. no random distribution).

based on Cohen's Kappa was then calculated whilst considering a probability of 40 per cent of responding in agreement with the MEESTAR model (i.e. only two of the five response options were in concordance; see also Nowack 2018; Hurtienne et al. 2010; Cohen 1960)[2].

Analyses of variance (ANOVA) as well as independent-samples *t*-tests were conducted to compare ratings of concern when ethical values are violated compared to when they are not. Repeated-measures analyses of variance (ANOVA) as well as paired-samples *t*-tests were conducted to compare ratings of concern as well as importance ratings of the seven ethical aspects after testing for normal distribution (Shapiro-Wilk test). Independent samples *t*-tests were also conducted to examine influences of age, gender, technical experience and the violation of ethical aspects on the frequencies (in per cent) of rates of concern and importance of the seven ethical aspects.

All effects are reported as significant at $p < .05$ (Bonferroni correction for multiple comparisons).

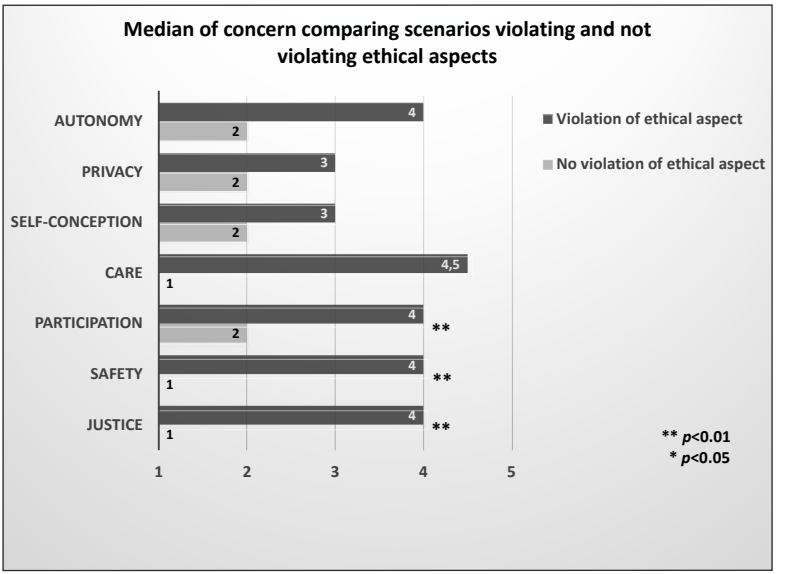
3. Results and Discussion

3.1 Hypothesis 1 – Agreement with The MEESTAR Model

To test the first hypothesis that people are concerned with violations of the ethical values of *autonomy*, *privacy*, *self-conception*, *care*, *participation*, *safety* and *justice*, I analysed whether participants reliably detected violations of the ethical values in the scenarios. As depicted in Figure 1, violations were detected and led to significantly higher ratings of concern compared to the scenarios in which ethical values were not violated.

2 MEESTAR strength (MS) $= \frac{observed agreement - .40(\text{i.e.}, probability of agreement)}{1 - .40(\text{i.e.}, probability of agreement)}$

Figure 1: Median of concern expressed by participants for scenarios in which ethical aspects were violated compared to scenarios in which not violation took place



I then calculated the agreement rates with the MEESTAR model (i.e. MEESTAR strength) for the ratings of concern when an ethical value was violated in the scenarios. MEESTAR strength ranges from -1 to 1 with negative scores indicating disagreement and a score of 0 indicating selection by chance (Viera/Garrett 2005). MEESTAR strengths below .20 indicate only slight agreement, below .40 fair agreement, below .60 moderate agreement. MEESTAR strengths of at least .61 relate to substantial agreement whilst MEESTAR strengths of .81 and above indicate almost perfect agreement with the theory (cf. Viera/Garrett 2005).

In this study, the general agreement with the MEESTAR model for all ethical values is just reaching moderate agreement (*Mean* = .40; *SD* = .56). For design purposes, one should usually aim for an agreement (here, a MEESTAR strength) of at least 0.61 denoting a substantial agreement (cf. Hurtienne et al. 2010). Accepting this threshold, the general MEESTAR strength yielded in this study contradicts the first hypothesis. This may be due to violations of some of the ethical values emphasized by MEESTAR model not leading to the

anticipated rates of concern. This is also supported by a repeated measures ANOVA with questionnaire presented (questionnaire A; questionnaire B) as between participants variable that was performed on concern ratings for the seven ethical values. There was a significant main effect for ethical aspects ($F(6,373) = 2.819$, $MSE = 1.574$, $p = .011$, $\eta^2 = .153$) on the concern ratings: MEESTAR strengths depended on which particular ethical value participants had to rate. Therefore, I also looked at concern rates for the seven ethical aspects individually.

