



# How Arousing Benefits and Ethical Misgivings Affect AI-Based Dating App Adoption: The Roles of Perceived Autonomy and Perceived Risks

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**Abstract.** AI-based applications (apps) have presented tremendous ethical challenges such as AI biases and privacy breaches, leading to the issue of privacy paradox. The paradox is more salient for dating apps than ordinary shopping apps, as data breaches in dating apps could relate to users' close social circles such as families and colleagues, suggesting more serious ethical and even legal consequences. Given the limited attention to user' arousal-ethics paradox, we developed and empirically examined a conceptual framework regarding how the arousing benefits of dating apps, users' ethical misgivings, users' perceived autonomy and perceived risks collectively affect their adoption of dating apps. Survey data from 319 construction workers confirmed that arousing benefits are associated with users' perceived autonomy, which leads to dating apps adoption. In contrast, users' ethical misgivings, associated with perceived risks, are negatively related to dating app adoption. This study contributes to the interdisciplinary field of privacy paradox that involves big data, artificial intelligence, user experience, and ethics by examining ethical consumption and practical suggestions to AI-based dating app developers.

**Keywords:** Artificial Intelligence · Dating application · Perceived autonomy · Perceived risks

## 1 Introduction

Featured with volume, velocity, variety, and veracity, big data have provided great potential for firms to understand and capture consumer value [1]. Big data are often generated through sensor networks, social media, internet clicks, and mobile apps, and empowered with business values through artificial intelligence (AI) [2]. For instance, data mining techniques (e.g., link analysis & association rule learning) could identify high-value

customers and understand their patterns and preferences in using the functions of the mobile apps, allowing firms to offer personalized promotions to products and services [1]. The AI market was valued at \$16.06 billion in 2017 and is expected to reach \$190.61 billion by 2025. However, practitioners and researchers have warned that AI could be dangerous and render humans obsolete and useless [2]. In particular, mobile apps often require users' location, personal preferences, gender, age, interests, and other personal data to serve specific functions, allowing AI to access sensitive information about users [3, 4]. AI-based apps have presented tremendous ethical challenges such as AI biases and privacy breaches. In response, researchers have investigated 1) the ethics of digital governance [5] and 2) how app developing companies reveal processes of sensitive data deployment as an ethical re-sponse to consumer concerns [6], and 3) and consumer responses to AI-based apps that collect sensitive information [7].

Consumers hold mixed feelings about AI: enjoying the superior capabilities of AI-enabled services while worrying about the negative implications of privacy breaches; a phenomenon known as privacy paradox [8, 9]. One type of data-sensitive app has been dating apps, which support the search for romantic and sexual partners [6, 10]. Dating apps are most suitable to investigate the ethical concerns of paradox research as they involve intensive data generation, algorithmic processing, and cross-platform sharing of sensitive data [10]. According to Guardian's journalist Judith Duportail, dating apps can access users' gender, sexual orientation, location data, political affiliation, and religion, but also data about users' activity on social media platforms (e.g., information from Facebook and Instagram accounts & conversations with every match on the app) [11]. Compared to other data-sensitive apps such as financial and shopping apps, dating apps could, in the event of a privacy breach, result in more serious consequences to users. Known examples of such breaches include 'Ashley Madison data breach', where 60 Gb of detailed user data (including user data from Saudi Arabia, where adultery is subject to a death sentence) on this extramarital affair website were released. Given the limited attention on ethical implications of data-sensitive apps from a consumer perspective, this study examines consumers' trade-off decisions between the arousing benefits promised on dating apps and the ethical misgivings over the possibility of data breach. Users in the privacy paradox may also make adoption decisions based on their knowledge about how AI-based apps works [7]. Drawing on existing literature, we proposed and empirically examined a new conceptual framework to unravel how users' data related knowledge, i.e., perceived autonomy & perceived risks, affect users' adoption of dating apps, given the privacy paradox (i.e., arousing benefits & ethical misgivings).

The remainder of this paper is structured as follows. The next section summarizes the existing literature on dating apps introduces the key variables in the conceptual framework related to consumer adoption of those apps. Section 3 introduces the research design and samples used in this study. Section 4 presents the details of the results of the survey and data analysis. Section 5 discusses this paper and suggests the study's implications from different perspectives, limitations and directions for future research.

