Információs Társadalom

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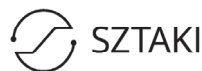
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CONTENTS

KATALIN KANCZNÉ NAGY, HELÉNA MANOJLOVIC,
AND PÉTER TÓTH

Engineering students' relationships with new technology and the use of AI

The aim of our research was to explore university-level engineering students' attitudes toward new technology and relationships with AI. We administered the Technology Readiness Index 2.0 and a proprietary measurement tool adapted to AI (i.e., TRI AI) in a sample of 361 engineering students. According to the results, students are generally open to AI, though their attitudes differ according to their engineering specialization and digital competencies. Greater digital proficiency was closely related to greater knowledge about AI, greater confidence with AI, and less resistance to AI. Cluster analysis, revealing four types of attitudes, clarified that attitude toward AI differs from attitude toward technology in general. Meanwhile, moderate correlations between TRI AI and TRI scores indicated the need for an AI-specific approach when measuring students' readiness and attitudes toward AI. The results can be used to develop targeted educational and communication strategies that take into account students' varying degrees of receptiveness to technology.

JUAN LIU, MAJID RAZA, SHAHZAD FARID,
HADIA KHALIL, MOHAMMAD FAWWAZ ENEIZAT

Journalism Meets Algorithms

This study explores how journalism students from diverse Chinese universities perceive the role of artificial intelligence (AI) and algorithms in journalism education. Drawing on 37 in-depth interviews and 11 follow-up conversations, the findings reveal a predominant narrative of a hybrid system, whereby students envision collaboration rather than competition between journalists and intelligent technologies. These imaginaries are shaped by state-driven narratives and limited transnational comparisons, reflecting a hybrid media model rooted in technological optimism and national pride. While participants recognize AI's potential to enhance efficiency and content distribution, they also raise concerns about algorithmic bias, data dependence, and ethical erosion. A cen-

tral theme is the "viral-valid fallacy"—the distinction between content virality and information validity in an era of rapid information overflow. Journalism training and political affiliation mediate these views, underscoring the need for ethically grounded, interdisciplinary media education and AI-integrated approaches to journalism design.

Developing resilience is crucial to prevent and manage natural disasters, each of which has unique characteristics that demand adaptable solutions. Nevertheless, preventive guidelines mostly apply technical or scientific approaches only, which significantly complicates the development of appropriate informational behavior and actions. The aim of the study presented here was to clarify the consequences of the deficit in resilience that affects communities, a significant cause of which is distrust stemming from the lack of proper information. In developing information literacy for crisis and warning communication, knowledge of disaster risks—as well as the ability to detect, monitor, analyze, and forecast hazards—is essential for effective early warning systems. The practical use of those features not only contributes to long-term prevention and risk analysis but can also be useful before a disaster occurs, given the opportunity for avoidance from the time of detection to the time of warning.

The spread of hate speech on social media, along with its psychological and social harms, potentially even hate crimes, has raised concerns among citizens and policymakers. In response, scholars have explored strategies to reduce hate speech's virality and thus its harms. Using a corpus of 3,210 comments in Persian and Pashtu posted by Twitter users in Afghanistan, we examined how users' anonymity and popularity affect the intensity and diffusion of hate speech. In a series of binary logistic and multiple regression analyses, anonymity showed positive relationships with hate speech's intensity and diffusion on Twitter, whereas user popularity was negatively associated with these factors. A social network analysis also revealed that anonymous accounts were the core

nodes in the hate speech cluster and suggested a peer-to-peer (i.e., anonymous user to anonymous user) pattern of interaction. By contrast, non-anonymous users tended to avoid interaction with their anonymous counterparts.

LECTORI SALUTEM

The editorial board welcomes the readers of the No. 3 issue of 2025!

This issue presents a diverse collection of studies focusing on the intersection of human behavior, society, and evolving digital technologies, ranging from artificial intelligence in education and journalism to crisis communication and digital entertainment.

In the first paper, Kanczné Nagy, Manojlovic, and Tóth examine the attitudes of university-level engineering students toward new technology and their relationships with AI. Using the Technology Readiness Index 2.0 and a specific AI measurement tool, the authors found that while students are generally open to AI, their attitudes differ according to their engineering specialization and digital competencies. The results suggest a need for targeted educational and communication strategies that consider students' varying degrees of receptiveness to technology.

Liu et al. investigate how journalism students from diverse Chinese universities perceive the role of artificial intelligence and algorithms in journalism education. The findings reveal a predominant narrative of a hybrid system, whereby students envision collaboration rather than competition between journalists and intelligent technologies. The authors highlight the "viral-valid fallacy"—the distinction between content virality and information validity—and underscore the need for ethically grounded, interdisciplinary media education.

Kállai examines the significance of the early warning system in the information society and the revision of information literacy during natural disaster operations. The study clarifies the consequences of the resilience deficit that affects communities, often caused by distrust stemming from a lack of accurate information. The paper argues that developing information literacy and the ability to detect, monitor, and forecast hazards are essential for effective early warning systems.

Pamirzad and Chen unpack the effects of user anonymity and user popularity on the intensity and diffusion of hate speech on Twitter (X) in Afghanistan. Using a corpus of comments in Persian and Pashtu, the authors determined that anonymity showed positive relationships with the intensity and diffusion of hate speech, whereas user popularity was negatively associated with these factors. Social network analysis further revealed that anonymous accounts served as core nodes in hate speech clusters, suggesting a peer-to-peer pattern of interaction.

Finally, Mello, Ramírez-Correa, and Moura analyze the influence of online game aesthetics on players' loyalty. Based on a quantitative approach involving online game players in Brazil, the study reveals that game aesthetics directly impact variables such as positive image and satisfaction, and indirectly influence avatar identification and players' loyalty.

We wish you a pleasant reading.

KATALIN KANCZNÉ NAGY, HELÉNA MANOJLOVIC,
AND PÉTER TÓTH

Engineering students' relationships with new technology and the use of AI

The aim of our research was to explore university-level engineering students' attitudes toward new technology and relationships with AI. We administered the Technology Readiness Index 2.0 and a proprietary measurement tool adapted to AI (i.e., TRI AI) in a sample of 361 engineering students. According to the results, students are generally open to AI, though their attitudes differ according to their engineering specialization and digital competencies. Greater digital proficiency was closely related to greater knowledge about AI, greater confidence with AI, and less resistance to AI. Cluster analysis, revealing four types of attitudes, clarified that attitude toward AI differs from attitude toward technology in general. Meanwhile, moderate correlations between TRI AI and TRI scores indicated the need for an AI-specific approach when measuring students' readiness and attitudes toward AI. The results can be used to develop targeted educational and communication strategies that take into account students' varying degrees of receptiveness to technology.

Keywords: *relationship to new technology, use of AI, empirical research, technical university student*

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INFORMÁCIÓS TÁRSADALOM

1. Introduction: Social aspects of the spread of new technology

In human environments, the general attitude toward recent achievements in technological development is an important factor in the effective use of new tools, as confirmed by international research conducted in different social groups and different disciplines. The success of innovation depends on how end users adopt the new technology and how they behave.

For example, online commercial activities on mobile devices are already an integral part of people's daily lives. Although the process of buying as well as selling goods and services is simpler and more enjoyable, the lack of limitations in time and space still have negative effects on consumer behavior (Syamfithriani et al. 2021). In another example, specifically regarding the difficulties of introducing new IT procedures in healthcare, have reported, sometimes in reference to additional studies (Michel-Verkerke, Stegwee and Spil 2015; Fanta, Pretorius and Erasmus 2018), that although IT tools can raise the quality of healthcare and offer a viable solution in developing countries and regions in conflict, the sustainability of electronic health continues to pose challenges. Even though many eHealth experiments are conducted in those countries, those projects cannot be fully implemented due to the attitude among locals.

In other work, the effects of the relationship to technology on social relations have also been analyzed (Pires, da Costa Filho and Junior 2024). Although the use of social media is widespread, the platforms, how they are used, and the motivations for using them among users differ just as widely. The differences in perceptions about social media strongly affect the behavior related to the use of those platforms. To be sure, the importance of such behavior is enormous, for social media posts can transform social relations, the current social environment, and relationships. Meanwhile, in social science research, Dolmark et al. (2022) have found empirical evidence that an individual's beliefs about technology affect learning behavior and the ability to absorb knowledge. Their research among university students has additionally confirmed the causal relationship between technological beliefs and an individual's learning ability.

In the context of attitudes toward new technology, the emergence and spread of AI can be considered to constitute one of the major social challenges of the current era. Indeed, due to its rapid development, AI is widely used in nearly every aspect of daily life. However, the idea that machines can behave similarly to humans and make decisions instead of humans scares many and has raised diverse concerns and prompted various debates. According to Héder (2020), calls for social control over AI have risen steadily since the mid-20th century. In a study by Douali, Selmaoui, and Bouab (2022), most educators interviewed were seriously concerned about the future use of AI, especially its impact on early childhood development, but slightly optimistic about its use in technical services and in assisting with teaching-related tasks. Dong et al. (2024) also examined fears about the emergence of AI in different professions across 20 countries in a sample with tens of thousands of people. Their research, focusing on the psychological characteristics of people in different occupations, confirmed a psychological model that can predict fears about AI in different countries and professional fields.

The emergence of AI presents considerable challenges to higher education as well, including fears among students. In research by Phong et al. (2024), attitudes toward AI significantly affected students' academic outcomes, and students had concerns that they would have to explain themselves if they used AI applications in learning environments. Despite those worries, knowledge of the benefits and challenges associated with using AI, as well as being skilled in doing so, is key for higher education institutions in terms of integrating AI and modern technology into the curriculum so that universities can create a learning environment that enhances educational outcomes.

What all the above suggests is that understanding users' attitudes toward new technology and internal drivers for using it plays a central role in the success of new technology to be introduced, including AI. Mapping the attitudes and technical preparedness of the new technology's stakeholders can thus be viewed as an important condition in the process of its introduction and implementation. Along those lines, a key question is which psychological construct provides the most appropriate framework for interpreting individuals' relationships with new technology. According to McLean (2003), attitudes, beliefs, and values correlate, but researchers have different theories as to which emerges and acts first and which derives from the other. Because humans learn about their values, beliefs, and attitudes through interactions with others, with an *attitude* defined as an individual's direct willingness to evaluate or respond to an abstract concept or object. Attitudes can change easily and often. By contrast, *beliefs* are ideas based on past experiences, not necessarily logic or facts. Beliefs often serve as a frame of reference through which people interpret their worlds. Last, *values* are basic concepts and ideas about what individuals consider to be good or bad, right or wrong, or what is worth a sacrifice. Similar to beliefs, values are not based on empirical research or rational thinking, and they are even more resistant to change than beliefs. For an individual to change their values, they may need a transformative life experience. Thus, when examining the relationship of individuals to innovative technology and AI, their attitudes, views, and beliefs should be interpreted as a complex, compound concept.

In our study, we evaluated the openness of individuals, specifically university-level engineering students, to new technology and AI in terms of affective, cognitive, and conative factors as well as their beliefs. We focused on their knowledge of AI-related concepts and, in relation to using new technology, specifically AI, their confidence, their optimism and innovativeness, their sense of discomfort and insecurity, and their interest and openness.

2. Purpose, research questions, and methods

Individuals with a high readiness to use technology—that is, "technology readiness"—are more likely to be open to using new technology, including AI. Technology readiness positively affects trust in the advantages of technology and thus the likelihood of its use by the individual.

Along those lines, in our study we aimed to assess the general technology readiness of students at a technical university, their relationship with using AI, and the

connection between the two trends. In the process, we sought to answer three questions:

Q1. What are students' relationships with technology in general?

Q2. What are students' relationships with using AI?

Q3. What is the connection between students' relationship to technology in general and their use of AI?

Three measurement tools were used in the study:

1. A questionnaire that we developed to collect the sociodemographic data of respondents and gain insights into their digital and language competencies;
2. The 16-item Technology Readiness Index 2.0 (TRI) questionnaire to examine students' relationship with the daily use of new technology; and
3. The Technology Readiness Index for Artificial Intelligence (TRI AI), another questionnaire that we developed to examine university students' relationship with the daily use of AI.

The development of the TRI, one of the best-known tools for measuring technology readiness, can be attributed to Parasuraman (2000). Meanwhile, the 36 items of the four-dimensional TRI were later developed to measure people's willingness to adopt and use an innovative technology. Among the four dimensions of the TRI—optimism, innovation, insecurity, and discomfort—optimism and innovation are motivating factors for technology readiness, while discomfort and insecurity are inhibiting factors (Parasuraman and Colby 2015). The TRI is a measure of the extent to which the user will be able to master the given technology and use it to perform their daily tasks and achieve their goals. Beyond that, the TRI provides an opportunity to form user groups and thus rationalize the process of introducing a new technology; in Parasuraman and Colby's study, those groups were skeptics, explorers, laggards, pioneers, and paranoiacs. The TRI is also widely used to gauge individuals' predisposition to using new technology and can characterize their general readiness to adopt the technology, especially based on individual personality. Because the introduction of new technology causes both positive and negative emotions, different characteristics and cultural beliefs play a significant role in terms of its use (Klaus 2013; Yang, Kim and Yoo 2013). In that sense, the TRI does not measure intention or behavior but does provides information about the individual's technology readiness (Abu-Assi, Al-Dmour and Abu-Assi 2014).

By comparison, our questionnaire was developed to investigate the relationship with using AI (i.e., TRI-AI), including in terms of several components of attitude:

☐ Cognitive factors: Knowledge of AI

☐ Beliefs: Views on AI

☐ Affective factors: Emotions related to using AI

☐ Conative factors: Experiences and actions related to using AI

Reflecting on the complexity of internal driving forces, we sought to examine engineering students' relationship with new technology and AI in order to reveal the distinct components underlying their attitudes. Based on the degree of internal

conflict, the findings suggest changes in attitudes, which may require pedagogical solutions in engineering training programs.

Constructs measured by the TRI and TRI AI	Technology Readiness Index (TRI)	Technology Readiness Index for Artificial Intelligence (TRI AI)
Knowledge of AI-related concepts	-	0.884
Confident use	-	0.839
Optimism	0.701	0.924
Innovation	0.737	0.795
Discomfort	0.612	0.864
Insecurity	0.594	0.896
Interest and openness	-	0.863

Table 1. Reliability of the two measurement tools

Based on the Cronbach's alpha factors, both measurement tools were reliable (Table 1). In the TRI's case, the consistency of constructs was also checked with Amos 23 (IBM), and the model fit fairly well with the expected structure (RMSEA = 0.057, TLI = 0.874, CFI = 0.897, AGFI = 0.917)[1]. In the TRI AI's case, the internal consistency of all seven factors was excellent.

3. Results

3.1. Sample

Of the 361 technical university students who participated in our study, 270 were men (74.79%), and 91 were women (25.21%). Their mean age was 22.84 years (*Mdn* = 22 years, *mode* = 19 years)—314 were 25 years or younger (86.98%), whereas all others were older—and 264 were currently enrolled in BSc programs (73.13%) and 97 in MSc programs (26.87%). Of the participants in the BSc programs, 225 graduated from a high school (85.22%) and 34 graduated from a technical school (12.88%). Most students were enrolled in engineering, while a smaller group was enrolled in social science or natural science programs (Figure 1).