Descriptive statistics for the seven ethical values individually are displayed in table 3 including median, modus, frequency (in per cent) of expressed concern (i.e. answer options *4 – rather concerned*, and *5 – strongly concerned*) and mean MEESTAR strengths (MS).

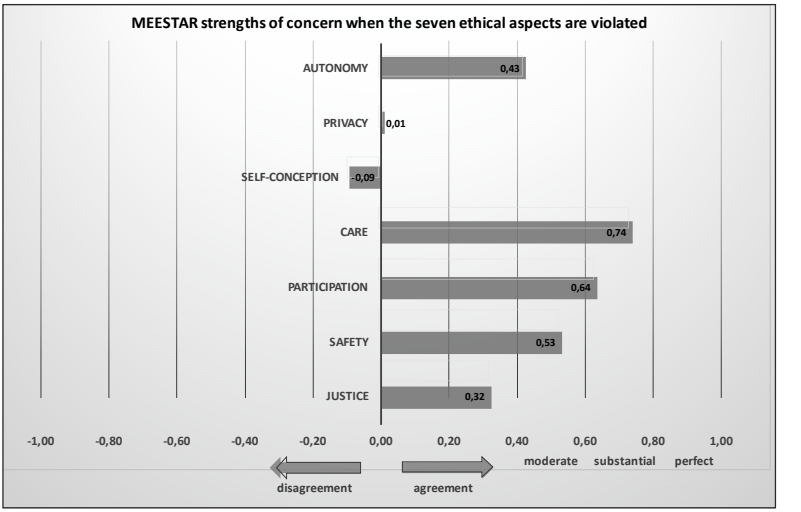
Table 3: Median, Modus, Frequency (in %) expressed concern and Mean MEESTAR strength (MS)

	Ratings of concern when ethical aspect is violated			
ethical value	Median	Mode	Frequency (in %) of expressed concern	Mean MEESTAR strength (MS)
justice	4	4	59.4	.32
safety	4	4	71.9	.53
participation	4	4	78.1	.64
care	4.5	5	84.4	.74
self-conception	3	3	34.4	-.09
privacy	3	2	40.6	.01
autonomy	4	5	65.6	.43
MS strengths below .20 denote slight agreement, below .40 fair agreement, below .60 moderate agreement, at least .61 substantial agreement, and .81 and above 'almost perfect' agreement (cf. Viera/Garrett 2005)				

Median and mode for the ethical values of *self-conception* and *privacy* suggest that participants in this study were less concerned with violations of these ethical values. A median and mode of 3 relates to a neutral response; a mode of 2 for *privacy* shows that most participants were rather unconcerned (see table 3). This is further supported by the MEESTAR strengths as shown in Table 3 and Figure 2. Whilst ratings of concern for violations of *self-conception* even contradict the MEESTAR model (i.e. slight disagree-

ment), concern ratings for violations of *privacy* almost reach no agreement. MEESTAR strengths for both *privacy* and *self-conception* were significantly lower than for all the other ethical values (all *p*'s < .01).

Figure 2: Agreement with the MEESTAR model (MEESTAR strength) for concern expressed by participants for scenarios in ethical aspects of justice, safety, participation, care, self-conception, privacy or autonomy were violated



As demonstrated in figure 2, participants in this current study were most concerned with violations of the ethical values *care* and *participation* (both reaching substantial agreement as well as both with significantly higher MEESTAR strengths compared to the other aspects; all *p*'s < .05). *Autonomy* and *safety* also led to concern reaching moderate agreement with MEESTAR. Concern ratings when aspects of *justice* were violated only reached a fair agreement with the MEESTAR model. These findings suggest that contrary to my first hypothesis, participants in this current study were not as concerned with violations of some ethical values as emphasized by the MEESTAR model for interaction with AI: this is especially true for *self-conception*, *privacy* and *justice*.

Regarding the importance of the seven ethical values, I first conducted independent samples Kruskal-Wallis-Tests to examine the impact of the questionnaire presented to the participants on their ratings of importance.

For all seven ethical values highlighted by the MEESTAR model, participants showed no significant differences in importance ratings (all *p*'s > .05). This means that importance ratings were not influenced by whether a particular ethical aspect was violated in a scenario or not.

I then calculated the agreement rates with the MEESTAR model (i.e. MEESTAR strength) for the importance ratings. A repeated measures ANOVA was performed on the ratings of importance for the seven ethical values. Contrary to the ratings of concern, the general agreement with the MEESTAR model for all seven ethical values was substantial (*Mean* = .62; *SD* = .38). This indicates that participants may consider all the ethical values emphasized by MEESTAR as important for interacting with AI. However, they appear to be less concerned with violations of these values than the MEESTAR model would suggest.