## 2 Literature Review

### 2.1 Dating Apps and Users' Privacy Paradox

The boom in dating apps has raised marketing interests and social concerns among practitioners and researchers [6, 12]. Indeed, the mobile apps allow users to connect with current loved-ones but also explore new ones while keeping the disconnected or geographically distant family members in touch. This is achieved through dating apps (e.g., Badoo, Momo, & Tinder) which generate location-based data (through GPS & postcodes), which after sophisticated calculative and ordering algorithms, could facilitate searching, photo sharing, texting, matching, and meeting among users [13, 14]. The registration and use of a dating app will trigger cross-platform connections where data related to the users' personal profile and preference information will be shared. Such data enable app developers to optimize and capitalize on user experience. However, cross-platform data sharing and integration have resulted in privacy concerns in the context of mobile dating apps.

According to Dinev and Hart [25], people develop different concepts of privacy according to their interpretations. In other words, if a certain behavior could bring about more positive outcomes (e.g., income & romance) than negative outcomes (e.g., exposure), mobile app users will disclose their personal information in exchange for the benefits, provided that their personal information can be used in ways that do not generate any negative consequences in the future [16]. For social media (e.g., dating app) users, such negative consequences can include social, psychological or informational threats from familiar individuals and app developers [13]. For dating app users, those threats may come from familiar individuals (e.g., colleagues & neighbors) could be more embarrassing and intimidating than those from app developers that share user data to third-party platforms.

### 2.2 Arousing Benefits

Dating app developers have designed app interfaces in ways that could stimulate user attention, engagement, and consumption. Those interfaces could provide atmospheric cues that suggest arousing benefits. We define 'arousing benefits' as the aesthetics involved in a dating app and the displayed photos of its existing users, sensory descriptions of user information (e.g., height & weight) and the interactive chat links that create an interactive and exciting atmosphere. As users increasingly take dating apps as a kind of game, developers add functions that support social interaction, flirting, traveling, and meetups [18]. Moreover, dating apps allow users to find strangers in nearby locations, check their pictured profiles [19]. As users tend to post attractive photos of themselves to increase publicity, these photos create an arousing effect on those browsing their profiles. Previous studies [20, 21] on user experience have confirmed the positive impacts of arousing benefits on users' adoption of apps. However, those studies fail to consider the mediating mechanism in the relationship, especially given the issue of the privacy paradox, suggesting further investigation to explain users' adoption of dating apps.

### 2.3 Ethical Misgivings

Users may have legal and ethical misgivings when adopting dating apps. According to the revenue and usage statistics report (2022) of Tinder, a dating app with over 100 million subscribers worldwide, around 30% of subscribers were married. Put the legal perspectives aside; those married subscribers may bear ethical misgivings when using the app. Ethical misgivings in this study refer to app users' concerns that their behaviors (e.g., lying & cheating) are wrong and unfair to those around them (e.g., families & partners). Another group of dating app users could involve those who aim to make friends, travel, and seek actual relationships. However, the unethical reputation of certain dating apps as hook-up websites could also bring ethical misgivings to those people.

### 2.4 Perceived Autonomy

Perceived autonomy in this study refers to users' evaluation of the degree to which they have control over their sensitive data on dating apps. Dating apps increasingly include the gamification functions where users are allowed to determine the various functions (e.g., the show of location, age, income on profile, & removal of visiting history). Moreover, dating apps enable users to select other users based on different demographic features (e.g., age & height), thereby promoting their perceived autonomy. Users with knowledge about the kind of data kept in privacy and that disclosed to the public could willingly give up certain data to enjoy the arousing benefits.

Therefore, the following hypotheses can be developed:

H1: Arousing benefits are positively associated with users' perceived autonomy.

H2: Perceived autonomy is positively associated with users' adoption of dating apps. In contrast, some users may worry that even if the dating apps promise not to release their personal information, their data could still be breached by hackers and sold for money, as illustrated in the data leakage cases. As such, these users may demonstrate fears of being controlled. Such fears could be more salient when users are adopting new technologies such as dating apps [22]. As such, the following hypothesis could be predicted:

H3: Ethical misgivings are negatively associated with users' perceived autonomy.