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[1] (Root mean square error of approximation [RMSEA] = 0.057, Tucker–Lewis index [TLI] = 0.874, comparative fit index [CFI] = 0.897, adjusted goodness-of-fit index [AGFI] = 0.917)
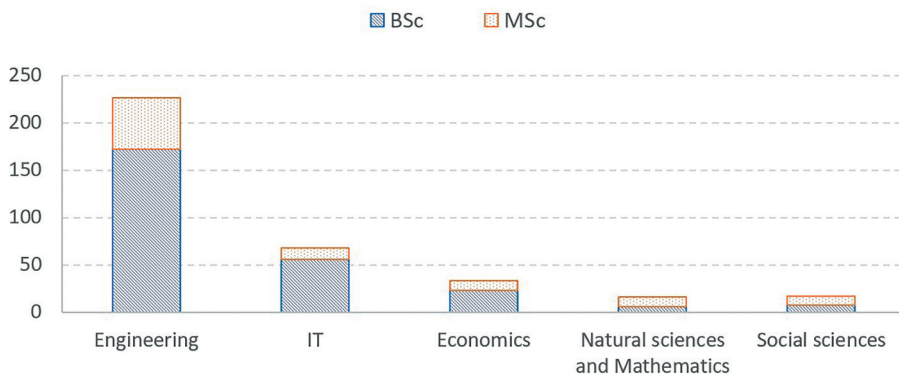
Figure 1. Distribution of students by academic level and fields of training

Of the students enrolled in MSc programs, with an expected study period of 2 years, 35 started their studies a year ago (36.08%), 36 started 2 years ago (37.11%), and 26 started more than 2 years ago (26.81%). Most participants in the BSc program, with an expected study period of 3.5 years, had been studying at the university for 1–4 years (Figure 2).
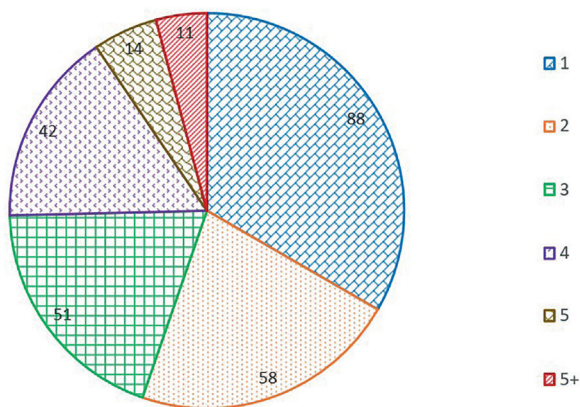
Figure 2. The time spent by BSc students in their fields of training

Regarding the use of technology, the level of foreign language and digital competencies is especially important. In the case of foreign-language competencies, we asked about English and German skills. The students had to evaluate their own language skills on a 7-point Likert scale from 1 (*completely missing*) to 7 (*excellent*). The

studied subcompetencies were reading comprehension, listening comprehension, and speaking. In English, there was a slightly weaker result in speaking (M = 5.15, SD = 1.376) but very good results in reading comprehension (M = 6.08, SD = 1.041), which is arguably more important in learning new technology, and in listening comprehension (M = 5.73, SD = 1.170), as shown in Figure 3. Approximately 10%–15% of students communicated at an acceptable level in German.
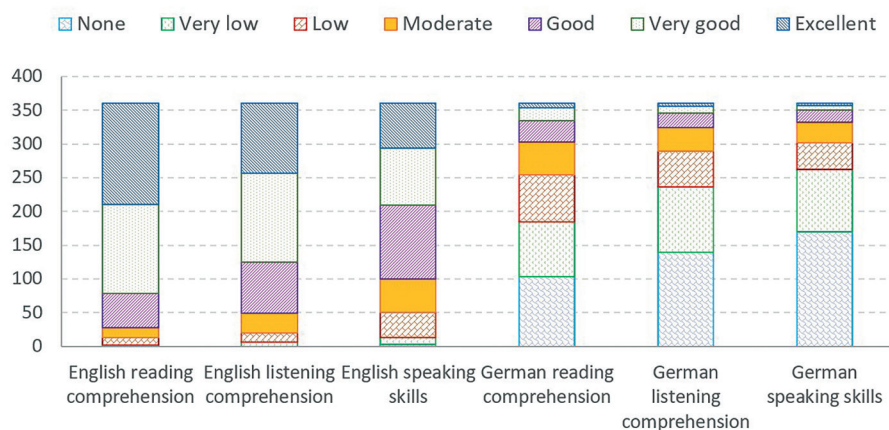
Figure 3. Development levels of students' foreign-language competencies

Based on the above, it can be established that the vast majority of students had the language competencies required for using technology, primarily in English.

The background questionnaire section on digital competencies had 21 items, which focused on questions related to searching, managing, generating, and protecting data and content as well as eliminating technical issues and complying with ethical standards. In that case, the students also had to evaluate their own competencies on a 7-point Likert scale.

Summing up all subcompetencies, we determined the development of students' digital competencies on a scale ranging from 20 to 147 scale (M = 108.87, SD = 19.420, 95% CI: 106.86, 110.88; SEM = 1.022, Mdn = 111, min. = 46; max. = 147). In terms of development level, we formed five categories: undeveloped (i.e., 21–46 points; n = 1), below average (i.e., 47–71 points; n = 11), average or moderately developed (i.e., 72–97 points; n = 83), above average (i.e., 98–123 points; n = 179), and developed (i.e., 124–147 points; n = 87). The vast majority of students had the competencies required for applying digital techniques and technology.

In the case of foreign-language competencies, we evaluated both languages and used the higher score of the two. The variable created thus expressed the level at which students can interpret the descriptions related to using technology in a foreign language and communicating with the technology. The score available was between 3 and 21. For students who scored less than 12 points, we considered their

language competency as being insufficient to interpret the descriptions related to the technology. Except for 32 students (8.86%), students generally possessed sufficient foreign-language competency to master new technology.
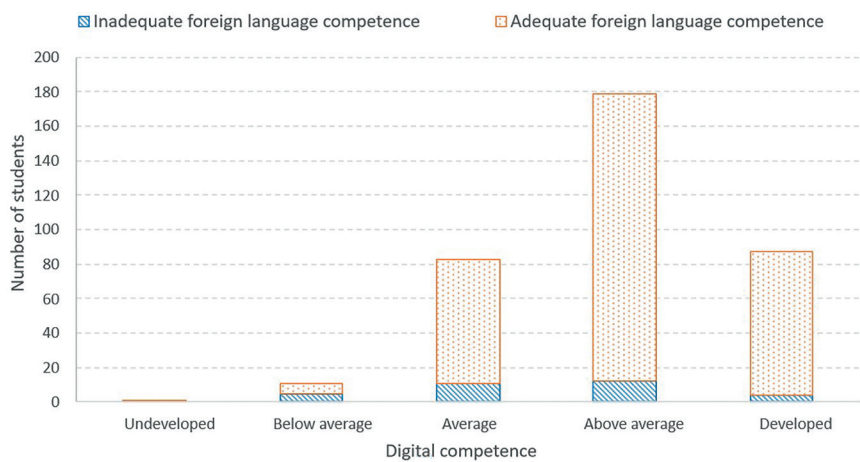
Figure 4. Relationship between students' digital and foreign-language competencies

We found a significant correlation between foreign-language and digital competencies ($\chi2$ = 23.301, p < 0.001); the strength of the symmetric relationship was Cramer's V (i.e., 0.254), which can be considered to be weak to moderate. Above-average digital competencies were also accompanied by appropriate foreign-language competencies; thus the cognitive prerequisites for the attitude toward the use of new technology are appropriate (Figure 4).

3.2. Engineering students' relationships with technology in general

None of the four factors followed a normal distribution, as the descriptive statistical indicators summarized in Table 2 show. Only the insecurity factor indicated a significant difference compared with the others. On a 4–20 scale, this was the lowest-scoring factor, that is, students felt less insecure about using new technology, while discomfort was the highest. In other words, those two negative factors appeared to be opposite. There was no significant difference between the two positive factors. Values close to optimism, innovation, and discomfort indicated that students were fundamentally positive about new technology and willing to use it, even if it involved some discomfort. That finding indicates that the predisposition to accept and minor inhibitions were balanced. Low insecurity indicated that students trusted technology and did not fear that it would be unpredictable.

	Optimism	Innovation	Discomfort	Insecurity	TRI total
M	14.58	14.86	15.31	10.90	55.65
SEM	0.159	0.180	0.146	0.163	0.463
Lower 95% CI	14.27	14.51	15.03	10.58	54.74
Upper 95% CI	14.89	15.22	15.60	11.22	56.56
SD	3.030	3.421	2.767	3.103	8.789
Variance	9.183	11.703	7.655	9.626	77.239
25%	13	13	14	9	50
50%	15	15	16	11	57
75%	17	17	17	13	62

Note. TRI: Technology Readiness Index; CI: confidence interval.

Table 2. Descriptive statistical indicators of factors of technology readiness

We also found a moderate relationship between the four subfactors, with innovation standing out as having the weakest relationship with the two negative factors (i.e., discomfort and insecurity), as shown in Table 3. Optimism and innovation moved together but were also fairly separated from each other. The negative dimensions were also closely correlated but affected innovative predisposition less.

	Optimism	Innovation	Discomfort	Insecurity
Optimism		0.451**	0.352**	0.439**
Innovation			0.173**	0.221**
Discomfort				0.375**
Insecurity				

** Correlation is significant at the 0.01 level (2-tailed).

Table 3. Correlation system between the subfactors of the Technology Readiness Index

All the above suggests that the technical university students were mature, technology adopters, "technology consumers," but also critical users. They were not naively optimistic, not afraid of technology, willing to train themselves, could learn independently, and had confidence in using technology. They were also open and cooperative and able to tolerate minor discomfort.

Total TRI scores can range from 16 to 80. In our study, the mean value was slightly higher than the average (Table 2), and unlike the subfactors, the variable followed the normal distribution according to permissive conditions of skewness (SES = −1.805) and kurtosis (SEK = 0.535; Sajtos–Mitev, 2007, 95). Regarding the relationship to technology, we formed three categories (Figure 5): distant (16–37 points; n = 8), prudent and cautious (38–59 points; n = 223 people), and open and interested (60–80 points; n = 130).

We analyzed those categories from several perspectives. When examining them based on the students' fields of expertise, the distant relationship was not or hardly typical in the field of IT or engineering, with the highest proportion occurring among students in the social sciences, as is understandable, for they encounter less technology during their studies than, for instance, engineers. It is also unsurprising that computer scientists were the most open, but perhaps it comes as a surprise that economics students were ahead of the engineering majors. That outcome may be because students in economics also use various forms of technology on a daily basis (e.g., in statistical programs, business simulations, and AI) and given the digitalization of the business world (e.g., e-commerce and digital marketing), such students may be more motivated (i.e., optimistic) in terms of embracing technological innovations. Engineering students may be more technically competent but are also less open to or enthusiastic about new technology, instead preferring to approach them pragmatically and critically.
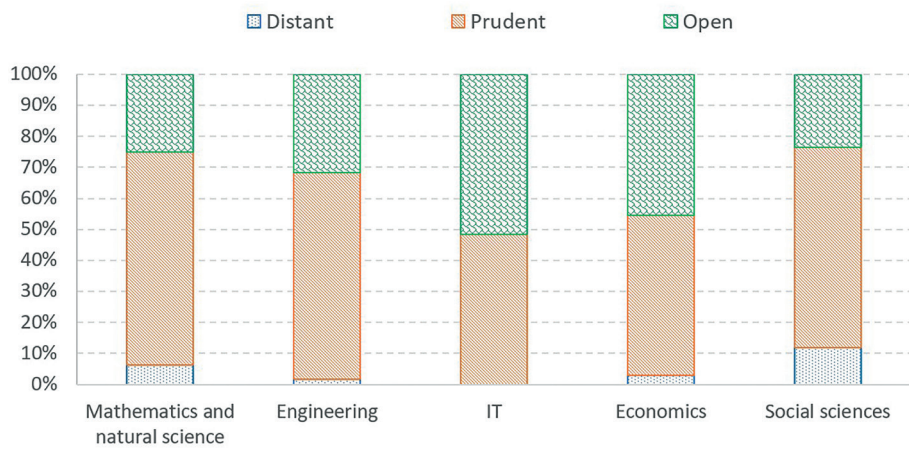
Figure 5. Categories by relationship to technology

Examining the subfactors, a significant difference emerged between the three departments except for the feeling of discomfort (Table 4). IT students showed the greatest technological openness, for their optimism and innovation were also outstanding, which is understandable given the strong technological orientation of their field. Economics students showed similar optimism, though their innovation

was far lower, suggesting that they recognized technology's usefulness more than they actively sought new solutions. The results for the engineering students, meanwhile, suggest that although they were less enthusiastic—their optimism was lower—they were also more confident in managing technology (i.e., had a lower sense of insecurity), which likely relates to the nature of their studies.

Academic program	Optimism	Innovation	Discomfort	Insecurity
	M (SD)			
Engineering	14.32 (3.064)	14.61 (3.414)	15.18 (2.722)	10.61 (2.936)
IT	15.46 (2.690)	16.94 (2.143)	15.82 (2.562)	11.65 (3.318)
Economics	15.48 (2.575)	13.58 (3.437)	15.76 (3.052)	11.91 (3.176)
χ2	8.705	33.210	3.859	9.832
p	0.013	0.000	0.145	0.007

Table 4. Comparison of subfactors of the Technology Readiness Index
for the programs analyzed

In addition to academic program, the other factor possibly associated with the relationship to technology was digital competencies. The two variables showed a significant correlation (Fisher's exact test= 52.913; $p < 0.05$), the linear trend was highly significant ($p < 0.05$), and the standardized statistics (6.747) confirmed a likely directed, growing relationship between the variables. Thus, a direct correlation seems to exist between students' relationship to technology and their digital competencies ($\eta = 0.359$), as shown in Figure 6.
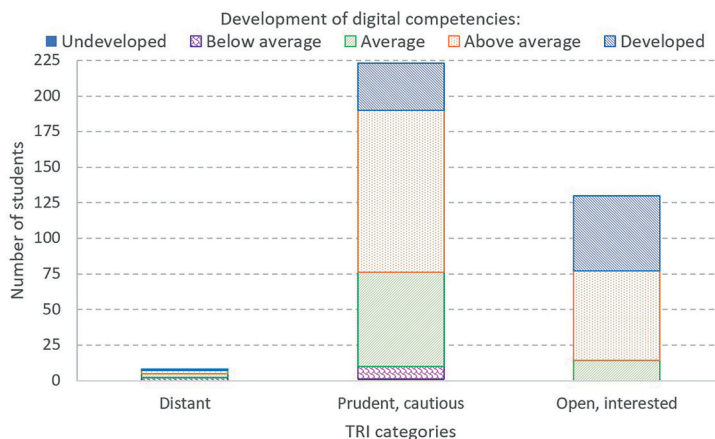
Figure 6. Correlation between the development of the Technology Readiness Index
and digital competencies

Using the digital (i.e., DigComp) and foreign language (i.e., LangComp) competencies, we set up the following model for the relationship to technology:

$$\text{TRI} = 27.582 + 0.213 \times \text{DigComp} + 0.282 \times \text{LangComp}^2$$

The development of both language and digital competencies significantly improved the relationship to technology. However, the model's explanatory power was not very high (adj. $R2 = 0.262$), meaning that other factors also affected the relationship to technology. The highest level of education and the number of semesters completed at the university did not, whereas the student's academic program only slightly improved the explanatory power (adj. $R2 = 0.283$). The above model had some explanatory power (F = 65.031; $p < 0.05$) despite being only moderate. Based on the standardized β, digital competencies seemed to explain a greater proportion (β = 0.472) of the variance in TRI score than foreign-language competencies (β = 0.103).