There was also a significant main effect for ethical aspects ($F(6,378) = 10.049$, $MSE = 2.444$, $p < .001$, $\eta^2 = .138$) on the importance ratings: MEESTAR strengths for importance depended on which particular ethical value participants had to rate. These differences are also found when analysing the seven ethical values independently.

Table 4 depicts descriptive statistics for the seven ethical values including median, modus, frequency (in per cent) of importance ratings (i.e., answer options *4 – rather important*, and *5 – very important*) and mean MEESTAR strengths (MS).

Median and mode for importance ratings for the seven ethical values indicate that, except for *privacy*, participants considered all values as *rather important* or *very important* when interacting with AI. Figure 3 depicts the agreement with the MEESTAR model for the importance ratings of the seven ethical values individually. *Privacy* reached significantly lower MEESTAR agreement than all the other aspects (all *p*'s < .001), achieving only a slight agreement with MEESTAR for importance ratings. *Self-conception* also reached a significantly lower MEESTAR strength than the other ethical values (all *p*'s < .05), except for *justice*, but still achieved a moderate agreement. Like the concern ratings, the ethical value of *care* was also considered the most important value, reaching substantial agreement. However, the differences for *care* were only significant for the aspects of *justice*, *self-conception* and *privacy*. Substantial agreement was also found for the ethical values of *safety*, *justice*, *participation* and *autonomy*.

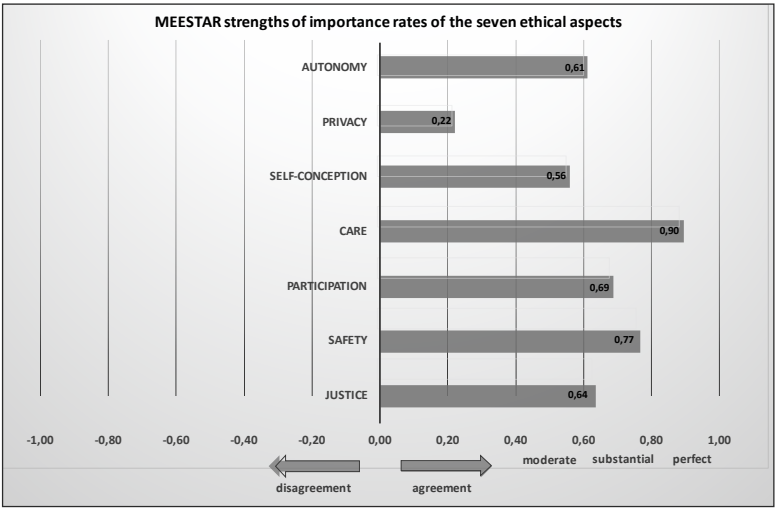
Table 4: Median, Modus, Frequency (in %) expressed concern and Mean MEESTAR strength (MS)

	Importance ratings of ethical aspects when interacting with AI			
ethical value	Median	Mode	Frequency (in %) of expressed concern	Mean MEESTAR strength (MS)
justice	4	4	78.1	.64
safety	5	5	86.0	.77
participation	4	5	81.3	.69
care	4.5	5	93.8	.90
self-conception	4	4	74.5	.56
privacy	3.5	4	53.2	.22
Autonomy	5	5	76.6	.61
MS strengths below .20 denote slight agreement, below .40 fair agreement, below .60 moderate agreement, at least .61 substantial agreement, and .81 and above 'almost perfect' agreement (cf. Viera/Garrett 2005)				

Accepting the threshold of at least .61 (i.e. substantial agreement), the current findings only partially support the first hypothesis for the ratings of importance. In line with the first hypothesis and the MEESTAR model, people indeed assign great importance to the values of *care*, *safety*, *participation*, *justice* and *autonomy* when interacting with AI. However, participants in this study did not assign great importance to the ethical values *privacy* and *self-conception*, which contradicts the first hypothesis and MEESTAR model.

Only for the ethical values of *participation* and *care*, both the concern and importance ratings clearly confirmed an applicability of the MEESTAR model for interacting with AI. By contrast, almost no agreement in ratings of concern as well as slight agreement in importance ratings for *privacy* suggest that this ethical aspect is not such a big issue for users interacting with AI as also shown by some of the previous literature (Acosta/Reinhardt 2020). Slight to moderate agreement with MEESTAR in ratings of concern as well as substantial agreement in importance ratings for *safety*, *justice* and *autonomy* suggest that individual difference variables may influence the extent to which users can anticipate the consequences that violations of these values may have. Likewise, the discrepancy between importance ratings and ratings of concern for *self-conception* may be affected by other variables. Therefore, I also analyzed the impact of individual difference variables (i.e. age, gender,

Figure 3: Agreement with the MEESTAR model (MEESTAR strength) for importance assigned to the ethical aspects of justice, safety, participation, care, self-conception, privacy and autonomy



technical experience, time perspective) on ratings of concern and importance.

