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The revenue model of mainstream online social networks and potential alternatives: A scenario-based evaluation by German adolescents and adults

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ABSTRACT

Mainstream Online Social Networks (OSNs) face extensive criticism for their revenue model and its negative consequences for users and societies. While experts often discuss alternative OSN models, little is known about potential users' evaluations of different OSN models. To close this research gap, the present study investigates how non-expert individuals, i.e., potential users, evaluate mainstream OSNs and expert-proposed alternative models. Next to the general evaluations of different models, individual differences among users open to various OSN models were explored.

Three OSN scenarios were created based on interviews with experts from academia and industry and presented to samples of German adolescents (N = 1166) and adults (N = 878): one describing the "status quo", one "option" model similar to the model currently considered by Meta, and one describing a "public-service" broadcasting OSN. Participants rated each characteristic of the "status quo" scenario, indicated their willingness to pay for each of the three OSN models, and specified their preferred OSN model next to providing sociodemographic information.

Replicated across both samples was that the "status quo" scenario received predominantly negative evaluations. Further replicated across both samples was that most participants were willing to pay for a "public-service" OSN and chose this model as the preferred one. Only a few significant relations of sociodemographic variables were observed. Consistently replicated across both samples, men rated various characteristics of the "status quo" scenario more positively, and women were more likely to prefer the "public-service" OSN. Some differences between the two samples also emerged.

In summary, both adolescents and adults demonstrated receptivity to alternative OSN models, especially a public-service broadcasting OSN. Most sociodemographic factors had limited influence indicating potential widespread adoption if such an alternative was implemented – at least in Germany. Consequences arising from such a model for platform design, policy, regulation, and governance are discussed.

1. Introduction

Social media platforms are intertwined with the lives of billions of young and old individuals across the globe [1]. However, mainstream online social networks (OSNs) like Facebook, Instagram, and TikTok are often criticized for their revenue model and its potential downsides for users and societies [2,3]. Buzzwords like "social networks use disorder", "filter bubble", "echo chamber", and "surveillance capitalism" are often mentioned in related debates among experts [4–9]. To minimize negative consequences, experts discuss alternative OSN models including novel revenue models for OSNs. However, little is known about how non-expert individuals and (potential) users of mainstream OSNs evaluate the prevailing platform model and prominently debated alternatives. For instance, it remains unknown how negatively or positively the current OSN model is evaluated, whether potential users were willing to pay for different and novel OSN platforms, and what OSN model they

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preferred. Knowledge on the evaluations of the demand side is nevertheless crucial: Only if issues of the status quo are acknowledged and proposed alternatives are accepted widely, novel OSN models are likely to succeed. Moreover, potential differences in such evaluations of non-expert individuals and systematic relations with, for instance, sociodemographic variables must be understood. Only alternatives that are accepted by individuals with different backgrounds are likely to be used by diverse individuals rather than by a small and homogeneous group of individuals only.

The present work aimed to contribute to the literature by conducting a study in the German (more broadly: European) normative context. The first aim of the present work was to investigate how non-expert individuals evaluate the status quo of OSNs and their revenue model as well as alternative models. The second aim of the present work was to examine whether sociodemographic factors are related to these evaluations.

1.1. Expert perspectives

1.1.1. Discussions on the revenue model of companies behind mainstream online social networks

OSNs are defined by three elements: (i) user profiles, (ii) networks, and (iii) streams. The latter describes elements enabling users to consume and/or engage with user-generated content [10]. *Mainstream* OSNs like Facebook, Instagram, TikTok, and Snapchat are defined by their large user base and being among the most used OSNs in Germany in the present work [11]. Many mainstream OSNs use an advertisement-based revenue model. In the context of OSNs, advertisements can be targeted at very specific groups of individuals on an unprecedented scale [12]. The huge amount of data points per user available online serves as the basis of this form of advertisement. More specifically, online companies, like those running mainstream OSNs, collect and store user data, clean, (pre-)process, and analyze them, and extract insights about users from these data. The extracted information, in turn, can be used for micro-targeting [13,14] to infer to whom to show certain ads in which way for maximum effectiveness and efficiency. The model of creating revenue based on micro-targeted advertisement is named the *user-related, advertisement-based revenue model* in the present work. It is the prevailing revenue model of many online companies including those behind mainstream OSNs [15–20] like Meta [21], ByteDance [22,23], and Snap Inc [24].

It can be hypothesized that increasing revenue via advertisements is the key driver of OSN providers. The more time users spend on a platform, the longer and the more advertisements can be shown to them. Additionally, having users actively providing data via liking, sharing, etc. seems crucial in relation to the aforementioned revenue model. Designing platforms in a way that makes users spend more time on them and evokes reactions thus seems beneficial for providers [3,25]. Accordingly, experts not only discuss the aforementioned revenue model itself but also how it impacts the design of mainstream OSNs and users in manifold ways as a consequence.

Users not having to pay usage fees is oftentimes named as a favorable aspect of the mentioned revenue model [26]. This is among others because the opportunity to use services applying this revenue model without paying fees, hence, independent of one's social status or income, is desirable in terms of social justice. Also, because many OSNs are used as a source of information and news [27], (monetarily) free access is aligning with the human right to freedom of opinion and expression including access to information A/RES/217, UN-Doc. 217/A-(III). In addition, the revenue model can be linked to the filtering and recommendation of information that potentially fits individual users' interests. This is another aspect that can be deemed positive [26]. Finally, many online platforms and OSNs employ a user-related, advertisement-based revenue model. Therefore, it can be assumed that users are accustomed to and appreciate the current state of having access to OSNs without monetary costs (see Sunstein [28] for a similar argument).

Decreasing informational privacy (i.e., "the ability to control the aggregation and dissemination of information" [29, p. 370]) of users or a complete lack thereof due to excessive data collection is one of the dangers being discussed in relation to the mentioned revenue model (see literature on "surveillance capitalism" [9]). Moreover, it is assumed that platforms are created in an immersive way to keep users on the platform and collect more data from them due to the revenue model. Related are fears that certain design elements draw individuals to spend an increasing amount of time on the platforms thereby contributing to "use disorder tendencies" [4,5,7,30]. Other prominent risks associated with the mentioned revenue model, especially in the context of mainstream OSNs, are the possible consequences on the free and unbiased formation of opinions. This issue is especially critically debated in the political sphere. Experts assume, for instance, that the personalization of information via filtering and recommender systems leads to homogeneous and attitude-aligning information environments ("filter bubbles"). Such information environments may, in turn, lead to (political) polarization [6,8,31]. However, it must be noted that the research on whether social media – which comprises both OSNs and messenger services – foster homogeneous and attitude-aligning information environments and whether they contribute to polarization is mixed at best [32]. Finally, the overall power that OSN providers have over what individuals see (e.g., via algorithms) and who is and is not seen (e.g., when politicians are banned from platforms) can be criticized. This power is potentially related to the revenue model because the revenue model likely contributed to the monopoly status of mainstream OSN providers in the first place.

1.1.2. Alternatives to the prevailing revenue model

When discussing different revenue and OSN models in the following, it is important to note that the present work was conducted in Germany, hence, a European/EU context. This constitutes a *W*estern, *E*ducated, *I*ndustrialized, *R*ich, and *D*emocratic context [33]. As such, the General Data Protection Regulation applies in Germany since 2018 and is well-known by most German individuals [34]. Further, a large share of German internet users (aged 16 to 64) seems to be concerned about the misuse of their personal data through companies [1,35]. Similarly, only around 20 % of adult German netizens seem to be okay with apps tracking their real-world activity, and 40 % prefer to stay anonymous when using online services [35]. These privacy-related contextual settings need to be considered when going forward.

In this context, several experts suggest alternative financing structures and accompanying changes for OSNs [2,3]. Such accompanying changes encompass in part regulatory changes to platform governance [2]. Indeed, some alternatively built and financed OSNs already exist (https://joinmastodon.org/; https://steemit.com). However, empirical research on alternatively built and financed OSNs is limited. The few works that do exist often discuss various revenue streams for social media in general based on a review of existing platforms. Alternative revenue streams discussed include content monetization, commissions, freemium options such as buying virtual goods, and account upgrade options [36–38].

In addition, novel potential alternatives to the prevailing revenue model of OSNs include that instead of "paying with data" [37], users could be charged a monetary usage fee. First studies show that some individuals appear to be willing to pay such a fee [28,38–40]. Further, one study suggests that in the context of – what the authors call – entertainment-oriented social media, revenue could be generated by providing virtual goods for which users have to pay. In the context of – what the authors call – business-oriented social media services, account upgrades may be a better way to generate revenue [38]. It must be noted however, that nowadays a clear differentiation into entertainment versus business-oriented social media seems difficult. This is because most platforms seem to offer functionalities for both. In addition, often neglected in these studies is that the platform design and regulation are likely to change if the current revenue model is no longer applied.