3.3. Engineering students' use of AI

Several AI applications are available that technical university students can use in their daily work and in fulfilling their academic requirements. At the beginning of the questionnaire, we asked about the frequency of their use.
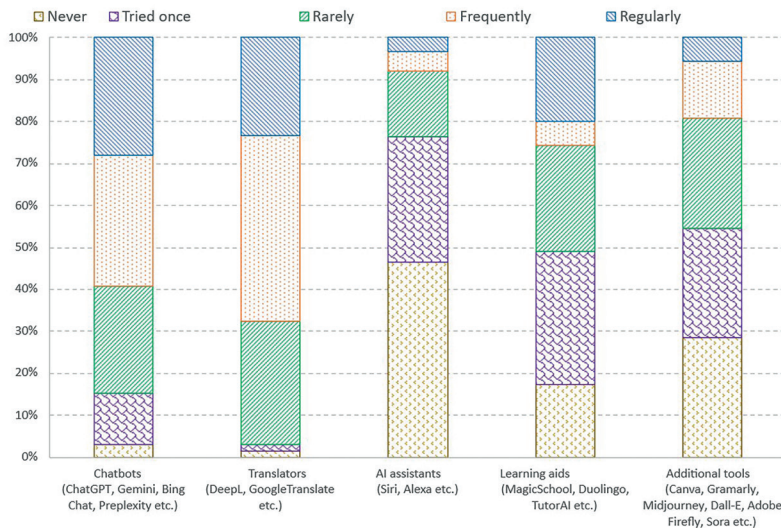
Figure 7. Students' use of AI applications

The most widely used applications among students (60%–70%) were chatbots and translators, which most students reported using frequently or regularly. Learning aids were less familiar to students (Figure 7), meaning that faculty members need to promote opportunities to use those aids among students in the future. In terms of majors, no significant difference arose in the opinions of students, and in terms of time spent at the university, only the use of translators (H= 10.256; p = 0.36) showed significant difference. As the students progressed in their studies, they seemed to increasingly use various translator applications.

We compared the three most common types of applications (i.e., chatbots, translators, and learning aids) with students' relationship to new, innovative technical tools. Based on the results, the students' technological susceptibility showed a significant correlation with the use of certain AI-based applications. There were also significant differences in the frequency of the use of chatbots (χ^2 = 60.950; p < 0.001; η = 0.375) and translators (χ^2 = 18.642; p = 0.017; η = 0.231) along the three types of technological attitudes developed on the basis of the TRI 2.0 (i.e., distant, prudent and cautious, and open and interested). Those correlations suggest that the more open and technologically inclusive a student is, the more committed they are to using those AI-based tools frequently. By contrast, we could not detect any significant relationship in the case of learning aids (χ^2 = 7.611; p > 0.05), which may indicate that external (e.g., study) factors were primarily behind their use, not students' openness to technology. The results support the idea that technological attitudes have a significant impact on the independent, motivated use of AI applications (Figure 8).
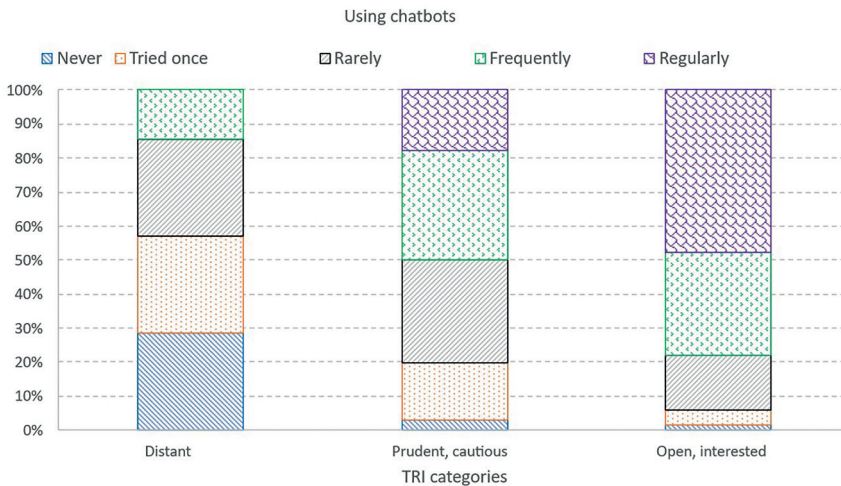
Figure 8. Link between the relationship to technology
and the frequency of chatbot use

Based on the relationship to new technology, the following findings can be made regarding the frequency of AI-based applications:

- □ Distant: (1) has high insecurity and discomfort; (2) is skeptical about the capabilities of AI; (3) uses chatbots or translation programs infrequently or not at all; (4) distrusts the decisions of automated systems; (5) seeks out human instead of machine help, especially with translation; (6) uses AI-based tools only as a last resort; and (7) values transparency and human control.
- □ Prudent and cautious: (1) tries chatbots or translators but only in a known, trusted environment; (2) checks the answers or translations provided by AI; (3) values usability, data protection, and reliability; and (4) uses AI in their studies but always has a human solution as a backup.
- □ Open and interested: (1) enjoys experimenting with new technology and actively uses AI solutions; (2) uses chatbots and machine translators regularly; (3) is curious about how to better integrate AI in their own work or daily life; and (4) is open to experimentation but monitors quality critically.

3.4. Engineering students' relationship with using AI

To assess students' attitudes toward using AI, we used a proprietary 33-item questionnaire (Table 5), where students had to evaluate the claim related to the AI application on a 5-point Likert scale. While compiling the questionnaire, we started with the TRI model but specified it for the use of AI and added three additional subfactors. Due to the different number of items and for the sake of comparability with the TRI, we calculated with relative scores. The descriptive statistical indicators appear in Table 5. None of the subfactors were normally distributed ($p < 0.001$).

	Items	*M*	*SD*	*SEM*	95% CI, Lower	95% CI, Upper
		Relative values				
Knowledge of AI-related concepts	3	14.45	4.1948	0.2309	13.99	14.91
Confident use	3	15.38	3.5605	0.1960	14.99	15.76
Optimism	6	14.08	3.8756	0.2253	13.64	14.52
Innovation	6	12.29	3.2799	0.1906	11.91	12.66
Discomfort	6	8.26	2.9393	0.1708	7.92	8.60
Insecurity	6	13.65	3.5502	0.2063	13.25	14.06
Interest, openness	3	13.73	4.4644	0.2458	13.24	14.21

Note. CI = confidence interval.

Table 5. Descriptive statistical indicators of the factors of the Technology Readiness Index for AI

Students' technical and cognitive readiness for AI was good (i.e., self-confident when using AI and knowledge of AI-related concepts) but also characterized by only moderate psychological openness (i.e., innovation and optimism). The moderate score for optimism did not indicate excessive commitment to AI, either, while the moderate score for innovation also indicated a follower instead of a pioneer relationship with AI. At the same time, no significant discomfort in relation to AI applications emerged.

Overall, the results suggest that, in technical university education, it seems necessary to increase trust in AI in order to raise awareness of the ethical standards of its application (e.g., to include a related course in the training program and develop the teaching methodology); to emphasize the need for reflective, critical thinking about the future of technology; and finally to develop students' innovation ability (e.g., creative use of AI).

We also examined the factors of the TRI AI according to various background variables and found a significant difference in several cases (Tables 6 and 7). Based on the analysis of the relationship- and knowledge-based differences related to AI, students' fields of expertise seemed to have a significant effect on the differences in the factors of the TRI AI. Students in IT training had the highest level of AI knowledge and felt the least discomfort in using AI. Paradoxically, the greatest insecurity also arose among them, which suggests that they are more aware of the risks and ethical problems associated with using AI owing to their deeper knowledge. Engineering students had similar technical and technological orientations, but their conceptual knowledge was slightly lower, and their sense of discomfort was slightly higher. Economics students, by contrast, had a relatively low level of AI knowledge but were extremely optimistic about the future impacts of technology. Taken together, those results may indicate that positive attitudes are sometimes not based on knowledge but instead on economic and social expectations and idealized visions of the future. At the same time, their sense of insecurity was lower, which may also suggest a less conscious perception of risks.

Academic program	Knowledge of AI concepts	Optimism	Discomfort	Insecurity
Engineering	14.35 (3.9839)	13.66 (3.9965)	8.47 (2.9377)	13.67 (3.6059)
IT	16.89 (2.8097)	14.16 (3.8427)	7.04 (2.7660)	14.14 (3.5673)
Economics	13.13 (3.7659)	16.09 (3.3878)	7.92 (2.3266)	11.87 (3.1921)
Kruskal–Wallis H	29.234	7.004	11.548	6.884
p	<0.001	0.030	0.003	0.032

Note. Means and standard deviations appear in parentheses.

Table 6. Significant differences by major

Digital competencies	Knowledge of AI concepts	Confident use of AI	Discomfort
Below average	7.60 (3.9277)	10.93 (3.8129)	10.47 (2.4954)
Average	12.16 (3.8622)	14.38 (2.8625)	9.37 (2.8232)
Above average	14.96 (3.4670)	15.79 (2.9940)	8.31 (2.9058)
Developed	17.21 (3.1994)	16.96 (3.5758)	7.03 (2.8202)
Kruskal–Wallis H	60.890	26.735	35.026
p	<0.001	<0.001	<0.001

Note. Means and standard deviations appear in parentheses.

Table 7. Significant differences by categories
of digital competencies

Students' relationship with the use of AI and their skills were significantly correlated with their self-assessed digital competencies (Table 7). The results clearly indicate that digitally advanced students approach AI technology from a more advantageous position, in terms of knowledge, attitude, and comfort of use.

Understanding the conceptual system of AI is closely related to general digital proficiency. The factor of confident AI use showed a similar trend—that is, individuals with low digital competency felt less comfortable using AI tools, whereas ones with advanced competencies were far more confident. That finding showcases the relationship between practical skills and users' self-confidence. The feeling of discomfort, however, followed a reverse pattern related to the use of AI—that is, there was a higher degree of resistance and discomfort among less digitally competent students, while the value was lower for ones with advanced digital competency, thus indicating greater acceptance and adaptability.

Statistically speaking, all those results were also strongly significant ($p < 0.001$ for all three variables)—that is, not indicative of a random pattern but showing a clear trend that the development of digital competency promotes the acceptance, understanding, and use of AI.

4. Comparison of results

In analyses with data from the 296 students who completed both questionnaires, results obtained with the two measurement tools (Tables 2 and 5) suggest no significant difference between the students' use of AI and use of technology in general. However, moderate differences in innovation and insecurity did arise, along with more significant differences in terms of discomfort.

Even so, there was much less discomfort with AI than with technology in general. That finding suggests that students felt more comfortable in the AI environment than when using other new technology. That result may seem somewhat surprising; however, it should be remembered that the study's sample was students at a technical university.

Insecurity was higher with AI than with general technology—that is, students were not sure how AI will affect their lives or whether it is reliable at all. They reported using it on a cognitive level but still had questions at the level of affective trust. Students used it rather passively and did not feel as though they were sufficiently active creators.

In sum, it can be concluded that students' relationship to AI is not hostile but less enthusiastic and less innovative than with other technology. However, it is also more uncertain, probably due to AI's complexity and novelty. AI-specific factors and general technology factors were related but did not completely overlap (Table 8).

	Relationship between TRI and TRI AI (p = 0.01)
Optimism	0.474
Innovation	0.402
Discomfort	0.455
Insecurity	0.351

Table 8. Relationships between factors of TRI and TRI AI

Those results indicate that students who are generally open to or optimistic about technology are more likely to have positive opinions about AI. By extension, attitude toward AI does not seem to be independent of attitude to technology in general. At the same time, it is also clear that the relationship to AI applications has its own, independent dimension, which cannot be described solely by the general relationship to technology.

AI is not simply a new technology but a phenomenon that triggers an independent relationship framework. The relatively weak correlation with insecurity suggests that other kinds of fears (e.g., ethical and control-related) other than the lack of familiarity also play a role in the relationship to AI.

Based on the relevant four factors of TRI and TRI AI, we determined total scores (i.e., TRI Total and TRI AI Total), which were subjected to cluster analysis, the results of which we separated into four groups (Figure 9).
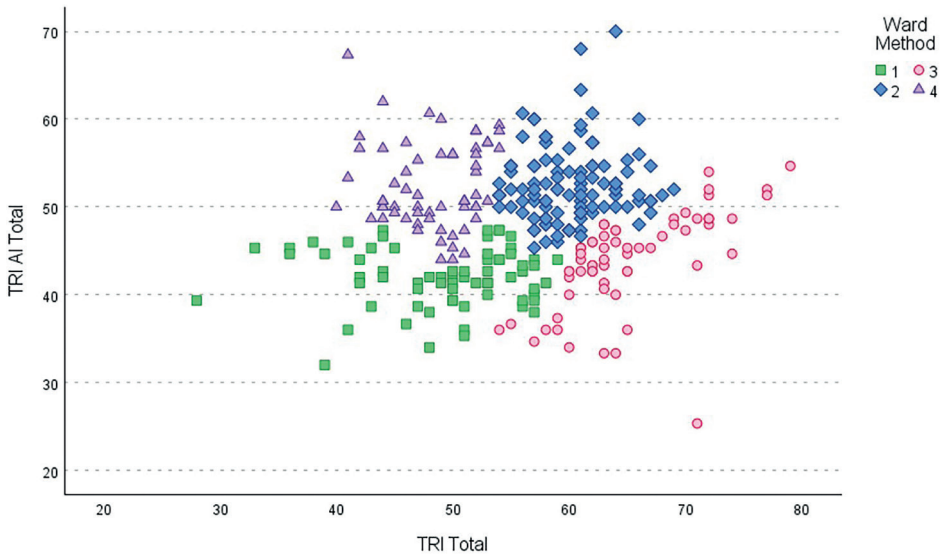
Figure 9. Clusters determined on the basis of TRI and TRI AI scores

The characteristics of the four separate groups are as follows (Table 9):

☐ Techno and AI sceptic (C1): This group achieved the lowest scores in terms of the relationship to both general technology and AI. Students in the group typically showed low technological receptivity and were skeptical or dismissive of the application options of AI. They were thought to have little experience or else a negative attitude fed by certain fears, insecurity, or lack of knowledge.

☐ Inclusive to both technology and AI (C2): This cluster was the most highly populated and accounted for nearly one-third of the sample. Its members had high technological affinity and a positive attitude to AI. They were the most open to innovations and were presumably active technology users.