3.2 Hypothesis 2 – Impact of Individual Difference Variables on Ratings of Concern when Ethical Values are Violated

To test for an impact of age, gender, technical experience and time perspective on ratings of concern when ethical aspects are violated, I first conducted a repeated-measures analysis of covariance (ANCOVA) with gender as between-participants variable and age, technical experience and time perspective as covariates on the MEESTAR strengths for concern ratings. Descriptive statistics are displayed in Table 5 and include mean MEESTAR strength for concern rates (left) as well as for importance rates (right) depending on gender. There were no significant impacts of age or technical experience (all *p*'s > .50).

Women express concerns that show moderate agreement whilst men express concerns that are only in slight agreement with the MEESTAR model.

However, the ANCOVA as well as a *t*-test show that these differences are not significant (all *p*'s > .50).

I also conducted independent samples Kruskal-Wallis-Tests to analyse the impact of gender on the concern rates for the seven ethical aspects individually. Here, significant differences were found only for the ethical aspect of *justice* (p = .04). Women were more concerned when this ethical value was violated (median = 4) than men who showed a neutral response (median = 3) to violations in *justice*. This is further supported by correlational analysis between gender and the median of the concern expressed when the aspect of *justice* is violated (r = - 0.36, p = .023): When perceiving injustice in the interaction with intelligent home assistants, women show a higher median and, thus, express greater concern than men.

Next, I analysed differences in MEESTAR strengths depending on gender (see figure 4), which show that women respond to violations of *justice* more in agreement with MEESTAR (substantial agreement) than men (slight agreement). This also supports the notion that women are significantly more concerned when interacting with AI leads to injustice than men. Female ratings of concern to violations of *care* were also more in agreement with the MEESTAR model (perfect agreement) than the male ratings (substantial agreement).

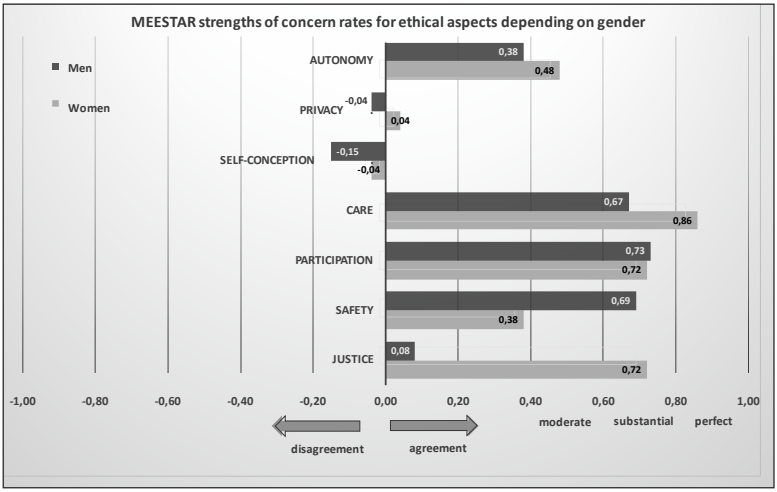
Table 5: Means (M) and standard deviations (SD) of MEESTAR (MS) strength for concern rates of violations and importance rates depending on gender

MEESTAR strength: concern ratings when ethical values are violated			MEESTAR strength: importance assigned to all seven ethical aspects		
gender	mean MS strength	*SD*	gender	mean MS strength	*SD*
female	0,45	0,58	female	0,67	0,39
male	0,34	0,49	male	0,59	0,38
all participants	0,39	0,53	all participants	0,62	0,38
MS strengths of .20 denote slight agreement, MS strengths of .40 denote moderate agreement, MS strengths of .60 denote substantial agreement with the MEESTAR model					

By contrast, men expressed greater concern in response to violations of *safety* (substantial agreement) than women (fair agreement; see figure 4). MEESTAR strengths for *autonomy*, *participation*, *privacy* and *self-conception* do

not differ between women and men. Concern ratings by both women and men for *privacy* and *self-conception* contradict the first hypothesis, while concern ratings for *autonomy* also don't reach the threshold of .61.