### 2.5 Perceived Risks

While ethical misgivings describe an individual's moral judgement regarding wrong behaviors, perceived risks in this study refer to dating app users' perception and evaluation of the possible negative results from personal data disclosure. The known risks perceived by dating apps include fake men/women and sales of personal data, which, fueled by the reported cases of data breach and user exposure, could raise user concerns about their privacy. Perceived risks could also lead users to the conviction that they lose control of their privacy once logging into a dating app [23]. Moreover, users with ethical misgivings are more likely to associate dating app usage with the various risks. Given such discussion, the following hypotheses can be proposed:

H4: Ethical misgivings are negatively associated with perceived autonomy.

H5: Ethical misgivings are positively associated with perceived risks.

H6: Perceived risks are negatively associated with users' adoption of dating apps.

The above hypotheses constitute a theoretical framework (see Fig. 1), which was empirically tested.

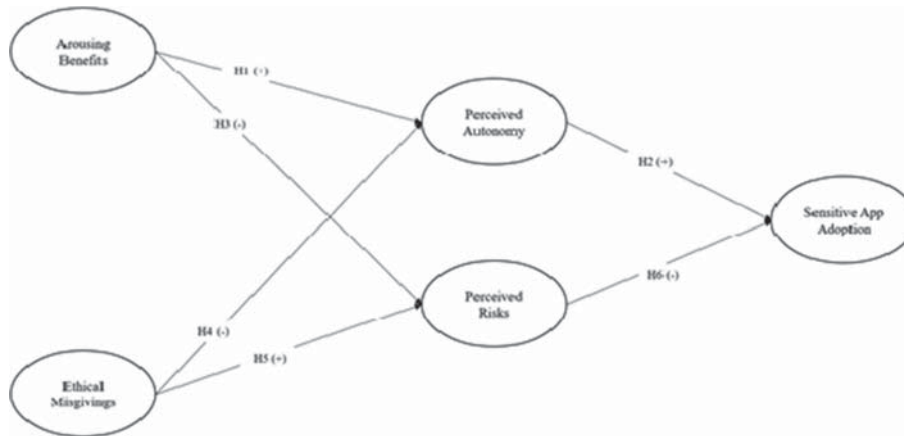


Fig. 1. Conceptual framework

### 3 Methods

#### 3.1 Measures

##### 1) Arousing benefits (AB)

The scale for 'arousing benefits' was adapted from 'sensational seeking' in Harden & Tucker-Drob [24]. The three items include 'I enjoy the sensational benefits promised in this app', 'I enjoy new and exciting experiences with new people through this app', and 'Life without sensations in it could be too dull for me'. All items were rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). The Cronbach alpha of this variable was 0.89.

##### 2) Ethical misgivings (EM)

The scale for 'ethical misgivings' was adapted from 'underreporting ethics' in Glen-thorne and Kaplan [25]. The five items include 'When using this app, I will feel guilty', 'Using this app goes against my moral principles', 'I think it is morally wrong to use this app', 'I think it is unfair for my family/partner if I use this app', and 'I think it is dishonest to use this app'. All items were rated on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree). The Cronbach alpha of this variable was 0.91.

##### 3) Perceived autonomy (PA)

The scale for 'perceived autonomy' was adapted from 'perceived loss of autonomy' in Rauschnabel, He, and Ro [26]. The four items include 'When using this app, I

could maintain my control over the activities’, ‘When using this app, I could maintain my discretion over my decisions,’ ‘When using this app, I could maintain control over each step of various situations’, and ‘When using this app, I could decide what activities the developers can monitor.’ All items were rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). The Cronbach alpha of this variable was 0.90.

4) Perceived risks (PR)

The scale for ‘perceived risks’ was adapted from ‘perceived risks’ in Chopdar et al. [9]. The four items include ‘I believe that this app could bring negative consequences to me’, ‘I believe that I should follow recommendations to reduce the risk of privacy breach’, ‘The risk of privacy breach is higher using this app than shopping apps’, and ‘I believe that the risk of privacy breach is high low when using this app frequently’. All items were rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). The Cronbach alpha of this variable was 0.92.