☐ Open to technology but distant in terms of AI (C3): This cluster's members had a very high level of technological receptivity but were more cautious and prudent in their perception of AI. They were likely to have reservations about the reliability, ethics, or impact of AI.

☐ Generally distant to technology but open to AI (C4): This group showed a contradictory profile, for they were characterized by a relatively high AI receptivity despite their low overall commitment to technology. They probably lacked a general interest in digital tools or platforms but found AI specifically useful, interesting, and/or exciting, especially if related to their field of expertise.

Clusters via Ward's method		TRI	TRI AI
Techno and AI skeptic (□)	M	49.16	41.98
	SD	6.702	3.374
	N	68	
	Proposed methodology: Practical examples, experience-based learning, presentation of best practices		
Inclusive to both technology and AI (◇)	M	60.20	52.56
	SD	3.571	4.396
	N	103	
	Proposed methodology: Involving students in research projects, testing, and mentoring their peers about AI		
Open to technology but distant in terms of AI (○)	M	65.10	43.90
	SD	5.506	5.592
	N	62	
	Proposed methodology: Developing students' critical thinking and clarifying ethical and validity issues		
Generally distant to technology but open to AI (△)	M	48.21	52.39
	SD	3.716	4.841
	N	63	
	Proposed methodology: Presentation of specific use cases		

Table 9. Key characteristics of clusters

The C2 cluster, which is committed to both areas, included students with diverse IT competencies (i.e., computer science engineers and mechanical engineers), whereas the group that was generally distant to technology but open to AI (i.e., C4) included students in the natural and social sciences.

5. Discussion and conclusion

Relationships to AI at the level of individual attitudes, views, beliefs, knowledge, and digital competency are particularly revealing among technical university students. The TRI AI questionnaire developed in the course of our research and adapted to AI reliably measured students' knowledge of AI concepts, confidence and innovation in using it, optimism toward it, and fears and resistance toward it, embodied in the factors of discomfort and insecurity.

Per our results, students are basically open and interested in AI technology, but such attitudes are significantly differentiated according to their specialization and digital competency. Computer science and engineering students have a higher level of knowledge and self-confidence, but the greatest degree of insecurity occurs among IT professionals, probably due to their awareness arising from their profound knowledge of technology. The optimism of economics students is high, but their knowledge of AI concepts and self-assessed confidence in using it are lower, which may indicate that their vision of AI is based on expectations instead of any foundation of knowledge. The developmental level of digital competencies is closely related for all AI factors examined—that is, higher digital proficiency correlates with higher knowledge, self-confidence, and lower resistance.

Based on our findings, it seems that the relationship of students to AI is generally positive, especially in terms of usability and technical confidence. At the same time, there remains room for improvement in terms of psychological integration and a future-oriented, innovative attitude, for the confidence index and creative openness are more moderate than in the case of the relationship concerning technology in general.

The results of our cluster analysis support that the relationship of university students to technology and AI is multidimensional and cannot be treated in a homogeneous way. The relationship to AI often differs from the general openness to technology, which also confirms the validity and meaning of using our own TRI AI questionnaire. Targeted communication and education strategies can be assigned to different clusters, which take into account individual receptivity and differences in assessment and utility.

Moderate correlations between the TRI AI and the original TRI scales support the argument that AI-specific attitudes and views partly derive from general attitudes toward technology but also require an independent, specialized approach. The typology consisting of four clusters allows the targeted development of students and the fine-tuning of the curricula.

Data availability statement

The data were collected at the Budapest University of Technology and Economics (BME) in 2025. Derived data supporting the findings of the study are available upon request.

Ethics statement

The research involving human participants, including the use of personal data, was conducted in accordance with the ethical principles set out in the Helsinki Declaration. The study protocol was reviewed and approved in accordance with the Code of Ethics of the Budapest University of Technology and Economics (BME Code of Ethics, 2023), which regulates research ethics at the institution. The approval for the research was obtained through the institutional supervision mechanisms specified in the Code.

Limitations

Based on the sampling, the conclusions of the research can be applied only to BME students participating in engineering training.

References

BME Rektori Kabinet. "A Szenátus X./1./2022-2023. (2023. VI. 26.) számú határozata a Budapesti Műszaki és Gazdaságtudományi Egyezet etikai kódexéről." Accessed September 30, 2025. https://rektori.bme.hu/sites/default/files/rektori/dokumentumok/pub_szabalyzatok/2023/bme_etikai_kodex_2023.pdf

Dolmark, Thomas, Osama Sohaib, Ghassan Beydoun, Kai Wu, and Firouzeh Taghikhah. "The Effect of Technology Readiness on Individual Absorptive Capacity toward Learning Behavior in Australian Universities." *Journal of Global Information Management* 30, no. 1 (2022).
https://doi.org/10.4018/JGIM.306245

Dong, Mengchen, Jane Rebecca Conway, Jean-François Bonnefon, Azim Shariff, and Iyad Rahwan. "Fears about Artificial Intelligence across 20 Countries and Six Domains of Application." *American Psychologist* (2024).
https://doi.org/10.1037/amp0001454

Douali, Latifa, Sabah Selmaoui, and Widad Bouab. "Artificial Intelligence in Education: Fears and Faiths." *International Journal of Information and Education Technology* 12, no. 7 (2022): 650–57.
https://doi.org/10.18178/ijiet.2022.12.7.1666

Fanta, Getnet Bogale, Leon Pretorius, and Louwrence D. Erasmus. "A System Dynamics Model of E-Health Acceptance: A Sociotechnical Perspective." In *Proceedings of the International Association for Management of Technology Conference*, 259–72. Orlando, FL, USA: International Association for Management of Technology, 2016.

Héder, Mihály. "A Criticism of AI Ethics Guidelines." *Információs Társadalom* 20, no. 4 (2020): 57–73.
https://dx.doi.org/10.22503/inftars.XX.2020.4.5

Klaus, Philipp. "The Case of Amazon.com: Toward a Conceptual Framework of Online Customer Service Experience (OCSE) Using the Emerging Consensus Technique (ECT)." *Journal of Services Marketing* 27, no. 6 (2013): 443–57.
https://doi.org/10.1108/JSM-02-2012-0030

McLean, Scott. *The Basics of Speech Communication.* Boston: Allyn and Bacon, 2003.

Michel-Verkerke, Margreet B., Robert A. Stegwee, and Tom A. Spil. "The Six P's of the Next Step in Electronic Patient Records in the Netherlands." *Health Policy and Technology* 4, no. 2 (2015): 137–43.
https://doi.org/10.1016/j.hlpt.2015.02.011

Parasuraman, A. Parsu. "Technology Readiness Index (TRI): A Multiple-Item Scale to Measure Readiness to Embrace New Technologies." *Journal of Service Research* 2, no. 4 (2000): 307–20.
https://doi.org/10.1177/109467050024001

Parasuraman, A. Parsu, and Charles L. Colby. "An Updated and Streamlined Technology Readiness Index TRI 2.0." *Journal of Service Research* 18, no. 1 (2015): 59–74. https://doi.org/10.1177/1094670514539730

Phong, Cao Thanh, Do Thuy Huong, Duong Quoc Thịnh, and Nguyen Thanh Hoang. "AI in Higher Education: Does AI Fear Hinder Learning Outcomes?" In *Proceedings of the 2024 Artificial Intelligence Revolutions (AIR) Conference*, 60–67. Roanne, France: IEEE Conference Publishing Services, 2024. https://doi.org/10.1109/AIR63653.2024.00013

Pires, Péricles José, Bento Alves da Costa Filho, and Ricardo Mendes Junior. "Revisiting the Technology Readiness Index (TRI 2.0): A Study Applied to Students Accessing Digital Social Networks in Brazil." *Relcasi* 16, no. 1, (2024): 1–14. https://doi.org/10.17705/1relc.00096

Syamfithriani, Tri Septiar, Nita Mirantika, Fahmi Yusuf, and Erik Kurniadi. "M-Commerce Application Acceptance Analysis Using Technology Readiness Index (Tri) Model in Kuningan Regency." In *Virtual Conference on Engineering, Science and Technology*, 1–6. Kuala Lumpur, Malaysia: IOP Publishing, 2021. https://doi.org/10.1088/1742-6596/1933/1/011001

Yang, Byunghwa, Youngchan Kim, and Changjo Yoo. "The Integrated Mobile Advertising Model: The Effects of Technology- and Emotion-Based Evaluations." *Journal of Business Research* 66, no. 9 (2013): 1345–52. https://doi.org/10.1016/j.jbusres.2012.02.035

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Journalism Meets Algorithms

How Chinese Students See the Future of News

This study explores how journalism students from diverse Chinese universities perceive the role of artificial intelligence (AI) and algorithms in journalism education. Drawing on 37 in-depth interviews and 11 follow-up conversations, the findings reveal a predominant narrative of a hybrid system, whereby students envision collaboration rather than competition between journalists and intelligent technologies. These imaginaries are shaped by state-driven narratives and limited transnational comparisons, reflecting a hybrid media model rooted in technological optimism and national pride. While participants recognize AI's potential to enhance efficiency and content distribution, they also raise concerns about algorithmic bias, data dependence, and ethical erosion. A central theme is the "viral-valid fallacy"—the distinction between content virality and information validity in an era of rapid information overflow. Journalism training and political affiliation mediate these views, underscoring the need for ethically grounded, interdisciplinary media education and AI-integrated approaches to journalism design.

Keywords: *Algorithmic Imaginaries, Artificial Intelligence (AI), China, Media Ethics, Digital Journalism*

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1. Introduction

The rapid integration of artificial intelligence (AI) into global media ecosystems has transformed journalistic practices, ethics, and epistemologies. This integration has far-reaching implications for society and journalism because algorithmic literacy has become essential for the public to comprehend its sociopolitical and ethical consequences (Bucher 2019; Ji et al. 2024; Foà, Couraceiro, and Pinto-Martinho 2024). Journalists act as a transformative bridge between the public and AI developments and are increasingly responsible for critical and informed reporting that aligns algorithmic developments and social values (Markelius et al. 2024; Diakopoulos 2015, 2019; Broussard 2018). China is seeking AI dominance by 2030 and to establish a global alternative to liberal democracy by adopting AI as a strategic resource (Zeng 2022; Kuai 2025). The shift from traditional newscasting to AI-assisted newsroom processes, from content production to algorithmic delivery (Kevin-Alerechi et al. 2025), calls for consideration of how aspiring journalists perceive AI's functions, boundaries, and social impacts. This study explores algorithmic imaginaries among journalism students in China. Algorithmic imaginaries are defined as collectively held visions, beliefs, and expectations about the agency and cultural impact of algorithms (Natale and Ballatore 2017). The study also explores how these imaginaries interact with students' professional role visions, influencing AI-driven journalism within the nation's contested digital public sphere.

Existing literature has prioritized AI in journalism within the Western media landscape, specifically AI efficiency, risks, and bias (Diakopoulos 2019; Lewis et al. 2019). Chinese studies have focused on the integration of journalism and AI in the Chinese media landscape (Yu and Huang 2021; Kuai et al. 2022; Kuai 2025). Recent studies have analyzed journalism aspirants' attitudes toward AI, its training, and applicability (Zhu et al. 2024; Sun et al. 2024), highlighting a void in advancing understanding of algorithmic preferability in journalism in China, where media innovation is driven by imperatives to advance technological sovereignty (via Baidu ERNIE, iFlytek's models), while ensuring alignment with "cyberspace governance" frameworks (Zhang 2024; Yılmaz 2025). Journalism aspirants must address the tensions between techno-utopian ("AI as an efficiency engine") and state-formed functionalities ("AI as a propaganda amplifier") and situate their imaginaries within their sociotechnical context (Jasanoff 2015).

There are three reasons why it is crucial to understand these imaginaries. First, they predict what future journalists will face when they work with humans and AI. AI performs routine tasks (e.g., data scraping, template-based writing); however, how novice data journalists envision their future roles as passive "tool users" or active "conductors" (Fang 2023) determines whether journalistic values such as public accountability and critical inquiry persist. Second, imaginaries mediate ethical adoption processes. Chinese journalists now worry that AI's "rigid" output is soulless (Zhang and Liu 2024), that algorithmic bias will widen societal fault lines, and that generative-model "hallucinations" clash with political sensitivities. How aspirants imagine these risks determines their ability to mitigate potential damage. Third, imaginaries mediate between resistance and compliance in constrained

spaces. Students may adopt state narratives of AI as promoting "socialist core values" (Central Cyberspace Affairs Commission 2023) or as critical literacies that resist technological determinism (Brennen et al. 2022).

Aitamurto and Boyles (2025) explored four dimensions through which journalistic norms and practices, affected by "imaginary constructed visions," explain the importance of algorithmic imaginaries among journalism aspirants. In algorithmic distribution, journalistic tasks become more challenging as journalists attempt to maintain event or fact reporting over search engines' preferences. China's virtual ecosystems may influence aspirants to become AI assistants instead of conductors, thereby compromising journalistic integrity and ethics. This dynamic may distance aspirants from journalism's public service mission because independent journalists in China, although not in favor of algorithms, produce content that complies with algorithms to raise traffic and attract audiences (Zhang et al. 2020). Umejei (2022) similarly found that Nigerian journalists on Chinese platforms compromise journalistic autonomy to increase viewership and algorithmic optimization.

We draw on the lens of sociotechnical imaginaries (Jasanoff 2015) to frame algorithmic imaginaries as co-produced by technical affordances, institutional power, and cultural values. Therefore, this study asks:

1. How do Chinese journalism aspirants perceive and interpret algorithms and AI in digital media, and how do these interpretations shape their envisioned future professional role?
2. How do Chinese journalism aspirants view the future of journalism in the New Era of China, and what role do their imaginaries play in constructing this perceived future and societal values?

Algorithmic imaginaries shape journalists' perspectives on AI, influencing how society navigates AI narratives and professional values. This study applies the concept of algorithmic imaginaries, defined as "the way people imagine, perceive and experience algorithms" (Bucher 2019), to comprehend AI and human interaction, how journalism aspirants envision AI in the Chinese media landscape, how perceptions of AI shape professional role visions, and what strategies they devise to align with or challenge AI and Chinese society.

Algorithmic imaginaries, rooted in Science and Technology Studies (STS), explain how technology embodies sociocultural meanings beyond its technical characteristics. The perceptions and interpretations of technology are rooted in historical processes that assign meanings and construct mythologies. Jasanoff (2015) defines sociotechnical imaginaries as "collectively held, institutionally stabilized, and publicly performed visions of desirable futures." This scope extends from nation-states to professional societies and collectivities (Hendriks et al. 2025). Algorithmic imaginaries emphasize the interplay among platforms, users, media narratives, and societal beliefs (Maragh-Lloyd et al. 2025; Bank 2025), which affect journalism (Diakopoulos 2019). Journalists co-construct imaginaries by assigning meaning to AI (Ji et al. 2024), thereby influencing their role performance (Lewis et al. 2019). As journalistic values are susceptible to spatial or geopolitical imaginaries, AI's "thingness" must be spatially understood (Suchman 2023; Hecht 2012). Kuai (2025) used

this lens to analyze the integrated shaping of society, politics, education, and journalism.