Figure 4: MEESTAR strengths for ratings of concern in response to violations of the ethical aspects of justice, safety, participation, care, self-conception, privacy and autonomy depending on gender



Regarding time perspective, the ANCOVA showed a significant influence of past ($F(1,63) = 5.822$, $p = .024$, $\eta^2 = .202$) and present time perspective ($F(1,63) = 4.974$, $p = .036$, $\eta^2 = .178$). This was also supported by Pearson's correlational analyses between age, gender, technical experience, time perspective and the mean MEESTAR strengths for concern ratings when ethical values are violated. These were also significant for the past ($r = 0.41$, $p = .02$) and present time perspective ($r = -0.37$, $p = .031$): past-oriented participants responded more in agreement with the MEESTAR model by displaying higher ratings of concern when ethical aspects were violated. Present-oriented participants responded less in agreement with the MEESTAR model by expressing lower ratings of concern when ethical aspects were violated. This is in line with previous research showing a higher tendency for risky behaviour such as substance use and abuse as well as risky driving behaviour (Keough et al. 1999; Zimbardo et al., 1997). However, these results contradict recent find-

ings of a link between past negative time perspective and risky behaviour (Măirean/Diaconu-Gherasim 2021). This may be due to the fact that the current study employed a simplified version of the ZTPI (Zimbardo/Boyd 1999) that excludes highly emotional items. These results suggest that the interrelations between past negative time perspective and risky behaviour found by Măirean and Diaconu-Gherasim (2021) may be mainly influenced by the (negative) emotionality of the past negative scale rather than by an orientation towards the past as such.

3.3 Hypothesis 3 – Impact of Individual Difference Variables on the Importance Ratings

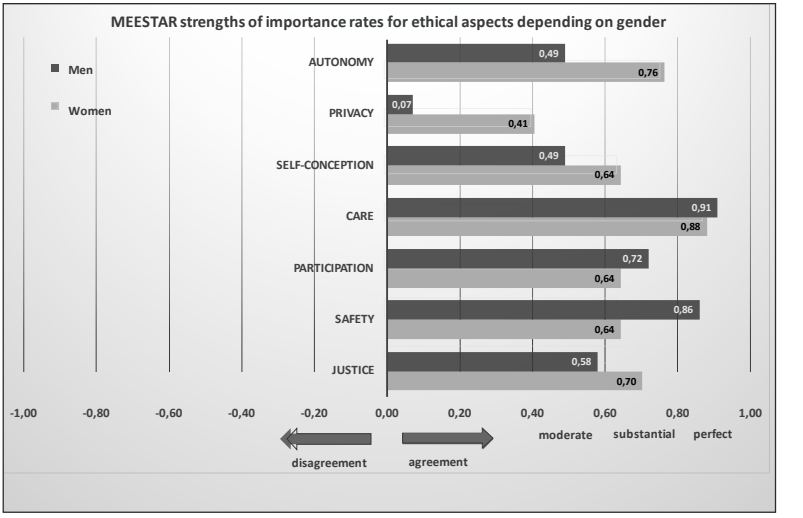
Table 2 (right) depicts the mean MEESTAR strengths for importance rates generally assigned to the seven ethical values depending on gender. Women show importance rates of substantial agreement whilst men show importance rates of moderate agreement with the MEESTAR model. However, a repeated-measures analysis of covariance (ANCOVA) with gender as between-participants variable and age, time perspective and technical experience as covariates on the MEESTAR strengths for importance ratings as well as a *t*-test show that the influence of gender on general importance ratings for all ethical values was not significant. Likewise, there was no significant impact of age and time perspective (all *p*'s > .50).

However, the ANCOVA showed a significant influence of technical experience ($F(1,63) = 12.88$, $p < .001$, $\eta^2 = .182$). This was also supported by Pearson's correlational analyses between age, gender, technical experience and the mean MEESTAR strength of the importance rates. These were only significant for technical experience ($r = 0.44$, $p < .001$): participants with greater technical experience generally assigned greater importance to the seven ethical aspects, while participants with minimal technical experience assigned less importance to these aspects.

Next, I conducted independent samples Kruskal-Wallis-Tests to analyze the impact of gender on the rating of importance for the seven ethical aspects individually. Here, significant differences were found for the ethical aspect of *privacy* ($p = .034$) and *autonomy* ($p = .049$): women assigned greater importance than men to both ethical aspects. *Privacy* is rated by women as rather important (median = 4) whilst men are neutral (median = 3) towards this aspect. Autonomy is rated by women as very important (median = 5), by

men as rather important (median = 4). This is also supported by significant differences in MEESTAR strengths depending on gender (see figure 5).