5) Dating app adoption (DA)

The scale for ‘dating app adoption’ was adapted from ‘branded app adoption’ in Hsieh, Lee, and Tseng [20]. The three items include ‘I intend to continue using this app rather than discontinue its use’, ‘I intend to increase my use of this app in the future’, and ‘If I could, I would like to continue my use of this app’. All items were rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). The Cronbach alpha of this variable was 0.87.

6) Control variables

We controlled the variables that might give alternative explanations for the factors that affect user adoption of dating apps, including user age, gender, education, income, and relationship status which are used in related studies (e.g., Lutz & Ranzini, 2017) [27].

### 3.2 Sampling

The sample comprised 682 employees from two construction firms in Chongqing, China. With the help of the human resources department of each firm, we sent survey links to employee WeChat through a Wechat group. Those employees were selected because they often worked and lived at construction sites that were far from downtown areas and lacked entertainment facilities. We informed respondents that the survey was voluntary and that their names and responses would be kept confidential and used only for this study. To improve the response rate, we gave each respondent one bottle of soft drink (US \$ 0.7). Among the 682 invited employees, 319 of them provided valid responses.

## 4 Results

### 4.1 Common Method Bias

To check the problem of common method bias, we conducted Harman's single-factor test. The analysis returned five factors with eigenvalues greater than 1, with the first factor explaining less than 40% [27] of the variance (39.41% of 78.48%). This suggested that there were no serious indications of common method variance.

### 4.2 Confirmatory Factor Analysis

To ensure the construct validity of the variables, we first undertook a series of confirmatory factor analyses (CFA) to evaluate the convergent and discriminant validities [28] of the five variables (i.e., arousing benefits (AE), ethical misgivings (EM), perceived autonomy (PA), perceived risks (PR), & dating app adoption (DA)), and then used Mplus 8.0 to analyze all hypotheses.

As is shown in Table 1, when the hypothesized model is compared with a series of competing models, the five-factor model indicates the best fit of all. The values on the fit indices showed that the five-factor CFA model provided a good fit for the data ( $\chi^2/DF = 1.129$ , CFI = .996, TLI = .995, RMSEA = .020, and SRMR = .031). This result offered a significant improvement in chi-square over a series of competing models.

**Table 1.** Confirmatory factor analysis of the models

Model	Description	$\chi^2$	DF	$\chi^2/DF$	CFI	TLI	RMSEA	SRMR
Hypothesized model	Five-factor model	160.25	142	1.129	.996	.995	.020	.031
Model 1	Four-factor model	878.194	146	6.015	.824	.794	.125	.109
Model 2	Three-factor model	1332.589	149	8.944	.715	.673	.158	.132
Model 3	Two-factor model	1934.701	151	12.813	.571	.514	.192	.125
Model 4	One-factor model	2341.353	152	15.404	.474	.408	.212	.140

Note: CFI = Comparative Fit Index, TLI = Tucker-Lewis Index, RMSEA = Root Mean Square Error of Approximation, SRMR = Standardized Root Mean Square Residual

### 4.3 Correlation, Reliability, and Discriminant Validity

Means, standard deviations, Cronbach's alpha and correlations of all variables used in this study are provided in Table 2. Table 2 shows that all Cronbach's alphas are higher than the suggested 0.70, thereby indicating a good reliability [29]. And we also examined the discriminant validity. The square roots of AVEs were higher than their correlation coefficients with other factors that strongly support the discriminant validity [30].

**Table 2.** Descriptive statistics, reliabilities, correlations, and discriminant validities.

	Mean	SD	Cronbach's Alpha	AB	EM	PA	PR	DA
AB	2.60	0.91	.89	.85				
EM	3.99	1.72	.91	-.42**	.81			
PA	3.61	1.01	.90	.35**	-.42**	.84		
PR	3.61	0.91	.92	-.41**	.43**	-.40**	.86	
DA	3.85	1.09	.87	.19**	-.21**	.42**	-.35**	.84

Notes: \*\*,  $p < 0.01$

AB, arousing benefits; EM, ethical misgivings; PA, perceived autonomy; PR, perceived risks; DA, dating app adoption. N = 319. Square roots of AVEs are on the diagonal.