China's education system shapes students' political ideologies, journalistic values, and media perceptions (Repnikova 2017). The lack of AI in education has led to calls for its inclusion (Zhu et al. 2025; Wang 2022; Hollanek et al. 2025). Wang and Kuntz (2023) reported that students interact with media as a primary source for forming their imaginaries. They found that comparative analyses with countries such as the US and Japan influence these imaginaries. Frau-Meigs (2024) found that Chinese students prioritize morality- and competency-oriented values, while Americans focus on self-improvement, although both affirm honesty and responsibility. Carlson (2018) noted that imaginaries shape algorithmic authority, which is also supported by Chinese studies (Zhang et al. 2020).

RQ1: How do Chinese journalism aspirants perceive and interpret algorithms and AI in digital media, and how do these interpretations envision their future professional roles?

Recently, private, governmental, and informal media in China have created a diverse and evolving landscape (Zhang et al. 2024). This competition has led to AI's growing influence on content production, distribution, and user engagement, raising questions about identity, values, and ethics (Xi and Latif 2022; Zhang et al. 2024; Liu et al. 2025), alongside concerns regarding news authenticity and trust (Levy-Landesberg and Cao 2025). However, the Chinese public appears to support AI in complementing news broadcasting (Sun et al. 2024).

Functional AI news anchors (e.g., Xin Xiaomeng at Xinhua) and hosts (e.g., Xiaoyu at Hangzhou News Broadcast) symbolize the New Era of Chinese media. Cloning technology that simulates human voices and movements raises ethical concerns. Levy-Landesberg and Cao (2025) introduced the concept of technovocality, analyzing sociopolitical concerns arising at the intersection of voices and media, and described how Sogou and Xinhua produced AI clones of human anchors.

The "New Era" in China is linked to Xi's leadership (Rena and Hillman 2024). Scholars have contrasted it with China's past, emphasizing modern values (Brown 2018). Some have glorified China's economic rise as the "New China," while Xi associates the New Era with achieving global autonomy by 2049 (Rena & Hillman 2024). We explore how journalism students' imaginaries are influenced by AI-infused journalism in this New Era, revealing whether aspirants align with national discourses or construct alternative visions. Wang and Kuntz (2023) highlighted how students' memories, perceptions, and media consumption shape their understanding of the New Era. Aladdine (2022) termed this media diversification a "digital revolution," which has shaped journalism students' perceptions of the transformation of journalism. The Chinese education system is gradually adopting AI technologies (Long and Zeng 2016; Wang 2020; Ma et al. 2025).

Thus, we ask:

RQ2: How do Chinese journalism aspirants view the future of journalism in the New Era, and what role do their imaginaries play in constructing this perceived future and its societal values?

2. Methodology

2.1. Participants

The study used a semi-structured qualitative approach to explore students' perceptions of algorithmic applications in journalism, their understanding of the future of journalism, and their envisioned professional roles in the Chinese media landscape. To collect nuanced data, 37 journalism students from three reputable Chinese universities in Beijing, Shanghai, and Guangzhou were selected. We contacted the relevant administration in journalism schools responsible for student affairs. The administration circulated our request with an open invitation to participate in this study without offering any financial incentives. From the interested volunteers, we recruited 37 journalism students with strong knowledge and articulate communication skills, all of whom were determined to pursue a career in Chinese journalism or media. The pool was clearly informed on the aim of the study (to explore their views on algorithms and the future of journalism in China) before they provided consent to participate. They were informed that we were not evaluating their knowledge or seeking politically affiliated opinions but aimed to obtain an in-depth understanding of their perspectives on the subject. The selected cases ensured diversity in university affiliation, gender, and years of study, contributing to the collection of distinctive narratives. The sample was distributed across students in their second-to-last semesters (20% from the second semester, 30% from the third to seventh semesters, and 50% from the last semester). Most students (70%) were from urban areas, such as Beijing. Furthermore, 20% were from smaller cities/towns in western China, and 10% reported a rural background. Five respondents affirmed their affiliation with the CPC. This sample was purposively selected to ensure diversity of perspective; we do not claim generalizability.

2.2. Data collection

All students were interviewed between December 2024 and April 2025 using an in-depth, semi-structured qualitative approach. Each interview lasted between 40 and 60 minutes and was conducted via secure video conferencing platforms. The interviews were conducted in Chinese by the principal researcher. Additionally, 11 follow-up interviews were conducted with participants whose responses required further elaboration for clarification. In total, 48 interview transcripts were documented. The interview protocols were developed to align with the research questions. A pilot study was conducted with four Chinese participants not included in the primary sample from Malaysia (1), Pakistan (1), and China (2). The pilot study experience helped refine our protocols. We developed three major categories of questions (see Table 1): (1) participants' experiences, views, and understanding of algorithms in the New Era and their imagined future work; (2) their understanding, hopes, and concerns regarding the role of algorithms in future journalism; and (3) their reflections on the role of education, training (e.g., internship), and the

sociopolitical context in shaping perspectives. Probing questions were asked to obtain more detailed information.

Section	Core Questions	Research Alignment
Opening & Rapport (5 min)	Tell me about yourself, your name, age, and educational activities. What do you do after school, your routine? Are you practically engaged with journalism? How do you do it?	Establishes professional identity context
Category 1: Present Experiences & Visions	4. How do you define an algorithm and AI? 5. What defines China's New Era in journalism or media in a broader sense? 5. Describe your most significant personal experience with algorithms in news consumption or production. What human skills would remain irreplaceable in an AI-driven Chinese media? How do you envision integrating AI tools into your ideal future journalism workflow? Which core journalistic responsibilities should never be fully automated in your view?	RQ1: Personal interpretations → Professional role
Category 2: Future Societal Role	What positive societal impacts could AI-powered journalism bring to China in the next decade? What hidden risks might emerge if algorithms dominate news curation? Sketch an ideal vs. problematic AI journalism scenario for 2030. How could algorithms affect journalists' accountability to the public?	RQ2: Societal values → Future imaginaries
Category 3: Formative Context	What aspect of your education has most prepared you to navigate AI in journalism? Describe an internship (or any other) experience that reshaped your view of technology's constraints/possibilities. Was there a moment when classroom theory clashed with technological realities?	Contextual grounding for RQ1/RQ2
V. Synthesis & Closing	Complete this: "In the future, a journalist's primary role will be…" What one tradition from pre-AI journalism must be preserved? Are there any crucial aspects we haven't covered?	Imaginaries crystallization

Table 1. Interview protocols of the study

The interviews were transcribed, translated into English, and reviewed by three language experts. Initially, the Chinese transcripts were sent to a professional translator. All authors reviewed the translated version to ensure coherence. After mutual agreement, the final English and Chinese versions were sent to two English language experts well-versed in Chinese to evaluate their coherence and accuracy. The final version was used for analysis. We used the best possible English translations for slang, sarcasm, and key expressions to retain explanatory power.

2.3. Data Analysis

The analysis focused on the transcribed data to uncover discursive constructions underpinning participants' algorithmic imaginaries and their envisioned future of journalism. We drew on Fairclough's (2003) perspective on the natural process of meaning-making in discourse. A multi-tier coding method was used (Corbin and Strauss 2012). Initially, open coding identified emerging concepts, which were condensed into provisional categories. Axial coding explored relationships between categories, and selective coding identified central themes and variations. The process employed a consistent, comparative approach. Linguistic features were analyzed after thematic analysis, focusing on semantic relations (e.g., humans vs. algorithms), lexical choices (e.g., alternatives for algorithms), and modality (e.g., [un]certainty in recommendations). This revealed underlying assumptions, argumentative strategies, and variations in meaning-making. All participants were assigned pseudonyms to ensure confidentiality. Participants reviewed the finalized summary to confirm their consent to ensure data validity. We used NVivo 10 for analysis.

3. Results

3.1. From AI Writing to Writing AI

The central theme that emerged from participants' frequent indication of a journalistic "new era" shaped by AI was how they imagine AI, algorithms, and journalism in the new era of Chinese media. Participants viewed AI and journalism as inseparable and unsustainable without each other in journalism and Chinese media at large. The frequent words that interviewees used to describe the new era of Chinese media were "AI media," "automated reporting," "no human media," "AI vloggers," "AI podcasters," "robotic broadcasting," and "AI journalism." Participants reflected upon thinking about the new era without AI as "...shallow thoughts of a journalistic newbie" (P23). As a student with an urban background responded about the journalistic new era, "AI reporters, broadcaster(s), and automated news, nothing more."

Most participants did not refer to any state policy or initiatives related to the new era, except for three students who referred to governmental AI policies, China's vision to be an AI superpower, and the use of AI in China's defense system. Their frequency of following national news was higher than that of other respondents.

This finding signifies that governmental narratives influenced their new era imaginaries. However, other participants reported that their major sources of information were social media platforms, especially Weibo and WeChat. Most participants did not compare Chinese media with any Western media when discussing the new era of Chinese journalism or media. The variation in students' new era imaginaries appeared to be shaped by their preferred sources of information, as indicated by their responses.

"I know this progress won't be possible without our political leadership. The Party is directing the country to the new path; I mean, economic growth, global power, technology, and so many more. China is progressing" (P33, one of the State media followers).

> I'm proud. We have invented so many things that (the) West is far behind us, things like robots, our researches. Haven't you heard of (the) Chinese Agricultural Revolution! China is not backward; it's evolving, rising, and will be the superpower soon. We are on track. AI innovation is one of the best examples; see DeepSeek and compare it with ChatGPT. Haven't you seen the AI news reporter or newscaster? (P 5, a social media user).

Students perceive algorithms in the new era of Chinese media, especially in journalism practices, as context-blind, trend- and hashtag-chasing, and biased tools with no ethical training. Although they view media algorithms as complementary tools to human effort, they are concerned about their potential to overtake jobs in the media. Their perception of algorithms was mixed; they were in favor of algorithmic efficiency and its ability to complement human work, yet critical of an excessive focus on trends that marginalized other important indigenous and national events. As P4, an intern in a local media channel, responded when asked about her views on algorithms,

> I think it's the algorithm in the back that pops up the stories that I frequently search or view. Same happens with my friend in school, but sometimes I'm in the mood for listening (to) music or watching a (favorite) movie of my taste, but it throws dresses, make-up, and such kind of stuff, 废话 [twice], [pause]...I think it doesn't always follow me.

As P31, a seventh-semester student, explained,

> ... let me describe a bit, aahhmm, I think the [China's] Space Project was more important than Russia and Ukraine. Why (is) my phone showing me news about them; isn't it weird? It means algorithms ONLY [he emphasized] go for what most of the people are interested in, 6.6.6 [sarcastically used].

They also viewed algorithms and AI as the same, thinking of them as a tool, language, program, and GenAI because the majority of students used these terms while responding to algorithms and AI. They associated AI with DeepSeek, ChatGPT,

Kimi, Sora, and Baidu ERNIE, viewing these tools as AI itself rather than its applications. However, senior students described AI as a language model, language tool, language prompt, and language reader program. The interviewees emphasized the cost and time efficiency of using AI and acknowledged its value for educational purposes. A second-semester student, P14, stated, "AI and algorithms are not the same? I think when I write a prompt to DeepSeek, I am interacting with its algorithm; is that not good? It could sum up things for me, and I can prepare for exams easily."

However, when describing its use in Chinese media, participants' views were entirely different. They viewed AI in journalism as contrary to the journalistic values, which they described as the delivery of facts, emotion, real-time, and on-the-ground reporting, and reflection of what people think. In contrast, AI only analyzes data and does not know the context. Therefore, "if it is, whatever it is whether right or wrong, available as data, the AI can only tell you that (P10)." The majority of students expressed concern about using AI in the media, citing AI broadcasting while acknowledging its error-free ability to read news. P21 stated,

> "Yes, AI does not make mistakes while reading news as it often happens with a human; it doesn't show fatigue, emotions, and awkward moments, but it can only read the news [moderate pause]. It could never be an analyst, but data catcher, and by the way [with a heavier tone], what data could it have, if I [human] stop writing on the internet!"

Journalism students who are engaged with journalism through internships, writing blogs, stories, and commentaries on social media had different narratives about their future roles in journalism than those who are not practically engaged with it. The engaged respondents believed that their future journalistic roles would be challenging, tough, painful, and difficult to sustain. However, they were passionate about retaining journalistic values such as delivering facts, reporting ground realities, and practicing impartiality. They believed that their skills were more important than AI, even when using AI in journalism. They were not afraid of being jobless but were confident that AI could not replace them.

They also reported that AI assistance would be part of their future tasks in journalism because of the large amount of information flow, which cannot be crafted single-handedly or managed efficiently. Although they used AI assistance to complete tasks on time, they were not in favor of using AI for content writing, specifically for unique stories and investigative journalism. They pointed out that these domains are highly contextual and sensitive, and that AI and algorithms do not understand them.

> Look, in (the) future, if I'm working on a story of a single parent woman with no child left to take care of her, I can do it better than any language programming tool. I guess it would take a longer time and efforts to correct the AI-produced stories than my own writing, but yes, I can have some ideas from AI (P2).

It [AI] cannot take my job because they cannot hold it accountable; at the end, it's me [human]. I would be in command, I would be accused or defused. AI and algorithms don't stand in air; human(s) materialize them, we give them life. OK, OK, AI can write better, but we write the AI. I won't be jobless, unless I'm skill-less (P15).

The non-engaged respondents feared that AI journalism and algorithmic prevalence would leave no space for journalism students in the media. A segment of programming experts would take over their jobs, and they would be left with no choice but to vlog, podcast, or self-report on social media or similar platforms. When asked about their future professional role, P4 replied, "Job! Hehe, I might not be able to have a job in media because the AI reporters and robots in the newsrooms will not let me in." However, they explained that without adhering to the core journalistic values of fact-finding and reporting without any political bias or influence, they could not sustain themselves as independent journalists. Like the engaged participants, they also acknowledged the hybrid model of independent journalism, but were concerned that in the near future, AI and human interaction in journalism would make job hunting highly competitive, highly specialized, and data-oriented. Most participants interpreted algorithmic use in journalism and media under the umbrella of the evolving Chinese media landscape. For example, P19 stated,

I remember my father reading newspapers, I mean printed ones, but I read and watch them on my tab, rarely on LED. News, broadcasting, anchoring, reporting, and even writing have all changed and are changing, without sound effects and so many complex graphics, and now AI! Computer-generated anchors, broadcasters, content writers, and influencers are publishing news.

3.2. Media Hybridity Shaping Empathetic Journalism

The Chinese students articulated the future of Chinese journalistic media as an integration of AI and human work – Media Hybridization. They did not imagine pure AI journalism (except P9) and consistently used words like "impossible," "out of the question," "no way," and "never." The viable path involves algorithmic data handling, news distribution, multilingual translations, and textual analysis that complement journalistic work, improving efficiency and so-called real-time effectiveness – "its work won't have impact like humans do" (P7). However, media hybridization risks the erosion of ethical empathy, contextual awareness, and investigative depth in stories. One of the participants from a rural background said, "AI writing would be empty emotions, no context, no empathy; it could make good breaking news of agricultural crisis, but, because I'm from a village, I can describe on (the) ground how a young, ambitious farmer will be feeling in that very moment" (P1).