Figure 5: MEESTAR strengths for importance assigned to the ethical aspects of justice, safety, participation, care, self-conception, privacy and autonomy depending on gender



Women rated the importance of the ethical values *privacy* and *autonomy* significantly higher than men as demonstrated by greater MEESTAR strengths (i.e. more in agreement with the MEESTAR model; all *p*'s < .01). Similarly, women also rated *self-conception* and *justice* as more important than men. By contrast, men assigned greater importance to *safety* (in perfect agreement; see figure 5) than women as demonstrated by a greater MEESTAR strength ($p < .05$). This shows that the extent to which users may be concerned with ethical values when interacting with AI is influenced by gender, even though the impact of gender differs between different ethical values.

Concerning interrelations between time perspective and the median of importance ratings for the seven ethical aspects individually, Pearson's correlational analyses were significant for future time perspective and *autonomy* ($r = 0.55$, $p = .002$): participants with a greater future time perspective assigned greater importance to the ethical aspect of *autonomy*. This is in line

with previous findings of future-oriented people assigning great importance to the aspect of autonomy in their goal-making if they perceive their future as open-ended (cf. Lang/Carstensen 2002). There were no significant correlations between time perspective and the other six aspects of *justice*, *privacy*, *safety*, *participation*, *care* and *self-conception*.

4. General Discussion

I aimed at investigating the extent to which the ethical values emphasized by the MEESTAR model (e.g. Manzeschke et. al. 2016) can explain user concern about AI systems. To this end, ratings of concern if the values of *autonomy*, *safety*, *privacy, care, justice, participation* and *self-conception* are violated as well as importance ratings were measured. This study yielded three main results. First, the MEESTAR model cannot be fully applied to the broader context of users of all ages interacting with AI. Some, but not all, ethical values emphasized by MEESTAR need to be considered in AI development: AI technologies need to be in alignment with the ethical values *participation* and *care*. The same also applies to *autonomy*, *safety* and *justice*, all of which were rated in substantial agreement with MEESTAR for importance but only in moderate agreement (*autonomy, safety*) or fair agreement (*justice*) in terms of concern if values are violated.

For *self-conception*, the results are mixed (i.e. in disagreement with MEESTAR for concern ratings; in moderate agreement for importance ratings). This may be due to *self-conception* entailing a variety of sub concepts such as the core psychological need for competence but also our social identities, personal goals, experiences and standards that are often influenced by society. Future research should, thus, focus on these underlying aspects rather than on *self-conception* per se. Furthermore, future research may investigate the extent to which the core psychological needs of competence, relatedness and autonomy influence our use of and trust in AI (Vansteenkiste et al. 2020). These needs are important for our well-being and, thus, for acceptance of AI (Self-Determination Theory; Ryan/Deci 2000).

Contrary to the first hypothesis (H1) but in line with some of the literature (cf. Acosta/Reinhardt 2020), users are not concerned if *privacy* is violated by AI. *Privacy* is also not considered particularly important. The findings for *privacy* as well as the general differences found between higher

importance ratings and lower ratings of concern emphasize the need for education to develop digital literacy for interacting with AI (cf. Leaning 2019). Accordingly, the literature shows positive effects of training older people in computer and Internet use on psychological well-being: learning how to use these new technologies had positive effects on their personal interactions (meeting their needs for relatedness) and on cognitive functions and led to an increased sense of empowerment and *autonomy* (Shapira et al. 2007). For users to understand, evaluate and use AI critically, independently and responsibly, they also need to be informed about their rights and ethical standards as well as about the possible consequences that a violation of their ethical rights may have for them personally and for society.

In line with this, there was a main effect of technical experience on importance but not concern ratings: greater technical experience was linked to higher importance ratings for all ethical values investigated in this study. Whilst technical experience should be related to digital literacy as part of the computer literacy skill set, there are also other important skills such as those referred to as information literacy. The current findings, thus, show that digital literacy entails so much more than computer literacy. Users also need to develop competencies that strengthen their information literacy (cf. Leaning, 2019).

Furthermore, I found individual difference variables that influenced ratings of concern and importance not in general but for some ethical values (hypotheses 2 and 3). There was an effect of gender on both ratings of concern and importance for some ethical values. Compared to men, women are more concerned about violations of *justice* and *care* and place greater importance on autonomy, justice, self-conception and privacy. Compared to women, men were more concerned about safety breaches and attached greater importance to this value. These gender differences are in line with studies that show an impact of gender on risk perception (Brown et al. 2021) as well as with studies showing that women place greater importance on the well-being of others (Beutel/Marini 1995).