#### 4.4 Hypothesis Testing

According to Table 3, the result of the path analysis demonstrates that AB has a positive effect on PA ( $\beta = .21, p < 0.05$ ), hypothesis 1 was supported; PA has a positive effect on DA ( $\beta = .38, p < 0.05$ ), hypothesis 2 was supported; AB has a negative effect on PR ( $\beta = -.31, p < 0.05$ ), hypothesis 3 was supported; EM has a negative effect on PA ( $\beta = -.39, p < 0.05$ ), hypothesis 4 was supported; EM has a positive effect on PR ( $\beta = .32, p < 0.05$ ), hypothesis 5 was supported; PR has a negative effect on DA ( $\beta = -.25, p < 0.05$ ), hypothesis 6 was supported.

**Table 3.** Results of hypotheses testing

Path	STD.Estimate	STD.Est./S.E.	P-Value
AB-PA	.21	3.42	.00
EM-PA	-.39	-6.71	.00
AB-PR	-.31	-5.20	.00
EM-PR	.32	5.44	.00
PA-DA	.38	6.64	.00
PR-DA	-.25	-4.10	.00

Notes: AB, arousing benefits; EM, ethical misgivings; PA, perceived autonomy; PR, perceived risks; DA, dating app adoption.

## 5 Discussion

The rise of dating apps and the breaches of user data generate many problems regarding user interest and wellbeing. So far, dating app providers have mostly focused on designs and user experience, while researchers [13] increasingly raise alarms on the social concerns of user privacy on dating apps. We respond to such concerns by empirically testing



how dating app users make trade-off decisions between the arousing benefits available on dating apps and their ethical misgivings. Our results suggest that the arousing contents from dating apps and users perceived autonomy lead to repeated dating app adoption. In contrast, users' ethical misgivings combined with perceived risks would discourage them from using dating apps.

### **5.1 Theoretical Implications**

This paper contributes to the research in the interdisciplinary field of privacy paradox that involves big data, artificial intelligence, user experience, and ethics. Previous paradox-related studies investigate the ethics of firms and how consumers perceive privacy risks related to AI-based apps [8, 14]. In the unique context of dating app adoption, we advance knowledge on this topic by adopting a user perspective. In doing so, we answer the factors that guide dating app users' moral behaviors. Unlike mobile shopping apps [9], dating apps may present ethical concerns for some users, together with consequences that could be devastating to their families, career, and even lives. We further examined how dating app users perceive the degree of autonomy they have on the possible privacy disclosure, and they perceive the associated risks for doing so. Our discussion on users' ethical misgivings and perceived risks provides a good starting point for scholars to further explore AI ethics from a user perspective, the implications of such issues for all the stakeholders (e.g., users & their families).

### **5.2 Practical Implications, Limitations and Future Research**

We suggest that AI-based dating app developers consider more stakeholders (e.g., users and their families) when designing the app interfaces. For instance, messages could be developed when collecting user demographic information (e.g., relationship status) to raise their concerns of ethical consumption, and remind them of the moral consequences of their behavior on dating apps. Now that AI-based dating apps could, at user permission, obtain data through other social media platforms (e.g., Facebook & Instagram), AI are likely to deduce the relationship status of users and identify fake information, dating app developers are encouraged to take the social responsibility to establish an ethical and healthy environment for users who can ethically benefit from these apps.

This study is also subject to limitations that suggest future research. First, we collected data from construction workers who often live separately with families, assuming that they are more likely to adopt dating apps than those living close to families and going home on a daily basis. Future research could include users of various careers in the study. Second, we used cross-sectional data, i.e., data collected at one point in time. Future research can collect data at different points in time through longitudinal methods. Moreover, users are often unaware of the ethical misgivings and perceived autonomy/risks that guide their dating app adoption, so self-reported questionnaires are not sufficient to capture the moments and reasons why users feel that their specific behavior is ethically right or wrong. Future studies could adopt qualitative and observational methods for a finer picture of the topic.

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