Their imaginaries about the future of Chinese journalism were focused on societal issues that they described as data-driven, algorithmic "pick and choose," and viral content being considered valid. The prevalent trends in media, mediated by algorithms, have forced journalists to report, write, and analyze these trends. However, journalism in the future is expected to be highly contextualized and investigative because "every viral content is not valid" (P17). The overabundance of information

on social media, including independent journalists' content, reduces the shelf life of important stories, events, and facts, a problem that will likely worsen in the future due to the algorithmic dependence of the media.

> I believe you also witness that every viral content is viral until the next viral story is on the screen. The war, poverty, a child story, and even a popular song or movie are all important and viral until the algorithm picks another viral content. This will worsen in the future. Your pain, your story, my good guess, would have lasted only for 30 to 40 minutes (P23, part-time journalistic content writer).

One student noted in frustration, "A celebrity giving coins to beggars will be viral, but not the issue of beggary itself." This reflects a broader anxiety that AI-curated content may privilege surface-level spectacle over structural depth, creating a media reality in which symbols overshadow substance.

Almost all participants mentioned AI-generated reporters, hosts, influencers, and female models on social media, indicating deep concerns about their prevalence in the near future, which could seriously endanger the ability to report on complex human phenomena. Quantifying events and trends will be left to AI and algorithms, but in-depth investigation, individual stories, and especially latent facts or marginalized forms of silent suffering will remain imperative journalistic domains because "Codes can't see the silent suffering" (P20). In contrast, only one male junior student from Beijing imagined a pure AI journalistic future, describing it as "Every media house (is) going to have AI reporters, anchors and broadcasters, behind the newsrooms, AI analysts as well. Codes are going to prevail, period" (P9). The specialized journalist role of the future was articulated as

> Well, my duty will not be reporting, for example, only the war data. It will be like reporting from the war zone, listening to the grandmother's stories, the widow's help, and frightened children, and forcing algorithms to carry their voices (P26).

Without comparing to international media houses, they proudly expected the global reach of Chinese media because of its advancement in AI-generated content accuracy and multilingual translations. Chinese culture, scientific advancement, and China's voice in global power would be the primary content distributed globally. They were skeptical about independent journalists' impact, having contrasting perspectives, as algorithmic dominance and surveillance were simultaneously increasing and being enforced, potentially censoring their voices: "One glitch and everything is vanished; who knows what AI would do with my content?" (P16). Almost half of the participants described the journalistic future as focused on effective visuals (e.g., graphics and color combinations) and accurate AI audio, including translation and 360° reporting. The most impactful media hybridization would be 3D-generated visuals with actual human-voice reporting of unseen events, marginalized stories, invisible scientific discoveries, and inaccessible areas. One of the

senior students, referring to the recent discovery of pillars beneath the pyramids of Giza, said,

> Reading news about huge pillars beneath the Egyptian pyramids is not attractive and takes time, but 3D videos of these pillars at CGTN and elsewhere are like Waoo... they attract everyone. Within one or two minutes, you can learn about seven years' worth of research. I think these methods will be sustained in journalism.

Despite their concerns about algorithmic and AI dominance, censorship, unemployment, and data-driven facts, they perceived AI and algorithmic prevalence in the media as serving society in dynamic ways, such as disseminating national discourses, narratives, and vital governmental instructions to all multilingual Chinese communities promptly. AI's effective translation ability would break language barriers, and it would be highly convenient for local news channels and independent journalists to access, comprehend, and report on cultural complexities in other languages. The participants from rural backgrounds elaborated on the possibilities of media-mediated local-language early warnings, such as alerts about the urgent need for rain harvesting, and about floods, droughts, and insect invasions in agricultural contexts.

The participants also described how AI has introduced new employment opportunities in media and journalism, and emphasized that they should be prepared in advance, considering emerging interdisciplinary approaches, such as journalistic data science, AI journalism, automated graphics and design editing, AI content editing, and algorithm development. Although they frequently mentioned guest lectures, workshops, and training on emerging interdisciplinary domains, their formal coursework did not align with industry requirements: "I cannot develop algorithms, work as an AI graphics editor, or even generate AI influencers. What future do I have?" (P27, senior student). They urged more practical work and AI-related courses and training. A student with an urban background stated,

> I should spend one or two days in the classroom, and the rest of the time in the field. I wish my studies could have been like this. The future is not about what you have studied, but what you can do! (P12).
> I know what investigative journalists do because I attended their lectures, but I can't do that; I haven't been with them to be trained (P25).

4. Discussion and Conclusion

Using a qualitative in-depth study approach, this study conducted 37 interviews (along with 11 follow-up interviews) with journalism aspirants from different Chinese universities to investigate how journalism aspirants perceive and interpret algorithms and AI in the new era of Chinese journalism. The study also explored what professional roles they imagine in transforming the Chinese media

landscape, and how they view the future of Chinese journalism and its broader social impact. This study explores the complex algorithmic imaginaries within the sociopolitical and technological context of the Chinese media ecosystem, providing a solid foundation for a deeper understanding of the future of Chinese media, particularly journalistic practice. The dominant narrative that emerged was that AI is algorithmically entangled with journalism, an inseparable relationship that places AI in an integral position in the future of the Chinese media landscape. The journalism students did not perceive a binary contest between machine and human, but rather a complementary or mediated partnership, described as media hybridization. This partnership allows each to compensate for the other's constraints—on the one hand, improving journalistic efficiency and, on the other, mitigating the limitations of AI and algorithms. This hybridization also benefits China's diverse geographic and linguistic territories and has emerged as a stabilizing metaphor that encompasses essential tasks such as multilingual translation, data processing, and content distribution. Their AI and algorithmic imaginaries could be viewed as a "hybridization" model of Chinese media. This aligns with several previous studies (e.g., Dörr 2016; Carlson 2018), including studies on Chinese students (Wang and Kuntz 2023).

Contrary to Wang and Kuntz's (2023) identification of Chinese students' limited knowledge of the New Era concerning national imaginaries, our findings indicated that students provided rich descriptions of the New Era within the Chinese media landscape. However, similar to Wang and Kuntz's (2023) findings, most students did not articulate their imaginaries as being influenced by state policies or initiatives. The source of information emerged as a key factor shaping these imaginaries, as their perceptions and interpretations of China's AI supremacy were implicitly absorbed through various state media outlets. The students' restricted imaginaries, limited to the Chinese Media landscape, that is, without comparisons to international media houses or policies, reaffirmed an implicit alignment with national narratives. This contradicts Guo's (2021), Astarita and Patience's (2020), and, in the Chinese context, Wang and Kuntz's (2023) emphasis on a comparative perspective of students' imaginaries. Consequently, the integrated context of China's distinctive technological advancement, influenced by national narratives of global leadership and propagated through state-driven media ecology, discloses this implicit ideological alignment. This is revealed in the students' descriptions of state-affirming technological optimism, expressed through narratives of national pride, progress, and development.

At the same time, epistemological and ethical concerns, as well as certain fears, were prevalent in these imaginaries, as students consistently attributed the transformative new era of Chinese media to AI's algorithmic bias, data dependence, and lack of emotional depth. Such a pattern reflects a conscious and critical interpretation of the existing and anticipated contest between prevalent journalistic values and algorithmic logic. It also resonates with the materialist phenomenology of Couldry and Hepp (2017), who argued that algorithmic media prefer quantification over contextualization, which thereby reconstructs social reality and discourse around what is visible, viral, and thus validated. Although journalism aspirants distinguish

between viral and valid content, this distinction elicits deep anxiety about the algorithmic and AI infrastructure of news production, which could potentially damage the core journalistic values of contextualized storytelling, uncovering latent facts, and investigative reporting.

Heterogeneous imaginaries are shaped by exposure to practical journalism and political affiliation. Practical experience highlights the tension between algorithmic pressure to produce viral content and the normative commitment to public service journalism. Although this dynamic elicits a compromise of journalistic independence on digital platforms (Caplan and Boyd 2018), it also shows that future journalists are not passive adopters of AI and algorithms, further highlighting their decisive orientation toward ethical and professional use of these technologies. Such findings contradict Umejei's (2022) argument about the algorithmic coercion of journalists to produce popular content. The irreplaceability of human contextual, ethical, and affective labor in highlighting human suffering, rather than merely presenting data, resonates with the recent journalistic concept of "human infrastructure," an imperative mediating force for technology (Anderson 2017). Political affiliation shapes algorithmic imaginaries that are influenced by state narratives framing the evolving Chinese media landscape as an affirmative product of governmental efforts and effective policy initiatives. This aligns with Zhang et al. (2020), who explored the role of politics in shaping the sociotechnical imaginaries of the masses.

Viral journalism, as proposed by Kostarella and Palla (2024), focuses on attractive headlines that evoke public emotions, thereby compromising information credibility and integrity, discouraging profound and critical investigation, and ultimately resulting in a loss of public trust in the media. We refer to this phenomenon as the "viral-valid fallacy." This fallacy represents a nuanced differentiation between the virality of content and the validity of information, highlighting how the rapid overflow of information across media platforms shortens the lifespan of important issues. This links social media, the "breeding ground for misinformation" (Agbasiere 2024), with mainstream media and underscores the importance of content integrity, credibility, and reliability. Thus, because it is generally assumed that viral content is inherently valid, which we identify as a fallacy, participants who were aware of this misconception insisted on prioritizing the quality and validity of journalism over its virality. The fallacy is rooted in the broader societal shift in communication, driven by algorithmic control of visibility, which reduces the longevity of public concerns about important issues and amplifies the epiphenomenon; for example, a slip of the tongue when describing poverty alleviation may receive more attention than the issue of poverty itself.

The fallacy serves as a critical conceptual intervention in the current information ecosystem, particularly within contemporary media, which often misrepresents and misinterprets viral content as valid. This could be unintentional, as the media's fundamental responsibility is to deliver facts. Nevertheless, viral content creates a general impression of validity, and the media reinforces this by reporting it explicitly as "viral content." By naming and conceptualizing this fallacy, we aim to initiatea scholarly and journalistic dialogue about the epistemological risks

inherent in algorithm-driven content dissemination. The fallacy reveals how journalistic ethics, digital media, and news organizations compromise their integrity and credibility through the pursuit of visibility and shareability of viral content, which could potentially distort public understanding and marginalize substantive issues. One of the essential reasons for highlighting this fallacy is that, on the one hand, it challenges normative assumptions about viral content, and, on the other hand, it offers media houses potential opportunities to reclaim their commitment to validity, depth, and public trust. Therefore, the "viral-valid fallacy" is not just a conceptual tool, but also an actionable roadmap guiding researchers toward valid content and a deeper understanding of the facts they must evaluate and report.

Imagining the future of the Chinese media landscape and their professional roles, some participants feared job displacement while reflecting on the rapidly transforming mainstream media and the misalignment of their educational training with this transformation. Participants indicated that specialized, interdisciplinary media jobs in the future would demand competitive skills rather than educational credentials. Highlighting these skills, they emphasized algorithmic reasoning, graphics production, and audience analytics. This highlights the urgent need to address the misalignment, which could inhibit graduates' readiness to engage with and transform the media landscape.

Conclusively, the imaginaries of Chinese journalism students reflect AI and algorithms as discursive agents – neither mere tools nor existential threats – co-constructing the transforming journalistic roles, including professional identity and societal communication. Their sociopolitical and pedagogical contexts implicitly shape their algorithmic imaginaries of the new era of Chinese media. However, their conscious and critical appraisal of the transforming Chinese media landscape revealed a complex interplay between human infrastructure and AI imperatives, while preserving the core ethical values of journalism, including contextualized, investigative, and factual reporting. These findings offer a future coexistence, rather than a competitive environment, between algorithmic efficiency, journalistic integrity, and human judgment, and extend an invitation to technology developers, media policymakers, and journalism scholars to co-design an AI-human collaborative media landscape.

Future research may extend this study by investigating the evolving imaginaries of students as they enter the workforce, and by comparing these imaginaries with those of students who have pursued independent journalism, podcasting, or vlogging. Furthermore, future research may examine the comparative development of imaginaries by selecting students from rural and urban backgrounds, with varying political affiliations, or by incorporating broader transnational perspectives on openness to sources of information. Understanding the imaginaries of individuals in a sociopolitical system that seeks to establish its global supremacy is not just an academic exercise; rather, it is a necessary endeavor to shape a more reflective and equitable future for the media.

AI Disclosure Statement

We confirm that we used ChatGPT (GPT-4o) and DeepSeek-V3 in preparing this manuscript for stylistic and grammatical refinement. The AI tools were utilized to enhance clarity, coherence, and readability; however, all intellectual contributions, arguments, and analyses remain our own.

Ethical Consideration

The Ethical Research Committee of the Faculty of Humanities and Arts at Xingzhi College of Xi'an University of Finance and Economics has evaluated the case. It certifies that the research study of Ms. Liu Juan (Registration No. 20180401) entitled "AI in Journalism: Chinese Aspirants' Role Imaginaries and Societal Reflections" does not involve any sensitive information or include any identification of respondents. The committee, therefore, grants ethical approval for this study.

Informed Consent

All participants were fully informed about the purpose, procedures, risks, and benefits of the study prior to participation. Written informed consent was obtained from all adult participants. In cases where participants were under the age of 18, written informed consent was obtained from their parent or legal guardian. Participants were assured that their participation was voluntary, that they could withdraw at any time without penalty, and that all data would be kept confidential and used solely for research and publication purposes.

Disclosure Statement

No conflicts of interest are reported.

References

Agbasiere, Chukwuemeka L. *From Viral Rumors to Fact-Checked Information: The Influence of Social Media Platforms and Fact-Checking Organizations on Public Trust during the Covid-19 Crisis.* Master's thesis, Illinois State University, 2024.

Aitamurto, Tanja, and Jan Lauren Boyles. "Next Generation Journalistic Norms: Journalism Students' Social Imaginary of AI-Infused Journalism." *Journalism Practice*, 2025, 1–19. https://doi.org/10.1080/17512786.2025.2505950

Aladdine, Rym. "Journalism: As Seen in the Eyes of Current Journalism and Digital Media Students." *Žurnalistikos tyrimai* 16 (2022): 108–137. https://doi.org/10.15388/ZT.JR.2022.4

Anderson, C. W. *Apostles of Certainty: Data Journalism and the Politics of Doubt.* Oxford: Oxford University Press, 2017. https://doi.org/10.1093/oso/9780190492335.001.0001

Astarita, Carlo, and Allan Patience. "Chinese Students' Access to Media Information in Australia and France: A Comparative Perspective." *Media International Australia* 175, no. 1 (2020): 65–78. https://doi.org/10.1177/1329878X20905695

Bank, David. "Big Tech as a Technopolitical Actor: Imaginaries of Personalization and Their Unintended Consequences." *Information, Communication & Society*, 2025, 1–18. https://doi.org/10.1080/1369118X.2025.2497943

Broussard, Meredith. *Artificial Unintelligence: How Computers Misunderstand the World.* Cambridge, MA: MIT Press, 2018.