Contrary to my hypotheses, age had no influence on concern and importance ratings. Does this suggest that perception of these ethical values remains relatively stable over a lifetime? The literature suggests the contrary for personal values, which appear not to stabilize until a later age (cf. Konty/Dunham 1997). However, the empirical evidence on age-related influences on broader ethical values is scarce. For *autonomy*, for instance, we must differ between *autonomy* as a value, *autonomy* as a core psychological need and *au-*

tonomy as an experience of control. The latter has been shown to increase with age (Mackenzie et al. 2018). As a core psychological need, autonomy has been argued to remain relatively stable over the span of a lifetime (cf. Ryan/Deci 2000). Here, more empirical research on the stability of ethical values that are important on a cultural and individual level is necessary.

Third, corresponding to my hypotheses, time perspective influenced concern and importance ratings: present-oriented participants were less concerned with violations of all ethical values, while past-oriented participants showed greater concern. Future-oriented participants placed greater importance on *autonomy* for AI interaction. Here, the findings complement the literature by showing that time perspective is not only interrelated to other aspects of psychological time (Nowack/van der Meer 2013; 2014; Nowack et al. 2013). In line with studies that link time perspective to general well-being, consumer behaviour or to the environmental context (Klicperová-Baker et al. 2015; Milfont et al. 2012; Mooney et al. 2017), the current study extends the concept of time perspective to an application within the AI context.

Due to the explorative nature of the current study, I investigated ethical values in a small sample as well as with a small selection of scenarios only. This limits the generalizability of the results. However, these initial findings emphasize the need to further investigate ethical values at the individual level by employing a wider selection of scenarios.

The current study, nevertheless, goes beyond previous investigations in two important ways. First, it highlights the need for more empirical research *with* users to investigate ethical values in AI interaction. In line with the uses and gratification approach (cf. Rosengren 1985), users will select those AI assistants that promise to meet their standards, needs and expectations. Upon fulfilment, probability increases that users will want to interact with AI assistants again. If user expectations and needs are not met, people are less likely to interact with AI. Likewise, if AI assistants violate users' standards, it could lead to a state of cognitive dissonance (Festinger 1957). This is not only perceived as unpleasant but may also result in feelings of anger, guilt and regret (cf. Marikyan et al. 2020). Second, the study provides empirical evidence that AI systems can only be successfully introduced to society if they are accompanied by strategies that increase and strengthen digital literacy in everyone regardless of age, gender, educational or cultural background.

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Appendix

Questionnaire A	Questionnaire B
Scenario 1 – Justice The 67-year-old widow Erna Schmidt has never had much to do with technology in her life. Her late husband had always taken care of all these things – for instance, he had a modern air conditioning system installed just before his death. However, the air conditioning is much too complicated for Mrs. Schmidt. She doesn't understand the structure and the menu sequence of the operating controls, and she can hardly see anything on the small display. Since the air conditioning cannot be used properly by her without technical experience, she is considering having it removed again.	**Scenario 1 – Justice** The 67-year-old widow Erna Schmidt has never had much to do with technology in her life. Her late husband had always taken care of all these things – for instance, he had a modern air conditioning system installed just before his death. After an initial fear of doing something wrong, she discovered that she could communicate her wishes simply by speaking to the device. She is glad that she doesn't have to keep asking her son for help because she can use the air conditioning despite her minimal technical experience.

Questionnaire A	Questionnaire B
Scenario 2 – Safety Helmut and Rosemarie Weber are happy because they are going to Leipzig for 2 days today to visit their grandchildren Lea and Lukas. Since the Webers spend every weekend in Leipzig, the alarm system has already learned to be active 24 hours a day for the next two days. After a brief query and confirmation of the changed settings, the data is stored internally in the system. The data does not leak out and is not passed on to third parties.	**Scenario 2 – Safety** Helmut and Rosemarie Weber are happy because they are going to Leipzig for 2 days today to visit their grandchildren Lea and Lukas. Since the Webers spend every weekend in Leipzig, the alarm system has already learned to be active 24 hours a day for the next two days. After a brief query and confirmation of the changed settings, the data is forwarded to an external server. Rosemarie doesn't really like this. Only last year there was a data leak at the manufacturer of the alarm system, in which someone had gained unauthorized access to the private data of many homeowners. But Helmut calms down Rosemarie. After all, the manufacturer promised that something like this would never happen again.
Scenario 3 – Participation Frank Müller had a new modern heating control system installed in his father's house, which is operated by using an app on the smartphone. Due to his visual impairment, however, the pensioner cannot see anything on the smartphone display. If he wants to go away for the weekend with his fishing friends, he must keep heating the house at high costs, because he cannot change the basic settings made by the installer himself.	**Scenario 3 – Participation** Frank Müller had a new modern heating system installed in his father's house. In addition to many technical innovations, the heating control also enables the pensioner to adjust the settings to his wishes simply by speaking. If he wants to go away for the weekend with his fishing buddies, he simply tells his heater, "I'm going away. Please lower the temperature to 15°C until Sunday 5 p.m."