Such changes can be illustrated by examples of alternative financing structures of other types of media: For instance, in Germany, there are the "Pur" and "Contentpass" subscription models. When users access a website applying the "Pur" model, they are asked whether to pay a monetary fee (e.g., 3.99€ per month at https://www.welt.de/; 2024-02-19) or proceed without any monetary costs. Users are told that they can access the websites with less tracking and cookies and without being presented with personalized advertisements if they pay the fee. When not paying, users agree to tracking, cookies, transfer of data to third parties, etc. (see Eberl [41] for a critical review). A similar model is supposedly currently being discussed by Meta – the company behind Facebook, Instagram, and WhatsApp [42]. Given the prevalence of such optional payment models, their discussion in the context of mainstream OSNs and individuals' evaluations of such a model seem important to be investigated more in-depth.

In addition, next to private, commercial broadcasters, Germany – like other countries – relies on public-service broadcasting. For private households, companies, institutions, and public interest bodies it is usually mandatory to pay a fee. This fee finances a large share of otherwise free public-service broadcasting services. This financing strategy allows for public radio, television, and internet services to be independent of governmental or commercial influences. In addition, only a few advertisements are presented on public-service broadcasting channels [43–45]. The "Association of Public Broadcasting Corporations in the Federal Republic of Germany" states that their activities strive to fulfill the social, cultural, and democratic mandate. Further, it is mentioned that among others independence (jointly financed, independently organized) and responsibility (transparent and sustainable) are their core values [46]. It seems an interesting avenue to consider a public-service OSN model, which is publicly funded and underlies the public law and press code accordingly (see first attempts in Germany [47]).

1.2. Perspectives of (potential) users

1.2.1. (Potential) user groups

Manifold different individuals use social media including OSNs, which is underlined by the fact that in 2023 around 85 % of the German population was active on social media [35].

In line with this, a large share of adolescents uses social media. For instance, around 50 % of adolescents between 12 and 14 years and 75 % of adolescents between 15 and 16 years of age use social media, including OSNs, at least (nearly) daily in Germany [48]. Additionally, adolescents might be specifically vulnerable to drawbacks of the user-related, advertisement-based revenue model. This is why there is an ongoing discussion to prohibit targeted advertisements for minors in the EU [49]. Moreover, a study shows that adolescents take little action to implement privacy protection measures in terms of targeted advertisement [50]. In line with these observations, Montgomery [51] argued already in 2015 that the privacy of youths should be a fundamental right and suggested "Fair Information and Marketing Principles for Children and Teens" ([51], p. 780). Further, a meta-analysis indicates particularly high prevalence rates of problematic social media (including OSNs) use in adolescents [52]. These aspects and considerations are crucial and underline the necessity to investigate adolescent samples in the context of OSN research.

In addition, it is relevant to investigate adults. This is not only because adults make up a great share of OSN users as well. According to recent data, more than 95 % of German social media – which includes OSNs – users aged 13+ are 18 years or older [53]. Additionally, (young) adults may serve as role models for some younger, adolescent individuals, providing them with ideas about which new OSNs to use in line with a social learning approach. Further, adults, more specifically parents, are likely to (want to) monitor, control, and impact their children's/adolescents' OSN use [54–57]. For the decision on how to monitor their children's OSN use, it is important to consider the evaluations of the parents. This additionally highlights the need to examine adult samples in the context of social media and OSNs. Finally, it is also of importance to investigate adult samples to relate findings from adolescent samples to findings from adult samples. Especially because most previous scientific work in the OSN context has been conducted on adult samples, such a comparison can support better integration of findings into previous literature.

Therefore, all investigations of the present work were replicated across adolescents and adults. The examination across adolescents and adults supports an understanding of how individuals of different age cohorts evaluate OSN models.

1.2.2. Evaluations of the prevailing revenue model and alternatives

OSNs based on something akin to a "Pur" ("option" model), or a "public-service" broadcasting model are likely to differ from the current mainstream OSN model ("status quo" model) in many respects. These differences may be evident in aspects like user privacy, presentation of (personalized) ads, content moderation, compliance with the press codex, information provision, or digital well-being in general. While there are some partial insights into specific aspects of currently prevailing OSN features and users' evaluations of them, knowledge on these topics remains limited. Previous research on Facebook has shown that individuals rate settings like allowing one's e-mail address and phone number to be shared with others as a privacy risk [58]. Another study showed that most (>50 %) individuals were not comfortable with marketers using their publicly available social media data for targeted advertisement [59]. Further, it was found that advertisements presented in one's Facebook newsfeed are negatively evaluated by young adults, for instance, in relation to intrusiveness, being too personal, and related privacy concerns [60]. However, overall, it remains widely unknown, how non-expert potential users evaluate different, and especially novel, OSN models. As such, it is unknown whether they would be willing to pay for OSNs built based on different models or which one they would prefer.

It is of utmost importance, though, to know about the preferences and evaluations of the demand side, both for existing but also alternative models. If alternative models are deemed positive by the small group of experts but not by potential users, they are unlikely to be successful. Thus, the following research question was formulated:

RQ1: How do adolescent and adult non-expert individuals evaluate OSNs based on the "status quo", an "option", and a "public-service" model?

In addition, differences between individuals in these evaluations are of interest. Knowledge of whether specific (groups of) individuals evaluate various models differently is important. Such knowledge supports the understanding of whether the status quo and alternatives are only accepted by a small, homogeneous subsection or a large share of potential users. For instance, only if evaluations are independent of individuals' characteristics, is it likely that a diverse set of users accept, and potentially mitigate to alternative OSNs in the future.

When looking at individual differences in evaluations of OSN models, it must be considered that each OSN model has upsides and downsides and constitutes a tradeoff accordingly. As mentioned before, given manifold differences between the "status quo" and alternative OSN models, many different aspects might contribute to the overall evaluation of different OSN models. However, the probably most obvious up- versus downsides are related to paying with data or money and allowing extensive data collection versus reducing data collection, i.e., increasing informational privacy. Focusing on these aspects, individual differences in the evaluations of the different models can be looked at from the angle of the privacy calculus theory. Broadly, the privacy calculus describes that individuals compare the expected benefits to the assumed risks or costs of reducing privacy before disclosing information and/or showing related behaviors [61–63]. The estimation of costs and benefits as well as their weighing is subjective [29,64]. Estimated risks seem to be related among others to individuals'

(general) privacy concerns [65–67]. Sometimes, perceived risks and concerns related to privacy even seem to be used interchangeably and not clearly separated [29,68].

Sociodemographic characteristics might play a role in explaining individual differences in privacy concerns as well as expected risks and benefits in the context of evaluations of different OSN models based on the privacy calculus theory. For example, slightly more women seem to be concerned about the misuse of their personal data online by companies compared to men [53]. Similarly, women seem to be more concerned about their online privacy in the context of personalized advertisements [69]. Moreover, men seem to focus more on perceived benefits, and utilitarian benefits, specifically. Women seem to stress risks more in their privacy calculus-related decisions in relation to location-based social networking services [70]. With regard to age, research from different applied contexts indicates mixed findings for relations between age and privacy concerns, among others in the context of social media and personalized advertisements [69,71–73]. Furthermore, education might be related to privacy concerns. Results of one study in the context of personalized advertisement indicate that a higher educational background is related to lower privacy concerns [69]. In the context of the present work, which examines various revenue/payment models of OSNs, the evaluation of the different models might also be influenced by individuals' financial resources. More money at hand might be related to a higher willingness to pay and a more positive evaluation of related models, such as the "option" model and the "public-service" model, compared to the "status quo" model. This is especially likely when fees are comparatively high. In addition, higher income has been related to higher privacy-related concerns further supporting this notion [69].

In summary, sociodemographic variables may be related to differences in the evaluations of the "status quo" and alternative OSN models based on the privacy calculus model. However, as mentioned, other features of OSNs that differ between the "status quo" and alternative models may also be relevant for the evaluations. As such, for sure, a calculus perspective weighing risks and benefits can also be applied to other aspects of the current and alternative OSN models. Unfortunately, literature is lacking. Therefore, due to the limited literature and inconclusive findings regarding the privacy calculus theory, the following research question was formulated:

RQ2: How are the sociodemographic variables age, gender, education, and pocket money/income related to adolescent and adult non-expert individuals' evaluations of OSNs based on the "status quo", an "option", and a "public-service" model?