Brown, Kerry. *The World According to Xi: Everything You Need to Know about the New China.* London: I.B. Tauris, 2018.

Bucher, Taina. "The Algorithmic Imaginary: Exploring the Ordinary Affects of Facebook Algorithms." In *The Social Power of Algorithms*, 30–44. New York: Routledge, 2019.

Caplan, Robyn, and Danah Boyd. "Isomorphism through Algorithms: Institutional Dependencies in the Case of Facebook." *Big Data & Society* 5, no. 1 (2018): 2053951718757253 https://doi.org/10.1177/2053951718757253

Carlson, Matt. "The Robotic Reporter: Automated Journalism and the Redefinition of Labor, Compositional Forms, and Journalistic Authority." In *Journalism in an Era of Big Data,* 108–123. New York: Routledge, 2018.

Corbin, Juliet, and Anselm Strauss. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory.* 3rd ed. Thousand Oaks, CA: Sage Publications, 2012. https://doi.org/10.4135/9781452230153

Couldry, Nick, and Andreas Hepp. *The Mediated Construction of Reality.* Malden, MA: Wiley, 2017.

Diakopoulos, Nicholas. "Algorithmic Accountability: Journalistic Investigation of Computational Power Structures." *Digital Journalism* 3, no. 3 (2015): 398–415. https://doi.org/10.1080/21670811.2014.976411

Automating the News: How Algorithms Are Rewriting the Media. Cambridge, MA: Harvard University Press, 2019.

Dörr, Konstantin Nicholas. "Mapping the Field of Algorithmic Journalism." *Digital Journalism* 4, no. 6 (2016): 700–722. https://doi.org/10.1080/21670811.2015.1096748

Fairclough, Norman. *Analyzing Discourse: Textual Analysis for Social Research.* London: Routledge, 2003.

Fareed, Muhammad, Anis Ahmad, Siti Sarah Mohamad Salleh, Wan Siti Wan Mohd Noor, and Mohd Faizal Mohd Isa. "What Makes Human Resource Professionals Effective? An Exploratory Lesson from Techno-Based Telco Firms of a Developing Country." *Frontiers in Psychology* 13 (2022): 774165. https://doi.org/10.3389/fpsyg.2022.774165

Foá, Célia, Pedro Couraceiro, and António Pinto-Martinho. "Decoding Algorithmic Literacy among Journalists: Methodological Tool Design and Validation for Preliminary Study in the Portuguese Context." *Observatorio (OBS)* 18, no. 5 (2024). https://doi.org/10.15847/obsOBS18520242433

Frau-Meigs, Divina. "Algorithm Literacy as a Subset of Media and Information Literacy: Competences and Design Considerations." *Digital* 4, no. 2 (2024): 512–528. https://doi.org/10.3390/digital4020026

Guo, Yingjie. "Transnational Journalism History and China Matters." *TMG Journal for Media History* 24, no. 1–2 (2021) https://doi.org/10.18146/tmg.781

Hecht, Gabrielle. *Being Nuclear: Africans and the Global Uranium Trade.* Cambridge, MA: MIT Press, 2012.

Hendriks, Annelies, Kaisa Karhunmaa, and Pierre Delvenne. "Shaping the Future: A Conceptual Review of Sociotechnical Imaginaries." *Futures*, 2025: 103607. https://doi.org/10.1016/j.futures.2025.103607

Hillman, Ben, and A. L. Ren. *China's New Era.* Canberra: ANU Press, 2024. https://doi.org/10.22459/CSY.2024

Jasanoff, Sheila. "Future Imperfect: Science, Technology, and the Imaginations of Modernity." In *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power*, 1–33. Chicago: University of Chicago Press, 2015.

Ji, Xueqing, Jing Kuai, and Rodrigo Zamith. "Scrutinizing Algorithms: Assessing Journalistic Role Performance in Chinese News Media's Coverage of Artificial Intelligence." *Journalism Practice* 18, no. 9 (2024): 2396–2413. https://doi.org/10.1080/17512786.2024.2336136

Kevin-Alerechi, Elfredah, Israel Abutu, and Oladunni Oladipo. "AI and the Newsroom: Transforming Journalism with Intelligent Systems." *Journal of Artificial Intelligence, Machine Learning & Data Science* 3, no. 1 (2025): 1930–1937. https://doi.org/10.51219/JAIMLD/Elfredah-Kevin-Alerechi/426

Kostarella, Ioanna, and Zoi Palla. "Sensationalism versus Substance: Exploring 'Viral' and 'Quality' Journalism in the Greek Public Sphere." *Journalism and Media* 5, no. 3 (2024): 1173–1193. https://doi.org/10.3390/journalmedia5030075

Kuai, Jing. "Navigating the AI Hype: Chinese Journalists' Algorithmic Imaginaries and Role Perceptions in Reporting Emerging Technologies." *Digital Journalism*, 2025, 1–20. https://doi.org/10.1080/21670811.2025.2502851

Kuai, Jing, Raúl Ferrer-Conill, and Michael Karlsson. "AI ≥ Journalism: How the Chinese Copyright Law Protects Tech Giants' AI Innovations and Disrupts the Journalistic Institution." *Digital Journalism* 10, no. 10 (2022): 1893–1912. https://doi.org/10.1080/21670811.2022.2120032

Levy-Landesberg, Hadar, and Xi Cao. "Anchoring Voices: The News Anchor's Voice in China from Television to AI." *Media, Culture & Society* 47, no. 2 (2025): 229–251. https://doi.org/10.1177/01634437241270937

Lewis, Seth C., Angèle L. Guzman, and Thomas R. Schmidt. "Automation, Journalism, and Human–Machine Communication: Rethinking Roles and Relationships of Humans and Machines in News." *Digital Journalism* 7, no. 4 (2019): 409–427. https://doi.org/10.1080/21670811.2019.1577147

Liu, Jie, Wei Dong, Xin Wang, and Guancheng Gao. "The Framing in Media Policy Narratives of Artificial Intelligence Generated Content: A Comparative between Traditional Media and Social Media in China." *Review of Policy Research*, 2025. https://doi.org/10.1111/ropr.70030

Long, Yiyi, and Xiaohui Zeng. "Journalism Education in China: The Reality and Challenges in the Digital Era." *Journal of Applied Journalism & Media Studies* 5, no. 1 (2016): 117–137. https://doi.org/10.1386/ajms.5.1.117_1

Ma, Chang, Faran Ijaz, Muhammad Fareed, and Hira Laeeq. "Adoption of E-Learning Technology in China's Higher Education: Insights from Teachers' Perspectives." *RIED-Revista Iberoamericana de Educación a Distancia* 28, no. 2 (2025). https://doi.org/10.5944/ried.28.2.43514

Maragh-Lloyd, Rhiana, Robert Stoldt, John Ssozie, Kevin Biddle, Brett Ekdale, and Timothy Havens. "'They're Trying to Influence Me to Gain the More Acceptable Viewpoint': The Algorithmic Imaginaries of Politically Activated Social Media Users." *New Media & Society*, 2025: 14614448251338502. https://doi.org/10.1177/14614448251338502

Markelius, Anders, Chris Wright, Jacob Kuiper, Nicolas Delille, and Yu Ting Kuo. "The Mechanisms of AI Hype and Its Planetary and Social Costs." *AI and Ethics* 4, no. 3 (2024): 727–742. https://doi.org/10.1007/s43681-024-00461-2

Natale, Simone, and Andrea Ballatore. "The Web Will Kill Them All: New Media, Digital Utopia, and Political Struggle in the Italian 5-Star Movement." *Media, Culture & Society* 36, no. 1 (2014): 105–121. https://doi.org/10.1177/0163443713511902

Repnikova, Maria. "Thought Work Contested: Ideology and Journalism Education in China." *The China Quarterly* 230 (2017): 399–419. https://doi.org/10.1017/S0305741017000583

Shao, Yuhui, and Qi Yin. "A Review of the Role of Artificial Intelligence in Media Content Creation for SDGs Development." *Journal of Lifestyle and SDGs Review* 5, no. 2 (2025): e03971–e03971. https://doi.org/10.47172/2965-730X.SDGsReview.v5.n02.pe03971

Suchman, Lucy. "The Uncontroversial 'Thingness' of AI." *Big Data & Society* 10, no. 2 (2023): 20539517231206794. https://doi.org/10.1177/20539517231206794

Sun, Mingxiao, Weijun Hu, and Yang Wu. "Public Perceptions and Attitudes towards the Application of Artificial Intelligence in Journalism: From a China-Based Survey." *Journalism Practice* 18, no. 3 (2024): 548–570. https://doi.org/10.1080/17512786.2022.2055621

Umejei, Emeka. "Chinese Digital Platform: 'We Write What the Algorithm Wants.'" *Digital Journalism* 10, no. 10 (2022): 1875–1892. https://doi.org/10.1080/21670811.2022.2151026

Wang, Lei. "The Gap between University Studies and Labour Market in Journalism: Opening Educational Community Example in China." *Heliyon* 8, no. 12 (2022): e11973. https://doi.org/10.1016/j.heliyon.2022.e11973

Wang, Min. "An Analysis of the Innovation Path of Journalism and Communication Education in Chinese Universities in the Era of Media Convergence." *Creative Education* 11, no. 11 (2020): 2458–2468. https://doi.org/10.4236/ce.2020.1111180

Wang, Xi, and Aaron M. Kuntz. "Chinese University Students' Imaginaries of China in 'the New Era.'" *Asia Pacific Journal of Education* 43, no. 1 (2023): 111–125. https://doi.org/10.1080/02188791.2021.1902784

Xi, Yanni, and Rana Asad Latif. "Reconstruction of News Production Driven by Artificial Intelligence in China." *Search: Journal of Media and Communication Research* 14, no. 2 (2022): 29–45.
https://doi.org/10.0410/cata/5424e6887fc950996301184dd18d72f3

Xu Ruoxi, Sun Yingfei, Ren Mengjie, Guo Shiguang, Pan Ruotong, Lin Hongyu, Sun Le, and Han Xianpei. "AI for Social Science and Social Science of AI: A Survey." *Information Processing & Management* 61, no. 3 (2024): 103665.
https://doi.org/10.1016/j.ipm.2024.103665

Yılmaz, Özgür. "Technology and State Relations: China Case." *Journal of Chinese Research* 1 (2025): 1–12.
https://doi.org/10.5281/zenodo.14730454

Yu, Yujie, and Ke Huang. "Friend or Foe? Human Journalists' Perspectives on Artificial Intelligence in Chinese Media Outlets." *Chinese Journal of Communication* 14, no. 4 (2021): 409–429.
https://doi.org/10.1080/17544750.2021.1915832

Zeng, Jinghan. *Artificial Intelligence with Chinese Characteristics: National Strategy, Security and Authoritarian Governance.* Singapore: Springer, 2022.
https://doi.org/10.1007/978-981-19-0722-7

Zhang, Angela Huyue. *High Wire: How China Regulates Big Tech and Governs Its Economy.* Oxford: Oxford University Press, 2024.

Zhang, Shengli I., Jing Zhu, and Yan Wang. "China: A Diverse and Complex Media Landscape." In *Media Compass: A Companion to International Media Landscapes*, 292–301. 2024.
https://doi.org/10.1002/9781394196272.ch28

Zhang, Weiyu, Zhi Chen, and Yanni Xi. "Traffic Media: How Algorithmic Imaginations and Practices Change Content Production." *Chinese Journal of Communication* 14, no. 1 (2020): 58–74.
https://doi.org/10.1080/17544750.2020.1830422

Zhu, Ruilin, Xinyu Wang, Xiaoyu Yu, and Paul W. K. Chan. "'AI Matters, but My STEM Sucks': Determinants of Chinese Journalism Students' Views on Greater AI Training in Journalism Courses." *Education and Information Technologies* (2024): 1–21.
https://doi.org/10.1007/s10639-024-13230-9

The early warning system's significance in the information society and the revision of information literacy during natural disaster operations

Developing resilience is crucial to prevent and manage natural disasters, each of which has unique characteristics that demand adaptable solutions. Nevertheless, preventive guidelines mostly apply technical or scientific approaches only, which significantly complicates the development of appropriate informational behavior and actions. The aim of the study presented here was to clarify the consequences of the deficit in resilience that affects communities, a significant cause of which is distrust stemming from the lack of proper information. In developing information literacy for crisis and warning communication, knowledge of disaster risks—as well as the ability to detect, monitor, analyze, and forecast hazards—is essential for effective early warning systems. The practical use of those features not only contributes to long-term prevention and risk analysis but can also be useful before a disaster occurs, given the opportunity for avoidance from the time of detection to the time of warning.

Keywords: *global information society, information literacy, integral security, resilience, early warning system, crisis communication*

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1. Introduction

The effects of climate change are clearly being witnessed with rising frequency across all aspects of the environment. Ongoing alterations in the environment, including soil erosion, earthquakes, and diminishing water supplies, contribute significantly to unanticipated natural disasters. In turn, devastating natural disasters undermine critical infrastructure, education systems, and other social services and thus create numerous challenges. Essential factors in addressing the problem are the theory and practice based on resilience-based experiences with early warning systems (EWSs), which constitute a significant feature of the process of sharing information in regional societies (Baudoin et al. 2016).

Developing resilience contributes significantly to the success of the pre- and post-disaster reconstruction, an important aspect of which is the level of trust within the community. After all, trust is central in human relationships and in mechanisms for coping with complexity. In that sense, both trust and resilience are ways to cope with complexity as well as uncertainty (Besenyő 2019).

In translating theory into practice in crisis communication, informing communities properly is a part of complex EWSs that is essential during both the prevention and rebuilding processes.

2. Methods

The study presented here was conducted by adopting the chief principles of international intergovernmental organizations and nongovernmental organizations as secondary sources of data. Given the complexity of the study's topic, comparative document analysis was applied while critically acknowledging the credibility, relevance, and timeliness of the data used. Data and results in domestic and international literature relevant to the topic were collected and examined by using secondary research. The study's objectives were also pursued by collecting and inspecting relevant domestic and foreign literature, including polls, articles, essays on the topic, and doctoral theses, both by civilian researchers by institutes of public security meanwhile, relevant literature was reviewed using both analytical and synthetic approaches.

3. Significance of developing community resilience in the information society

Understanding the informal role of EWSs in developing resilience requires clarifying the concept of resilience. *Resilience* is generally defined as the process of appropriate adaptation following events that cause trauma, tragedy, and other dangers or sources of significant stress using tools that are fundamentally biological, psychological, social, and cultural in nature and that help individuals to apply ppropriate processes of responding to stress (American Psychological Association 2014).

The development and characteristics of resilience vary by region and community, and it is important to distinguish between the traumas experienced by communities and individuals, for responses to stress from those traumas differ as well. For instance, the process of promoting a sense of hope and unity following trauma by adapting resilience differs in a war-torn or developing country compared with a developed, resource-rich region (Walker and Salt 2006).

The resilience matrix clearly and comprehensively summarizes the process of establishing of an appropriate level of resilience in affected communities, with the development of adaptive behavior based on raising awareness, considering social being, and practically applying scientific theories. On that basis, the resilience matrix can be divided into eight parts, in which predominantly negative values continuously affect positive ones and, by extension, significantly reduce their characteristics and impacts. In the process of developing resilience, the goal is to enable the affected individual or community to reverse the process in the resilience matrix by allowing the positive areas and values to dominate while continuously correcting the negative ones (Karvalics 2022b).