Scenario 4 – Care Marie has multiple sclerosis. Too much heat causes her illness to flare up again. It is therefore important that Marie avoids excessively high temperatures when showering. Since Marie, due to her illness (shaky hands; inability to perform fine motor movements), cannot operate her heating control via the keyboard or the display, her father visits her twice a week to adjust the water to a comfortable temperature for her before showering.	**Scenario 4 – Care** Marie has multiple sclerosis. Too much heat causes her illness to flare up again. It is therefore important that Marie avoids excessively high temperatures when showering. Since Marie, due to her illness (shaky hands; inability to perform fine motor movements), cannot operate her heating control via the keyboard or the display, she uses voice control to adjust the water to a temperature that is comfortable for her before she takes a shower.
Scenario 5 – Self-Conception The Müllers drive in a rental car to the Baltic Sea for Christmas. The rental car is equipped with a state-of-the-art driving assistant, which offers many interesting functions such as an "alcohol interlock". The retired couple has no idea what this could be and would like to find out more. After pressing the "wake-up" button, they are asked what the driver assistance can do for them. Surprised, Mr. Müller asks what an "alcohol interlock" is. The answer: "The alcohol interlock function is an alcohol-sensitive immobilizer. It prevents the car from starting if my sensors register the driver's alcohol consumption. Would you like to activate alcohol interlock?" The Müllers say no, but they are enthusiastic. At home they only have an old Opel station wagon that doesn't even help them park. Until now, they thought they were too old for such technical frills. But now they are considering buying a modern car with driver assistance.	**Scenario 5 – Self-Conception** The Müllers drive in a rental car to the Baltic Sea for Christmas. The rental car is equipped with a state-of-the-art driving assistant, which offers many interesting functions such as an "alcohol interlock". The retired couple has no idea what this could be and would like to find out more. However, the menu navigation of the driving assistant proves to be very complicated. It takes many individual steps that the Müllers cannot understand. They give up in frustration. Mr. Müller is glad that their old Opel station wagon doesn't have such frills. Somehow, they are probably too old for that. But they haven't used new-fangled technology for the last 10 years. Why should you change that now?

Scenario 6 – Privacy Mario has been unemployed for two weeks. However, he has not yet dared to talk to his wife about it. Somehow it never was the right moment. He comes home every day at 10 a.m. after his wife and children have left the apartment. Shortly before 4 p.m. he leaves the house again. The voice-controlled "personal smart home assistant" ROMEO has learned to raise the blinds and play Mario's favourite music when Mario comes home in the morning. One day, Mario's wife unexpectedly comes home just before 10 o'clock. Since ROMEO runs in private mode, it only learns user-specifically. ROMEO does not transmit data about its learned behaviour to other users. That's why the basic settings (blinds down, no music) are retained when Susanne arrives. Susanne does not find out anything about Mario's changed user profile. A few days later, Mario plucked up the courage and told her about his dismissal.	**Scenario 6 – Privacy** Mario has been unemployed for two weeks. However, he has not yet dared to talk to his wife about it. Somehow it never was the right moment. He comes home every day at 10 a.m. after his wife and children have left the apartment. Shortly before 4 p.m. he leaves the house again. The voice-controlled "personal smart home assistant" ROMEO has learned to raise the blinds and play Mario's favourite music when Mario comes home in the morning. One day, Mario's wife unexpectedly comes home just before 10 o'clock. Without prompting, ROMEO shows the behaviour it has learned from Mario at 10 a.m. sharp: the blinds are raised, Mario's favourite music is played. Mario's wife is surprised by this. She suspects that ROMEO learned this behaviour from Mario. But her husband always works from 8 a.m. to 5 p.m. In the evening, Susanne confronts Mario.
Scenario 7 – Autonomy Anna wears a fitness bracelet, which also measures her body temperature and skin conductivity and sends it to the air conditioning system. Based on the data, the air conditioner recognizes that Anna is sweating. The air conditioner alerts Anna to this and asks if the room temperature should be lowered to 18°C. Since Anna wants to leave the house right away anyway, she says no. The room temperature remains unchanged.	**Scenario 7 – Autonomy** Anna wears a fitness bracelet, which also measures her body temperature and skin conductivity and sends it to the air conditioning system. Based on the data, the air conditioner recognizes that Anna is sweating. It independently regulates the room temperature down to 18°C. Anna is not informed about the change in settings.