2. Materials and methods

2.1. General procedure

The present work is part of a larger research project, which emerged from the work of the group discussing social media during the DiDaT project [74]. The larger research project consisted of three parts: First, six semi-structured expert interviews were conducted. Thereby, valid knowledge on the user-related, advertisement-based revenue model in the OSN context was generated based on both scientific and practical views [75]. Second, three different scenarios, each describing an OSN built on another revenue model, were built based on these interviews. Third, two online surveys, one with adolescents (12–18 years; Study 1) and one with adults (18+ years; Study 2), were conducted. By doing so, evaluations of the prevailing revenue model and OSN design and alternative OSN models were assessed. The present work focuses on the results of the two online surveys, which were approved by the local ethics committee of Ulm University, Ulm, Germany.

Study 1 on adolescents was programmed on the SurveyCoder tool [76,77]. Participants were recruited by the commercial panel provider Bilendi GmbH (https://www.bilendi.de/). Their panels include more than 2,500,000 individuals (https://www.bilendi.de/academics#topNav). From their German panel, participants were drawn. This recruitment strategy ensured the recruitment of a sample with balanced age groups and gender distribution based on quotas. Moreover, it was aimed at wide variation in school types attended and German federal states of residence. After participation, individuals received anonymous feedback on their scores in one of the measures of the present work (a knowledge test with social media-related questions that is of interest to another research project). This was an additional incentive to increase willingness to participate. Additionally, it supported informing and teaching the participants since their responses and the correct responses to the knowledge test were presented and explained.

Study 2 on adults was programmed on the Qualtrics platform [78]. Similar to Study 1, participants were recruited by the Bilendi GmbH (https://www.bilendi.de/). Crossed quotas for age (groups: 18–29, 30–39, 40–49, 50–59, 60+) by gender based on census data for the general German adult population were set. Additionally, variability in educational backgrounds and federal states was aimed for.

All participants were informed about the study and gave their electronic informed consent before participation. Underaged participants of Study 1 needed to additionally confirm the consent of their parents/legal guardians. All participants received virtual points as an incentive in line with the regulations of the Bilendi GmbH.

2.2. Data availability

Both surveys were preregistered as exploratory studies: Study 1: https://osf.io/pszeu; Study 2: https://osf.io/abj5e. The data sets underlying the present work are made available on the Open Science Framework platform and analysis scripts are made available as well (https://osf.io/gm2y8/). The wordings of all the three scenarios presented to participants are provided in Supplementary Information (SI) II in German language and additionally in English language at the OSF (https://osf.io/my54e).

2.3. Samples

The data cleaning procedure is reported in SI I. The final sample of adolescents (Study 1) consisted of N = 1166 participants (n = 597 women, n = 569 men). The mean age was M = 14.99, SD = 1.92 years. There was a wide spread in different school types attended but roughly half of the participants attended high school ("Gymnasium"; n = 639). Only n = 26 individuals stated to not use any social media platform (item translated from German: "Do you use at least one social media platform or at least one messenger service? By this we mean social media such as Snapchat, TikTok, Facebook, Instagram and messenger services such as WhatsApp and Signal."; note that in the German day-to-day language, social media and online social networks are terms that cannot be clearly separated which is why examples were provided). These participants were included in the analyses because their opinion was deemed valuable. This is because they might still be interested in alternative and novel OSN models. Further, excluding them did not change the main findings, and analyzing the data separately is not meaningful due to the small sub-sample size.

The final adult sample (Study 2; after data cleaning; see SI I) consisted of N = 878 individuals (n = 432 women, n = 446 men). The mean age was M = 48.14, SD = 14.20. Most participants reported a secondary school leaving certificate ("Mittlere Reife"; n = 316) or a university (including University of Applied Sciences) degree (n = 253). Only n = 47 individuals stated to not use any social media platform. They were included in the analyses for the same reasons mentioned above.

2.4. Measurement instruments

A graphical depiction of the survey procedure and the order of measures in the survey is presented in Fig. 1. After providing some self-

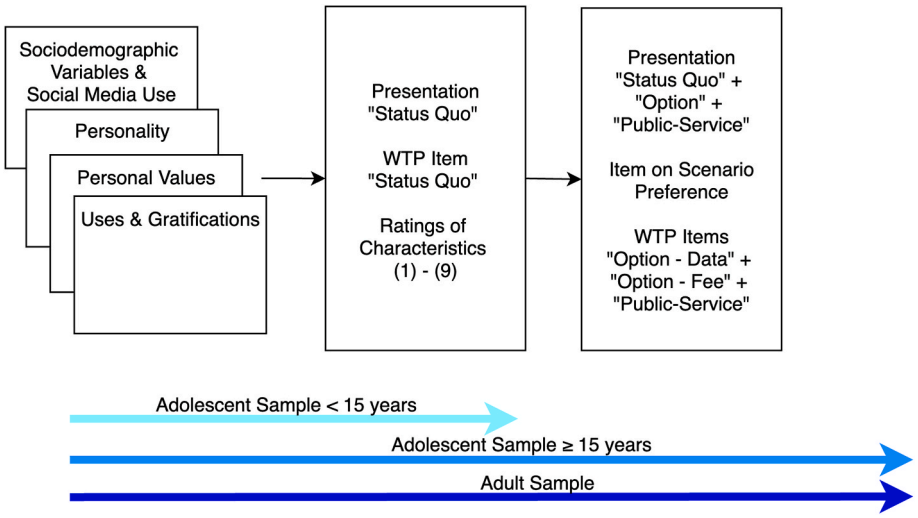

Fig. 1. Survey procedure.

report information, participants were first presented with the "status quo" scenario and related questions. Afterward, they were presented with all three scenarios ("status quo", "option", "public-service") and related questions (see following paragraphs).

Of note, in Study 1 on adolescents, participants below the age of 15 were only presented the "status quo" scenario and related questions. Participants from the age of 15 years (n = 698) were presented with all scenarios and related questions. This was done in line with the results of a small validation study. In this validation study, we asked adolescents to complete the full survey. Especially younger individuals (below the age of 15) and their parents reported that the complete survey was too long. They reported that the cognitive effort and time needed to participate were burdening the younger participants. Thus, it was decided that ratings of the "status quo" are most important and that only this scenario would be shown to individuals younger than 15 years. In Study 2 on adults, all participants were presented with all three scenarios and related questions.

The names of the scenarios as described in the present work were not presented to participants.

2.4.1. Scenarios on different online social network models

Based on the transcriptions of the six semi-structured interviews with experts from various scientific and practical fields by two independent raters, three scenarios were created. These were further validated in two steps with both the experts and adolescents and their parents to ensure correctness and easy readability. For detailed information, see SI II. One scenario described the "status quo" of mainstream OSNs, one described an "option" (including a description of both the "paying with data" and "paying usage fee" options), and one a "public-service" OSN model.

The final three scenarios differed from each other in the characterization of nine impact factors. Of note, the consistency of the characteristics was of special relevance. Hence, no classical fully crossed design was applied, but only impact factor-level combinations that were deemed consistent and realistic based on expert interviews were presented.

A table of each characteristic and its peculiarity in each scenario can be found in Table 1. The German wording of each scenario from Study 2 is presented in SI II. In the introduction to the scenarios, messenger services were not specifically targeted to have participants focus on what is named OSN in the present work.

2.4.2. Items on evaluation of scenarios

To examine individuals' evaluations of the different scenarios, the following items were assessed:

For the "status quo" scenario, participants were asked to rate each of the nine characteristics (Table 1) of the scenario on a 5-point rating scale from 1 = "very negative" to 5 = "very positive".

In addition, participants were asked how much of their own money they were willing to pay (Willingness to pay = WTP) per month for an OSN that is designed as described in the "status quo" scenario. The individuals who were additionally presented with the other two scenarios were asked the following questions: i) which of the three OSNs they would like to use the most ("status quo", "option", "public-service"); if they chose the "option" scenario, they were further asked which option they were more likely to use ("option – data", "option – fee"); ii) how much of their own money they were willing to pay per month (WTP) for each OSN that is described per scenario.[1]

In summary, the present work had three dependent variable groups: i) ratings of "status quo" characteristics, ii) WTP for each of the three scenarios (for the option scenario, WTP for both "option – data" and "option – fee" are available), and iii) the decision on which scenario individuals prefer.

2.5. Statistical analysis

All analyses were implemented in the statistical software R version 4.2.2 and RStudio version 2022.12.0 + 353 [79,80]. Comparisons of results between samples can be found in SI III.

2.5.1. Research question 1: analysis of scenario evaluations on group level

2.5.1.1. Analysis of ratings of "status quo" scenario characteristics. The ratings of each of the nine different characteristics of the "status quo" scenario were compared to each other within each sample applying Friedman tests and subsequent pairwise Bonferroni corrected Wilcoxon tests. The strict Bonferroni method was applied given the exploratory character and large quantity of analyses conducted.

2.5.1.2. Analysis of WTP scores. Given the large number of individuals who would not pay for any of the scenarios, the distribution of individuals who would not pay (WTP = 0) versus those who would pay something (WTP >0) was investigated. For these analyses, only n = 698

[1] For the scenario chosen as the one they were most likely to use, participants were further asked to rank the importance of each of the nine characteristics of this scenario for their decision. This variable is not included in the present work to not overload it.

Table 1
Characteristics of the scenarios and their peculiarities in each scenario.

		Status Quo	Option		Public-Service
			Option – Data ("paying with data")[a]	Option – Fee ("paying usage fee")[a]	
Impact Factors			**Characteristics**		
(1)	Choice over how to pay	Not given	Given	Given	Not given
(2)	Payment model	Advertising companies pay	Advertising companies pay (+usage fee from individuals who chose "option – fee")	Usage fee (+Advertising companies pay for individuals who chose "option – data")	Public-service broadcasting fee
(3)	Data collection	High for all users	High for users who choose this option	Low for users who choose this option	Low for all users
(4)	Advertisements presented	A lot of advertisements + targeting thereof	A lot of advertisements + targeting thereof	No advertisements	Low number of advertisements + no targeting
(5)	Individualized content filtering	High for all users	High for users who choose this option	Medium for users who choose this option	Low for all users
(6)	Development of new functions	High	High when many users choose this option; low when many users choose "option – fee"	High when many users choose "option – data"; low when many users choose this option	Low
(7)	Aiming at users spending (more) time on platforms	Given for all users	Given for users who choose this option	Not given for users who choose this option	Not given for all users
(8)	Transparency of Terms of Use	Low	Low	Low	High
(9)	User's possibilities to influence data collection	Low	Low	Low	At the tradeoff with functionality

Note. Low transparency of Terms and Use was described as long, difficult-to-understand Terms of Use in the scenarios. For brevity, it is referred to as "low transparency" in tables and figures.

[a] The option scenario was presented as one scenario in which individuals had the chance to choose either the "Option – Data" or the "Option – Fee".

participants from the adolescent sample that were at least 15 years old, were presented with each scenario, and provided WTP scores accordingly, were included. Within each sample, distributions were compared between scenarios using χ^2 tests.

2.5.1.3. Analysis of scenario preference. The distribution of individuals deciding for different scenarios was compared to the equal distribution by applying a χ^2 Goodness of Fit test in each sample. Again, only n = 698 participants from the adolescent sample who were at least 15 years old were included.

2.5.2. Research question 2: analysis of links between sociodemographic variables and scenario evaluations

2.5.2.1. Relations of ratings of "status quo" scenario characteristics with sociodemographic variables. A cumulative link mixed model was computed in each sample to investigate relations of age, gender, and education with ratings of the "status quo" characteristics. Cumulative link mixed models are appropriate here since they can handle ordinal dependent variables (compared to ANOVAs) while allowing for random effects and within- and between-factors. Characteristic (within subjects) and z-standardized age, gender (0 = men, 1 = women), and education[2] (between subjects), as well as the interactions of the three sociodemographic variables with the scenario characteristics were included as independent variables. A random effect was added for individual. Characteristic (6) on the development of new functions, which was rated most positive in both samples, was used as the reference.

2.5.2.2. Relations of WTP with sociodemographic variables. A multilevel/mixed logistic regression model was applied to predict whether individuals were willing to pay (WTP = 0 versus WTP >0) for the scenarios. Scenario (within subjects) and z-standardized age, gender, education, pocket money/income[3] (between subjects), as well as the interactions between these sociodemographic variables and scenario were included as independent variables. A random factor was set for individual.

2.5.2.3. Relations of scenario preference with sociodemographic variables. To predict which of the scenarios the participants prefer, a multinomial logistic regression model was computed in each sample. The sociodemographic variables age, gender, education, and pocket money/income were used as predictors. Choosing the "status quo" scenario was set as the reference.

2.5.3. Additional analyses

Preliminary and exploratory findings on relations of the Big Five personality traits, individual values, and uses and gratifications of OSN use with the three dependent variable groups on OSN model evaluations are presented in SI V.

3. Results

3.1. Research question 1: results on group level

As mentinoed before, results on differences between the adolescent and adult samples can be found in SI III.

3.1.1. Results on ratings of "status quo" scenario characteristics

Fig. 2 shows the descriptive ratings of the "status quo" characteristics. There were significant differences between the nine ratings in each sample (adolescent: $\chi^2(8) = 2{,}865$, $p < 0.001$, Kendall W = 0.31; adult: $\chi^2(8) = 1{,}920$, $p < 0.001$, Kendall W = 0.27). Most pairwise comparisons were significant. In both samples, characteristic (6) on the possibility to

[2] For this, educational background was dummy coded: adolescent sample – school type attended: 0 = "Hauptschule" (streamed secondary school), "Realschule" (secondary school), "Gesamtschule" (integrated school), "Gemeinschaftsschule" (interdenominational school), 1 = "Gymnasium" (High School), "Berufsschule" (vocational school); adult sample – highest educational degree: 0 = no educational degree, streamed secondary school, secondary school, 1 = vocational baccalaureate diploma, A-level/High school diploma, university (including university of applied sciences) degree. Income/pocket money was not investigated since no comparisons to other (monetary) payment models were made at this point.

[3] Income was assessed as an ordinal variable with seven response options in the adult sample. For these and the following analyses, this variable was dummy-coded (0 = less than 2000€ per month, 1 = 2000€ or more per month).

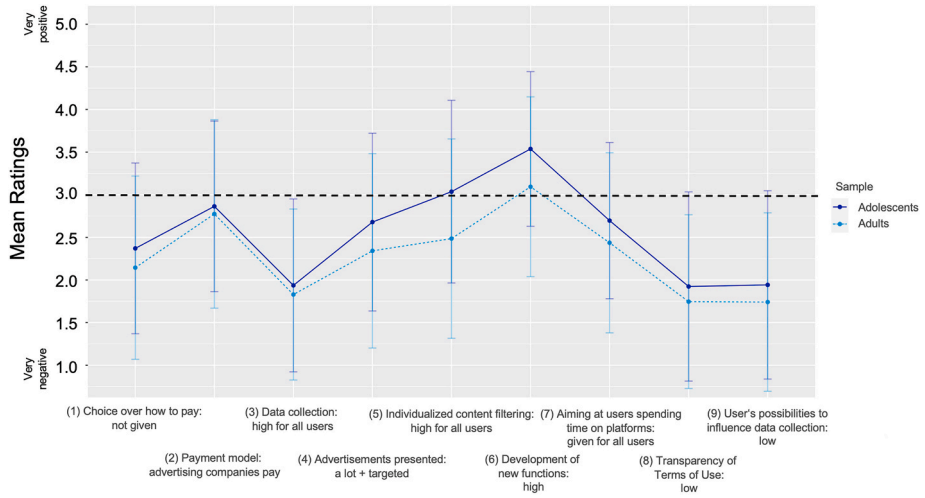

Fig. 2. Descriptive statistics (Mean, +/− 1 Standard Deviation) of ratings of each of the nine characteristics of the "status quo" scenario in the adolescent (N = 1166) and adult (N = 878) sample. *Note.* The dashed horizontal line indicates the "neutral" rating. All pairwise comparisons aside from those between ratings of characteristics (3) and (8), (3) and (9), (4) and (7), and (8) and (9) were significant (all Bonferroni-corrected p-values <0.001) in the adolescent sample. In the adult sample, all pairwise comparisons except for those between ratings of characteristics (4) and (7), (5) and (7), and (8) and (9) were significant (all Bonferroni-corrected p-values <0.050).

develop new functions was rated as the most positive characteristic. Characteristics (8) and (9) on long and difficult-to-understand Terms of Use and low possibilities to impact data collection were rated most negative in both samples (and (3) in the adolescent sample).

3.1.2. Results related to willingness to pay

Table 2 presents the number of individuals who would not (WTP = 0) versus would pay some money (WTP >0) for each scenario in both samples. The distributions of individuals not willing to pay versus those willing to pay differed significantly between all scenarios in both samples (all p-values of χ^2 tests <0.001; even after Bonferroni correction). In both samples, the largest share of individuals was willing to pay for the "public-service" scenario.

Table 2
Distributions of WTP (Willingness to Pay) in both samples.

	Total		
	N	**n (%) (WTP = 0)**	**n (%) (WTP >0)**
Adolescent Sample			
Status Quo			
WTP: Status Quo	1166	526 (45.11 %)	640 (54.89 %)
Option[a]			
WTP: Option – Data[a]	698	322 (46.13 %)	376 (53.87 %)
WTP: Option – Fee[a]	698	232 (33.24 %)	466 (66.76 %)
Public-Service			
WTP: Public-Service	698	225 (32.23 %)	473 (67.77 %)
Adult Sample			
Status Quo			
WTP: Status Quo	878	503 (57.29 %)	375 (42.71 %)
Option[a]			
WTP: Option – Data[a]	878	446 (50.80 %)	432 (49.20 %)
WTP: Option – Fee[a]	878	388 (44.19 %)	490 (55.81 %)
Public-Service			
WTP: Public-Service	878	376 (42.82 %)	502 (57.18 %)

Note. Sample sizes in the adolescent sample vary because only participants from the age of 15 years saw all scenarios and responded to the respective questions, accordingly; WTP "status quo" for participants from the age of 15 years in the adolescent sample: WTP = 0: n = 317 (45.42 %); WTP >0: n = 381 (54.58 %).

[a] The "option" scenario was presented as one scenario in which individuals had the chance to choose either the "Option – Data" or the "Option – Fee". They were asked for the WTP for both options within this scenario based on previous research ("Option – Fee"; Sindermann et al. [39,40]) and for consistency.

3.1.3. Results on scenario preference

For the decision on which of the three scenarios individuals wanted to use the most, the "public-service" scenario was most often chosen in the adolescent sample (n = 285, 40.83 %). In the adult sample, the "option" scenario (not yet differentiating between the two options) was chosen by most individuals (n = 384, 43.74 %). Both distributions significantly differed from the equal distribution (adolescent: $\chi^2(2) = 34.68$, $p < 0.001$, adult: $\chi^2(2) = 111.09$, $p < 0.001$).

Considering "option – data" versus "option – fee" separately (as mentioned, participants choosing the "option" scenario were further asked to specify which of the two options the preferred), the distribution of decisions also significantly deviated from the equal distribution in both samples (adolescent: $\chi^2(3) = 104.72$, $p < 0.001$; adult: $\chi^2(3) = 105.13$, $p < 0.001$). As can be seen in Fig. 3, most participants of both samples chose the "public-service" model as the preferred scenario.

3.2. Research question 2: sociodemographic variables and scenario evaluations

3.2.1. Results on ratings of "status quo" scenario characteristics

Detailed results of cumulative link mixed models are presented in SI IV. In the adolescent sample, neither significant main nor interaction effects (with characteristics) of age were observed. Men showed higher ratings than women in characteristics (1), (3), (7), (8), and (9) (and this difference was larger than the differences in ratings of characteristic (6); all p-values of interaction effects <0.003). These results are also illustrated in Fig. 4. The lower education group (Group 1) showed higher scores in ratings of characteristics (1), (3), (7), (8), and (9) than the higher education group (Group 2); and this difference was larger than the differences in ratings of characteristic (6) (all p-values of interaction effects <0.017).

In the adult sample, a main effect of age was observed ($p < 0.001$) indicating that older individuals of the adult sample generally rated the characteristics more negatively. Significant interaction effects of characteristics (8) and (9) with age (p-values <0.014) indicated that this effect was especially pronounced for those characteristics (Spearman correlations: (8): $\rho = -0.26$, $p < 0.001$; (9): $\rho = -0.27$, $p < 0.001$). Significant interactions of gender with characteristics (3), (7), (8), and (9) were observed (all p-values <0.044). As can be seen in Fig. 4, men showed higher ratings than women in these characteristics; and this difference was larger than the differences in ratings of characteristic (6).

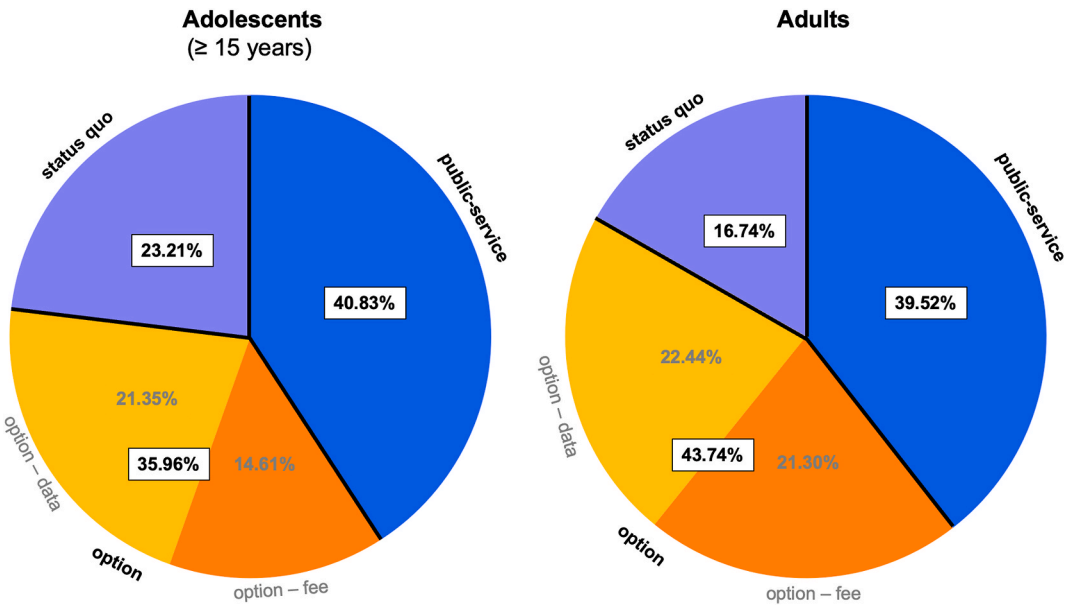

Fig. 3. Preference distribution in the adolescent (N = 698) and the adult (N = 878) sample.

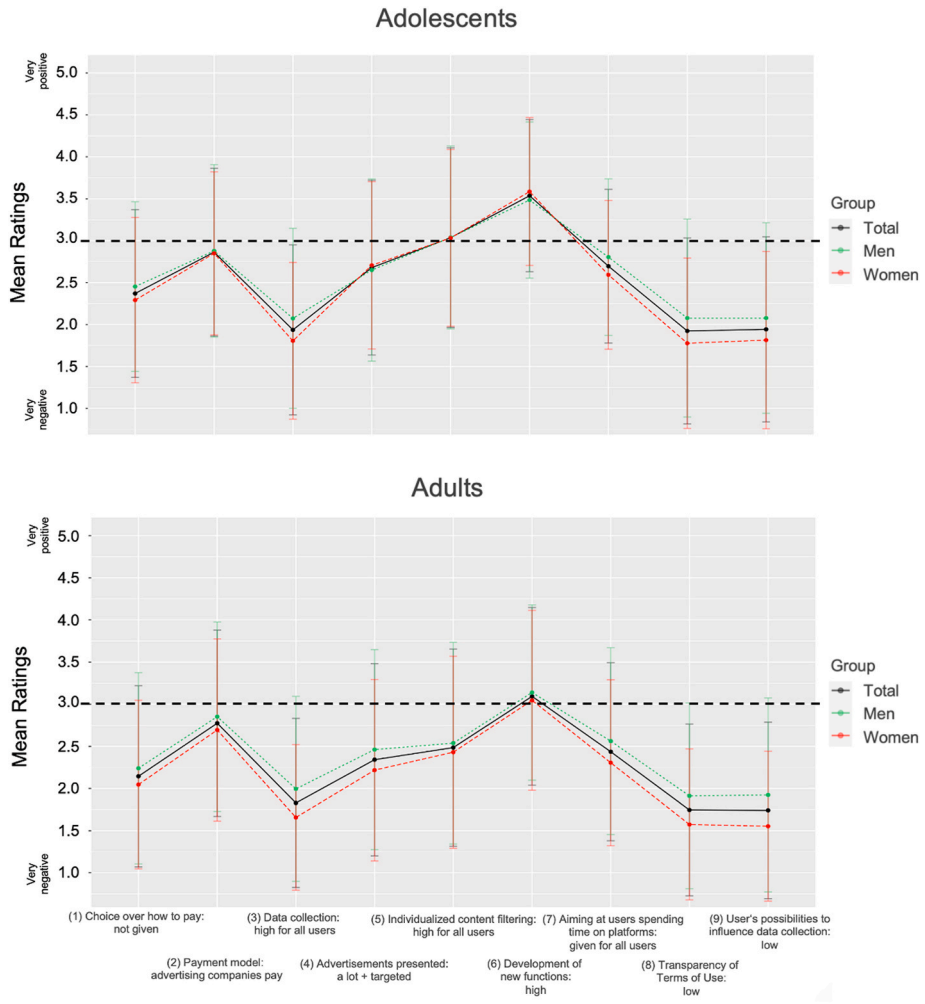

Fig. 4. Descriptive statistics (Mean, +/− 1 Standard Deviation) of ratings of each of the nine characteristics of the "status quo" scenario in the adolescent (N = 1166) and adult (N = 878) samples split by gender. *Note.* Dashed horizontal lines indicate "neutral" response.

Neither main effects nor interaction effects of education were observed.

3.2.2. Results related to willingness to pay

Detailed results of the mixed logistic regression model are presented in SI IV. In the adolescent sample, among others the interactions of the "public-service" scenario with gender ($p = 0.028$) and education ($p = 0.033$) were significant. In short, in women, the probability to be willing to pay for the "public-service" scenario was higher than for the "status quo" scenario; and this difference was higher than in men. Further, having higher education was associated with a higher probability of being willing to pay for the "public-service" versus the "status quo" scenario in the adolescent sample.

In the adult sample, younger individuals were in general more likely to be willing to pay ($p < 0.001$). Moreover, the interaction between the "public-service" scenario and age was significant ($p = 0.002$), as was the interaction between the "public-service" scenario and income ($p = 0.003$). In short, younger age was related to a higher probability of being willing to pay in the adult sample, especially for the "status quo" versus the "public-service" scenario, and higher income was related to a higher probability of being willing to pay for the "public-service" versus the "status quo" scenario.

The distribution of WTP scores in men and women of each sample is presented in Table 3.

Table 3
Distributions of WTP (Willingness to Pay) scores in the adolescent and adult samples separately for men and women.

	Men			Women		
	n	**n (%) (WTP = 0)**	**n (%) (WTP >0)**	**n**	**n (%) (WTP = 0)**	**n (%) (WTP >0)**
Adolescent Sample						
Status Quo						
WTP: Status Quo	569	252 (44.29 %)	317 (55.71 %)	597	274 (45.90 %)	323 (54.10 %)
Option[a]						
WTP: Option – Data[a]	296	122 (41.22 %)	174 (58.78 %)	402	200 (49.75 %)	202 (50.25 %)
WTP: Option – Fee[a]	296	97 (32.77 %)	199 (67.23 %)	402	135 (33.58 %)	267 (66.42 %)
Public-Service						
WTP – Public-Service	296	105 (35.47 %)	191 (64.53 %)	402	120 (29.85 %)	282 (70.15 %)
Adult Sample						
Status Quo						
WTP: Status Quo	446	250 (56.05 %)	196 (43.95 %)	432	253 (58.56 %)	179 (41.44 %)
Option[a]						
WTP: Option – Data[a]	446	221 (49.55 %)	225 (50.45 %)	432	225 (52.08 %)	207 (47.92 %)
WTP: Option – Fee[a]	446	191 (42.83 %)	255 (57.17 %)	432	197 (45.60 %)	235 (54.40 %)
Public-Service						
WTP – Public-Service	446	186 (41.70 %)	260 (58.30 %)	432	190 (43.98 %)	242 (56.02 %)

Note. Sample sizes in the adolescent sample vary because only participants from the age of 15 years saw all scenarios and responded to the respective questions accordingly. Descriptive statistics for participants with different educational backgrounds are not presented to not overload the table; if readers are interested in descriptive statistics for different educational groups, they can check the data underlying the present work that are uploaded online. WTP "status quo" for participants from the age of 15 years in the adolescent sample: men: WTP = 0: n = 128 (43.24 %), WTP >0: n = 168 (56.76 %); women: WTP = 0: n = 189 (47.01 %), WTP >0: n = 213 (52.99 %).

[a] The "option" scenario was presented as one scenario in which individuals had the chance to choose either the "Option – Data" or the "Option – Fee". They were asked for the WTP for both options within this scenario based on previous research ("Option – Fee"; Sindermann et al. [39,40]) and for consistency.

3.2.3. Results on scenario preference

Detailed results of the multinomial logistic regression model are presented in SI IV. Only a few significant results were found: In both samples, an effect of gender was significant (see also Fig. 5), indicating that women are more likely than men to choose the "public-service" model versus the "status quo" model. In the adult sample, higher age was additionally significantly related to choosing the "public-service" model over the "status quo" model.

4. Discussion

Based on six semi-structured interviews with experts from academia and industry [75], three scenarios were built. They dealt with how OSNs based on the user-related, advertisement-based revenue model are conceptualized at the moment and how OSNs might look if the revenue model was changed: one scenario reflected the current state of OSNs ("status quo"), one described an OSN financed like the "Pur" model, where individuals have the options to "pay" with data versus money ("option"), and one scenario was based on the public-service broadcasting idea ("public-service").

The first aim of the present work was to investigate how non-expert individuals evaluate these OSN scenarios. The second aim was to examine how individual differences in these evaluations relate to sociodemographic variables. All investigations were independently replicated across an adolescent and an adult sample.

4.1. Discussion of results related to research question 1: group-level results

The findings of the present work show that related to the "status quo" of OSNs, adolescent and adult participants rated characteristic (6) on high possibilities of OSNs to develop new functions most positively of all characteristics. In the scenario, it was not differentiated between various functions that might be developed. It was only mentioned that the possibilities to develop new functions are high. Maybe among others because of the lack of differentiation, the mean ratings only slightly exceeded the neutral rating in both samples. Nevertheless, this characteristic seems to be of interest to future studies and discussions. In our opinion, these possibilities could be taken advantage of by OSN providers. As such, they could be used to reduce privacy-related risks and dangers related to unbiased opinion formation, and to increase the psychological well-being of users, even if sticking to the prevailing revenue model. For instance, new functions could be implemented to increase the OSN platform's capacity to boost digital well-being from our point of view. This approach is called "well-being supportive design" or "positive computing" [81]. Maybe, non-expert individuals and potential users would rate the development of such functions especially positively. However, the fact that possibilities to develop, test, and evaluate new functionalities are intertwined with the collection of – at least some – data must be considered. As such, the degrees of development capacities and data collection can be deemed a tradeoff.

In this regard, it must be noted that characteristic (8) on long and difficult-to-read Terms of Use, and characteristic (9) on few possibilities for users to impact data collection were on average rated the most negative of the "status quo" scenario characteristics in both samples; similar to characteristic (3) on high data collection, which was also rated negatively in the adolescent sample. The finding in relation to negative ratings on the Terms of Use is in line with results indicating that individuals tend to skip them. This is likely because skipping them is easier than reading them. Moreover, such terms are often experienced as too long and potentially not understandable [82]. Further, information overload due to the length of terms of service and privacy policies seems to predict scrolling through them without reading [82]. These findings point toward the importance of especially short explanations for individuals to actually read them and – most likely – rate them more positively. Some design ideas in relation to explaining data handling are

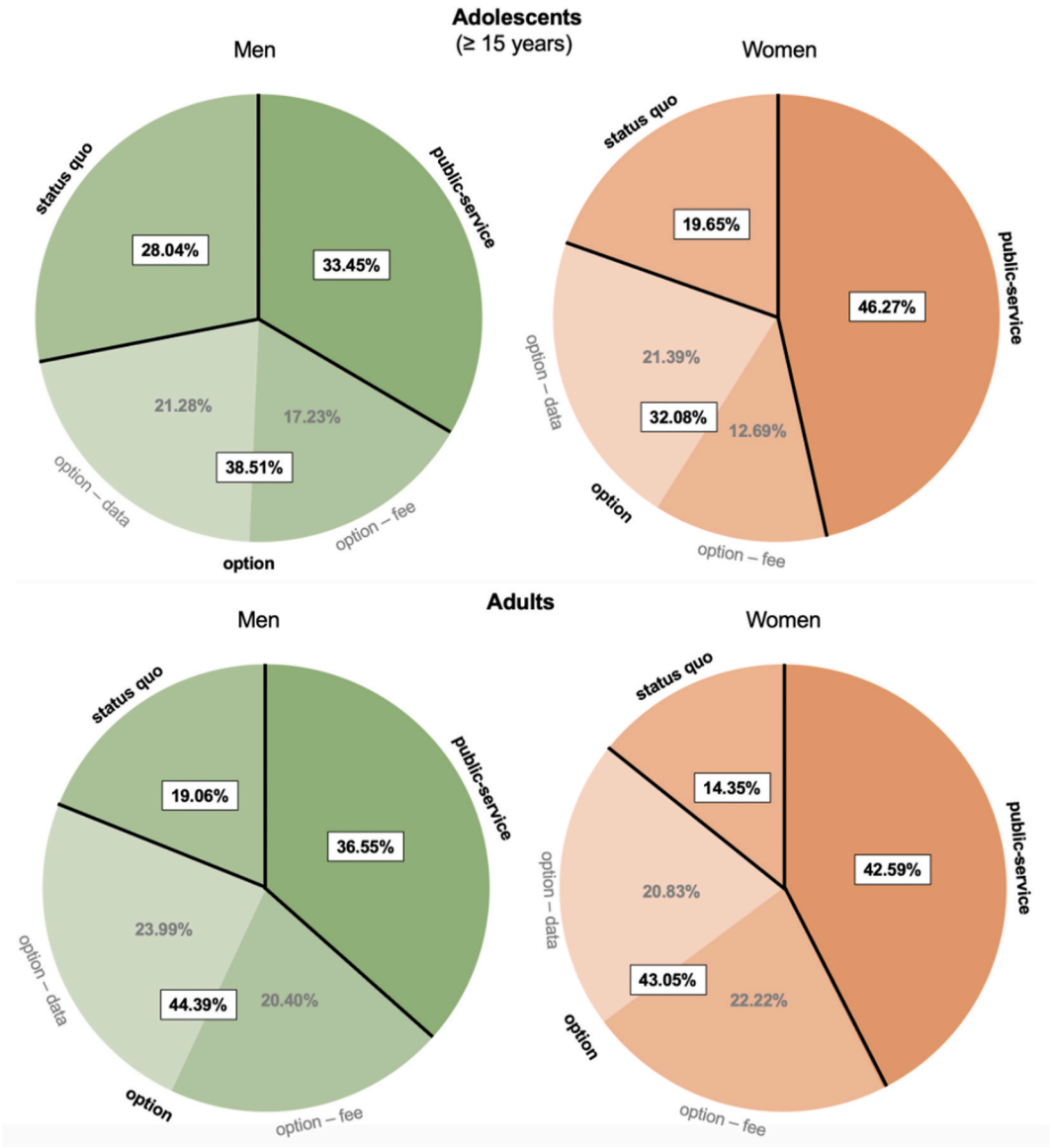

Fig. 5. Distribution of scenario preference in the adolescent (N = 698) and adult (N = 878) samples separately for men and women.

presented in Barth et al. [83].

The low ratings of characteristics (8) and (9) and the generally few positive ratings of "status quo" characteristics draw attention to the fact that non-expert individuals indeed seem to acknowledge critical points of the currently prevailing OSN revenue model and accopmanying platform regulations and design. In addition, the ratings might explain the relatively negative evaluations of this scenario compared to the other two scenarios. This is evident from its status as the least likely scenario to be chosen by participants in both samples when comparing the three OSN model options ("status quo", "option", "public-service").

With the comparatively low number of individuals choosing the "status quo" scenario, the present work provides insights that at least part of non-expert individuals is open to alternative revenue/payment models for OSN and accompanying changes in platform design. While all scenarios provide advantages and disadvantages, from the (privacy) calculus perspective, it seems like the disadvantages in the "status quo" scenario predominate the advantages and weigh heavier than the disadvantages in the other scenarios. As such, the rather negative evaluation of the "status quo" scenario across variables investigated in the present work might in part be due to the characteristics of this scenario, which indicate lower privacy and high data collection. As mentioned before, in Germany a significant share of individuals is concerned about their privacy online [1,35]. Moreover, a generally positive attitude toward alternative revenue models and the design of OSNs is underlined by the fact that in both samples, most individuals were willing to pay for the "public-service" scenario. In addition, in both samples, most individuals chose the "public-service" scenario to be the OSN they would most likely want to use; in the adult sample, however, only when differentiating between "option – data" and "option – fee". The broad similarity in the findings on the evaluations of the "public-service" scenario in both samples is interesting especially because the adolescents grew up in a world where the "status quo" OSN was always available. In comparison, most (older) adults grew up when the "status quo" OSN did not exist. However, they should be very familiar with the "public-service" model via respective television/radio channels. Such a difference in upcoming would intuitively be related to large differences in evaluations. However, this does not seem to be the case.

In addition, the generally rather positive evaluations – in terms of WTP and scenario preference – of the "public-service" scenario might, at first, seem surprising. This is because in Germany there is a lot of critical debate about public-service broadcasting and related fees among citizens and at the party level [84–86]. In France, the abolition of public

broadcasting fees has been approved [87]. Nevertheless, trust in public-service media is still higher than in private TV and the boulevard press in Germany. Moreover, many individuals seem to deem information from public-service media an important contribution to democracy. News derived from social media, video platforms, and alternative media are generally trusted little [88]. In line with these findings, participants in the present surveys deemed a "public-service" OSN valuable. Individuals might even trust a democratic state's public (versus governmental) regulation of an OSN [89] and might value the social, cultural, and democratic mandate of "public-service" models. In addition, the unique manifestations of characteristics in the "public-service" scenario might underly the present findings: Participants might, for instance, have deemed social aspects as favorable, such as same fees, low content filtering, and not aiming to keep users on the platforms applying similarly to all users. Hence, a social "We"-perspective might underly decisions for the "public-service" scenario compared to the "option" scenario where all users are responsible for themselves. Additionally, privacy and transparency-related aspects (for oneself) might have been important for the favorable evaluations.

Implementing a "public-service" OSN in Germany comes with several challenges. First, an infrastructure must be created and financed, likely leading to an increase in the existing public-service broadcasting fee. Another challenge is that while in Germany a "public-service" OSN seems to be accepted based on the present results, it is vital to ensure that such an OSN is also accepted and used outside of Germany. This not only enables users to communicate with international friends and family. It is also important to profit from network effects [90] and keep up with the current supranational OSNs. The cross-cultural applicability might be one of the biggest challenges because not all countries currently apply public-service broadcasting, and it must be considered how users from such countries pay. Additionally, questions about which and how cultural, political, and societal values and laws are followed on such a platform will be faced. However, these challenges similarly apply to already existing mainstream platforms. Thus, knowledge from experts from academia and industry with backgrounds in political, legal, media, and communication sciences, as well as from sociology, ethics, and psychology is important. Only such an inter- and transdisciplinary team can ultimately ensure that aspects like platform design and content moderation are implemented in ways that align with the core values of public-service broadcasting and are cross-culturally applicable and accepted. Another possibility is to rely on corporate social responsibility applied to public-service broadcasting OSNs [91]. One crucial point in this context will be the development of content moderation criteria and regulations about how these criteria are observed and enforced; i.e., what happens to users violating the community rules. Next to an interdisciplinary expert team, also the inclusion of citizens is possible, maybe even necessary to ensure a truly publicly regulated OSN. While those – and many other challenges – seem difficult to solve right away, a deeper look into the feasibility of a "public-service" OSN seems worthwhile given the possibilities to overcome negative impacts attributed to the prevailing revenue model of OSNs.

4.2. Discussion of results related to research question 2: relations with sociodemographic characteristics

Concerning sociodemographic variables in relation to individual differences in evaluations of OSN scenarios, only a few significant findings were observed in the two samples. In both samples, characteristics on (3) high data collection, (7) the aim that users spend more (active) time on platforms, (8) long and difficult-to-understand Terms of Use, and (9) low possibilities for users to influence data collection were rated more positive by men compared to women. This is in line with previous literature in the realm of the privacy calculus indicating higher privacy concerns in women [53,69]. In addition, the rating of the characteristic of increasing time spent on the platforms being more negative in women might be explained by findings indicating that women are more prone to develop use disorder tendencies for certain platforms [7,92,93]. Additionally, identifying as a woman was related to a higher probability of choosing the "public-service" scenario compared to the "status quo" scenario in both samples of the present work. The arguments for a positive evaluation of the "public-service" scenario mentioned before might, therefore, be specifically applicable to women.

The otherwise non-significant and/or not replicable findings on relations between sociodemographic variables and scenario evaluations might be due to the differences between samples, e.g., in how education and income/pocket money were measured. In addition, for the adult sample, the present findings are in line with findings in another adult sample showing mostly non-significant findings for relations between the sociodemographic variables age and gender and WTP for improved services on social media [39]; but note some significant relations with age in the present adult sample. Thus, it seems like aside from some gender (and age) differences, individuals with diverse sociodemographic backgrounds evaluate the "status quo" of OSNs as well as alternative models similarly. This indicates that if new OSN models were put to the test, it is not likely that only small, homogeneous groups would be open to them. Instead, the present findings underline that the user base of alternative OSNs can be diverse, at least with respect to sociodemographic backgrounds and in WEIRD societies like Germany.

4.3. Discussion of results in adolescents versus adults

While direct comparisons of the adolescent and adult samples were not in the scope of the present work, some differences seem especially interesting.

Adolescents showed higher ratings of the "status quo" characteristics with especially pronounced effects for ratings of (5) individualized filtering of content, and (6) development of new functions (see Fig. 1; SI III). Related to the differences in the ratings of characteristic (5), on the one hand, adults may be more knowledgeable about concepts and discussions around "filter bubbles" and "echo chambers" [6,8,94]. They may, therefore, be more skeptical in relation to content filtering than adolescents. This is especially likely since this topic gains the most attention in the political context. On the other hand, adolescents might be more open to the (subjective) benefits of algorithmic personalization increasing content that is of interest to them, especially outside of the political context. Why characteristic (6) is rated more positively by the adolescent sample remains unknown for now. Adolescents might value OSNs more and/or might be generally more open to new developments.

In addition, although it was specifically asked how much of their *own* money participants were willing to pay, in the group of individuals presumably having less money (adolescents) more were willing to pay. It is possible that OSNs are of greater value to adolescents than adults. Some research indicates that younger individuals use more social media platforms and use social media more frequently, and that a larger share of younger versus older individuals uses social media [95,96]. None of the cited studies specifically investigated adolescents versus adults. Nevertheless, a higher or qualitatively different valuation of OSNs in adolescents versus adults might explain the higher willingness to pay irrespective of the exact structures and payment models applied to OSNs as found in the present work [97].

Further, while specifically the "option – fee" option in the "option" scenario was the least preferred in the adolescent sample, the "status quo" scenario was least preferred in the adult sample. This result can be due to different reasons. For instance, it is possible that more adolescents prefer the "status quo" over the "option – fee" because they are more used to the "status quo" and do not realize significant improvements of the "option – fee" over the "status quo" model. Additionally, Fig. 5 shows that in adolescents, the difference in how often the "status quo" scenario was preferred between men and women was descriptively larger (28 % : 20 %) than in the adult sample (19 % : 14 %). This indicates that gender effects in this regard might be especially pronounced in younger individuals.

Furthermore, only in the adult sample, significant effects of age were observed. That the effects were not replicated in the adolescent sample is most likely due to the limited age range in that sample; especially for analyses of WTP and scenario preference in which only individuals from the age of 15 were included.

In summary, further investigations of the exact mechanisms and decision rules underlying differences between adolescents and adults in their evaluations of OSNs and their revenue models could be an interesting research approach for upcoming studies. Developmental psychological theories on social learning [98,99], psychosocial [100,101], and cognitive development [102] could inform such studies.

4.4. Limitations

The present work is of an exploratory nature. Therefore, all interpretations are post hoc. In addition, data were assessed cross-sectionally disallowing for any causal interferences. Self-reports, as used in the present work, can additionally be subject to certain biases, like social-desirability bias. Additionally, for the present work, a scenario-based approach was chosen to compare sets of factor levels (i.e., characteristics) against each other. By doing so, no classical fully-crossed design was applied. Instead, factor-level combinations that were deemed consistent and realistic based on expert interviews were presented. For instance, a scenario in which data collection is low and individualized content filtering is high seems impossible and was, therefore, not included in the present work. This approach enables an investigation of realistic alternative OSN models only and reduces the time for participation compared to a fully-crossed design. Moreover, it might be seen as a limitation that the present work is purely hypothetical. As such, it remains unclear whether, in a real-world setting, participants would choose an OSN for which they needed to pay money, over an OSN which is free of monetary charges. Most likely, this decision would also be based on the amount of money that needed to be paid, which was not set in the present work due to disagreement across the expert interviewees. In the "status quo" scenario, participants in this study rated the possibility of creating new functions positively. However, it is unclear whether specific functions, such as those suggested in the discussion section to improve digital well-being, will in fact be incorporated in OSNs by their developers in the future. And it remains unknown whether they would be rated more favorably than others by users. Furthermore, evaluations of various OSN scenarios are likely to be influenced by factors beyond sociodemographic variables. For example, why and how individuals use OSNs may be important. SI V presents some preliminary correlations in this regard. Finally, due to technical limitations in the adolescent sample, the scenarios were presented in a fixed order. Specifically, it was not possible to ensure that only individuals below the age of 15 were presented with the "status quo" scenario while also randomizing the order of the three scenarios for individuals from the age of 15 years. Similarly, in the adult sample, the scenarios were not randomized, consistent with the lack of randomization in the adolescent survey. However, order effects are unlikely since all participants were presented with the "status quo" scenario first, followed by all three scenarios - including a repeated presentation of the "status quo scenario" - on the same page, along with accompanying questions.

5. Conclusions

The present work underlines individuals' rather positive evaluations of OSN platforms' possibilities to develop new functions. This characteristic should – in our opinion – be taken advantage of in the future to increase privacy where possible and the digital well-being of users if platforms stick to the user-related, advertisement-based revenue model. In addition, negative ratings of long and difficult-to-read Terms of Use, and few possibilities for users to impact data collection point towards the necessity of easier-to-understand terms to increase transparency and trust, if OSN providers want to stick to the prevailing revenue model.

Nevertheless, results also provide evidence that in general, a share of individuals seems to be open to alternative payment methods for OSNs and accompanying changes in platform design and regulation. The strength of those evaluations seems to partly underlie individual differences, which are in part related to gender. As such, men seem to evaluate several characteristics of the currently prevailing OSN model more positively, and women are more in favor of a "public-service" OSN model compared to men. Aside from gender, however, most findings of the present work on relations with sociodemographic characteristics reveal small and non-significant results and/or results that were not replicated across the adult and adolescent samples. While the findings might indicate that other factors are of importance to explain variation in the evaluations, they can also be deemed positive: It seems like individuals with different sociodemographic backgrounds were willing to pay and willing to use alternative OSN paving the way for diverse user bases on newly developed platforms. Following this, a deeper look into the development of alternative OSNs like a "public-service" OSN seems to be an important next step on the way to creating new OSNs to overcome limitations of currently existing platforms.

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Declaration of assistance

During the preparation of this work the authors used chatgpt (https://chat.openai.com/) in order to rephrase some sentences. Moreover, the authors used scribens (https://www.scribens.com/), Grammarly (https://www.grammarly.com/), and DeepL write (https://www.deepl.com/write/) in order to ensure grammatical correctness of the text. After using these tools, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

CRediT authorship contribution statement

Cornelia Sindermann: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Validation, Visualization, Writing – original draft. **Nana Löchner:** Data curation, Investigation, Writing – review & editing. **Rebecca Heinzelmann:** Data curation, Investigation, Writing – review & editing. **Christian Montag:** Writing – review & editing. **Roland W. Scholz:** Conceptualization, Funding acquisition, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

The Authors declare that there is no conflict of interest. For reasons of transparency Dr. Montag mentions that he has received (to Ulm University and earlier University of Bonn) grants from agencies such as the German Research Foundation (DFG). Dr. Montag has performed grant reviews for several agencies; has edited journal sections and articles; has given academic lectures in clinical or scientific venues or companies; and has generated books or book chapters for publishers of mental health texts. For some of these activities he received royalties, but never from gaming or social media companies. Dr. Montag mentions that he was part of a discussion circle (Digitalität und Verantwortung: https://about.fb.com/de/news/h/gespraechskreis-digitalitaet-und-verantwortung/) debating ethical questions linked to social media,

digitalization and society/democracy at Facebook. In this context, he received no salary for his activities. Also, he mentions that he currently functions as independent scientist on the scientific advisory board of the Nymphenburg group (Munich, Germany). This activity is financially compensated. Moreover, he is on the scientific advisory board of Applied Cognition (Los Altos, CA, USA), an activity which is also compensated. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data and analysis scripts are available online (https://osf.io/gm2y8/).

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Appendix A. Supplementary data

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