3.1. Trust in effectively using community-based information and enabling resilience

A particular community's level of resilience is significantly determined by the level of trust within it, the degree of inequality within it, and their interrelationship.

The established level of trust can be interpreted using a two-level scale. On this two-tier scale, one value reflects the degree of knowledge supported by adequate information, while the other indicates the extent of uncertainty or missing knowledge. Together, these two values define the appropriate level of trust.

(Sumpf 2019). The familiarity principle can be applied to balance the scale based on the idea that trust fundamentally represents favorable future expectations and belief in situations in which the outcome is unpredictable (Möllering 2006). Building the level of trust is essential not only for resilience but also for the success of each community's functioning, because individual social interactions are also based on mutual trust when a favorable outcome is expected (Luhmann 2017).

An affected community can easily manage misinformation within it if it retains a sufficient level of trust toward the institutions, organizations, and individuals providing that information. Overall, theoretical reasoning suggests that communication about limits of knowledge can foster conscious trust in the system by recognizing the potential for failure and adjusting expectations to maintain stable trust (White and Eiser 2006).

Building on these expectations surrounding trust in risk and warning communication, it is essential to clarify how crises themselves are conceptualized within the broader field of crisis communication. Crisis communication is a multidisciplinary area of study encompassing a variety of practices that organizations use to communicate before, during, and after crises to restore normal operations. According to Ulmer et al. (2015), crises are unique moments that move beyond common,

unpleasant calamities and, following Herman (1972) have three distinguishing markers: surprise that exceeds expectations, a threat or risk that exceeds standard operations, and the need for organizations to respond quickly and effectively. Although many definitions of organizational crisis exist, a multidisciplinary approach to understanding an organizational crisis includes acknowledging that a crisis is a highly consequential event or series of events of little to no predictability that either perceptually or actually threaten an organization's performance or public perception and consequently cause the organization to engage in sensemaking in order to reduce uncertainty and restore stability (Coombs 2014; Ulmer et al. 2015; Weick and Sutcliffe 2007). To be clear, that definition comprises five components:

1. Organizational crises have significant consequences for organizational operation and reputation;
2. Organizational crises an be a simple or complex event or a series of events that converge;
3. Organizational crises surprises that have little to no predictability;
4. Organizational crises early or perceptually threaten performance or public perception; and
5. Organizational crises enquire organizations to engage in a sensemaking process to reduce uncertainty and restore a semblance of stability that allows organizational life to be sustained.

4. Crisis communication and EWSs as tools to improve information literacy

As a result of climate change, numerous disasters occur worldwide each year that cause trillions of dollars in damage and alter, if not threaten, the daily lives of countless human lives. In the coming decades, that trend will become increasingly significant as natural disasters become more frequent (Intergovernmental Panel on Climate Change 2013).

In response, disaster-based risk management has recently been articulated in the fields of hydrology, and meteorology and in numerous theoretical and practical guidelines (Plate 2002). The application of those theories and guidelines can be interpreted as the development of EWSs. In general, EWSs operate based on forecasting, disaster assessment, communication, and timely response, all with the aim of delivering the appropriate information to individuals, communities, and governments in affected areas in time. Such action and information are essential for timely responses to reduce the risks posed by natural disasters.

Each EWS is a distinct kinds of technology, including sensor devices and ICT for sensor data exchange (Mokhov et al. 2011). To achieve the most efficient results, the system also uses specialized software that filters, deletes, and stores information and data, complemented by software that analyzes usable tools, documents, and models. Most of the models examined in research and/or used are mostly hydrological and evacuation models, whose combined application of tools supports the ultimate purpose of any EWS: to aid the decision-making process (Krzhizhanovskaya et al. 2011).

Because EWSs are influenced by numerous geographical and administrative features, systems such as the Delft-FEWS (i.e., Flood EWS) and MIKE Flood Watch have been developed that apply general analysis and tools. Both of those systems aim to flexibly ensure timely information exchange, facilitate the integration of sensors and other data, and provide the most effective response process during emergencies with the help of appropriate models and visualization tools (Werner et al. 2013).

4.1. Categories of EWSs

Socially based EWS developments for risk management and forecasting are typically adapted to accommodate the social characteristics and changes of the community affected and increase the community's disaster resilience capacity Such developments significantly reduce damages that cause loss of life, severe health issues, and material destruction.

One of the most-used hazard warning systems is the multi-hazard EWS, which was developed for managing various, distinct disasters in which hazardous events can occur independently, in parallel, or in a chain reaction but necessarily impact each other. The multi-hazard EWS, through coordinated integrated mechanisms and abilities involving multiple scientific disciplines, is capable of simultaneously warning about multiple hazards and significantly increasing the effectiveness of forecasts (United Nations Office for Disaster Risk Reduction 2017).
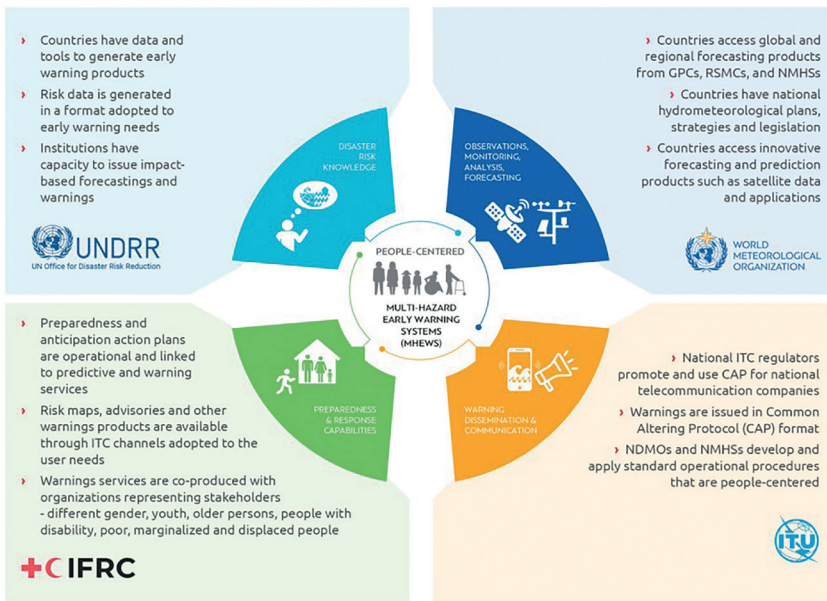

Figure 1. The multi-hazard early warning system (United Nations Office for Disaster Risk Reduction 2017)

By comparison, a people-centered early warning system (PEWS) is part of community-based developments in EWSs that are fundamentally characterized by people-centered, bottom-up organized systems. In the PEWS approach, different fragmented areas are provided with unified information regarding disaster situations (Zia and Wagner 2015). The primary goal of a PEWS is to "empower individuals and communities threatened by hazards to act in sufficient time and in an appropriate manner to reduce the possibility of personal injury, loss of life and damage to property and the environment" (United Nations International Strategy for Disaster Reduction 2006). It contributes to the affected individuals by recognizing their important role in the process of reducing vulnerability and damage, and, as a result, it strengthens the community's capacity for resilience so that they can cope with regional risks on their own (Marchezini 2020). Each PEWS has four fundamental elements: risk awareness, risk surveillance and alert services, risk communication and distribution, and reaction capacity.

RISK KNOWLEDGE

Systematically collect data and undertake risk assessments

Are the hazards and the vulnerabilities well known?

What are the patterns and trends in these factors?

Are risk maps and data widely available?

MONITORING AND WARNING SERVICE

Develop hazard monitoring and early warning services

Are the right parameters being monitored?

Is there a sound scientific basis for making forecasts?

Can accurate and timely warnings be generated?

DISSEMINATION AND COMMUNICATIONS

Communicate risk information and early warnings

Do warnings reach all of those at risk?

Are the risks and the warnings understood?

Is the warning information clear and useable?

RESPONSE CAPABILITY

Build national and community response capabilities

Are response plans up to date and tested?

Are local capacities and knowledge made use of?

Are people prepared and ready to react to warnings

Figure 2. Elements of a people-centered early warning system (United Nations International Strategy for Disaster Reduction 2006)

4.2. Crisis communication

Crisis communication is the primary tool for establishing the level of trust necessary for appropriate resilience and community information. In interpreting crisis communication, it is essential to examine the development and principles of informational behavior, which has determined human and other forms of life throughout evolution by in terms of timely preparation for survival and changes in environmental impacts.

Theory on informational behavior was first developed by Lajos Kardos (1899–1985), who created the informational cycle model named the "adiaphora determination schema." According to the schema, the essence of informational behavior is that an environmental effect that is barely perceptible at first reaches the individual, but that reaction is already capable of bringing about impending danger. During the time between the effects of the two processes, the individual has the opportunity to provide the most appropriate response to the dangerous situation—that is, to process, interpret, and finally make a decision and implement effective action in response (Kardos 1976).

Other significant research and theory concerning informational behavior has been developed by John Richard Boyd, a former colonel of the U.S. Air Force who created the observe–orient–decide–act (OODA) loop model (Frost et al. 2012). The OODA model's central concern is the evolution of the characteristics of the continuously changing environment of threats and opportunities in relation to the application of effective action and feedback loops. In the OODA model, four processes can be distinguished: observing the environment (i.e., observe), processing observations (i.e., orient), decision-making (i.e., decide), and action (i.e., act). Accordingly, behavior is determined by the result of decisions arising from comparing information formed by a combination of the perception of the external and internal world and the meanings associated with them (Karvalics 2022a).
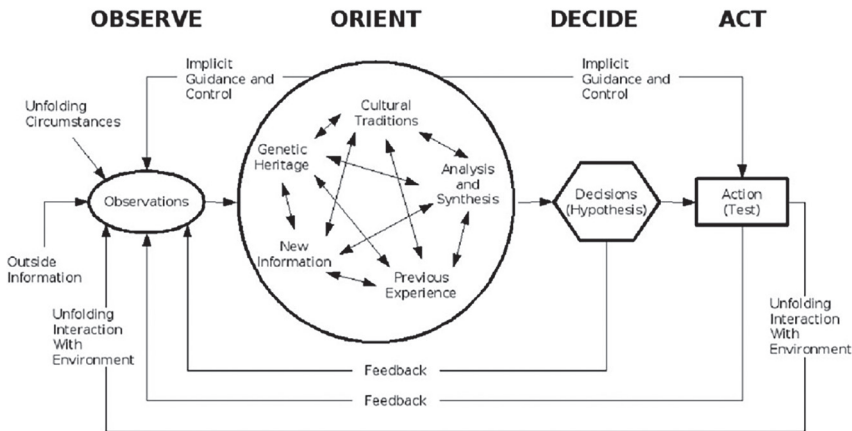
Figure 3. Boyd's observe–orient–decide–act loop model (Frost et al. 2012)

In Kay and King's (2020) work on the theory of radical uncertainty regarding informational behavior, it is suggested that experiential, practical information does not contribute to successful forecasting when only partial information and understanding are available. As a result, preventive responses to an emergency are necessarily limited. That theory also highlights the relationship between confusion arising from the lack of access to appropriate information and limited action.

Overall, crisis communication is a theoretical and practical tool that applies specific communication before, during, and after any crisis to eliminate the threat. According to the general definition, a *crisis* is a unique situation in which an unexpected threat and risk arise that affects the normal daily functioning of individuals and communities and whose resolution requires responsible organizations to respond as effectively as possible within a short period (Ulmer et al. 2015). By extension, a *crisis* is also an unpredictable event or series of events that have extremely significant consequences for the individuals and communities affected, for the unexpected situation threatens stability and security and significantly impacts public opinion (Weick et. al 2007). Turner (1976) has additionally separated each crisis into stages such as regular operations, beginning of the crisis, triggering event, early stages of the crisis, rescue and recovery, and the reorientation of the belief structure (Fischbacher and Smith 2001).

Those models and theories emphasize the significance of the pre-crisis phase, when organizations can prepare for possible future threats by developing and implementing preventive solutions and training and by using models that are appropriate for critical situations, which contribute to establishing proper relationships between individuals and relevant institutions (Karvalics 2019). Furthermore, during precise and timely crisis communication, certain cultural aspects have to be considered, for neglecting those factors can reduce the effectiveness of the response to the crisis both in the preventive phase and in the period following the crisis (Aldoory 2010).

5. Conclusion

Climate change, as one of the greatest global challenges of our time, presents numerous challenges to affected communities and their governments. Due to differences arising from the social, cultural, and economic characteristics of communities and individuals, the tasks involved in preventing and managing unexpectedly occurring natural disasters require an extremely complex solution. Among those solutions, the most effective methods include establishing and applying resilience-based strategies, guided by specific knowledge about the complexities, to ensure the exchange of accurate information and establish information literacy in order to develop the foundations of trust in affected communities. The benefit of those processes is significant, for the tasks involved in preventing and managing natural disasters rely on timely, accurate information within communities. By extension, the exchange of such information depends on the level of trust between communities, governments, and competent authorities and, if adequate, can ultimately establish the essential characteristic of resilience.

Being essential to information literacy, EWSs play a significant role in reducing and managing the risk of disasters, for their effectiveness contributes to extending lead times and minimizing losses by applying proper models of crisis communication.

References

Aldoory, Linda. "The Ecological Perspective and Other Ways to (Re)consider Cultural Factors in Risk Communication." In *Handbook of Risk and Crisis Communication*, edited by R. L. Heath and H. D. O'Hair, 399–414. New York, NY: Routledge, 2010.

American Psychological Association. *The Road to Resilience.* Washington, DC: American Psychological Association, 2014.
https://advising.unc.edu/wp-content/uploads/sites/341/2020/07/The-Road-to-Resiliency.pdf

Baudoin, Marie-Ange, Sarah Henly-Shepard, Nishara Fernando, Asha Sitati, and Zinta Zommers. "From Top-Down to 'Community-Centric' Approaches to Early Warning Systems: Exploring Pathways to Improve Disaster Risk Reduction through Community Participation." *International Journal of Disaster Risk Science* 7 (2016): 163–74.
https://doi.org/10.1007/s13753-016-0085-6

Besenyő, János. "Barry Buzan's Securitization Theory and the Case of Iraqi Kurdish Military Action against ISIS." *Journal of Security and Sustainability Issues* 8, no. 3 (2019): 295–306.
https://doi.org/10.1057/palgrave.crr.1550049

Fischbacher-Smith, Denis. "Crisis as a Catalyst for Change: Issues in the Management of Uncertainty and Organizational Vulnerability." In E-Risk: Business as Usual?, 81–88. London: British Bankers Association / Deloitte and Touche, 2001.

Frost, Susan, Kai Goebel, and Jose Celaya. "A Briefing on Metrics and Risks for Autonomous Decision-Making in Aerospace Applications." In Infotech@Aerospace 2012, paper 2012-2402. Garden Grove, CA: American Institute of Aeronautics and Astronautics, 2012.
https://c3.ndc.nasa.gov/dashlink/static/media/publication/2012_AIAA_Risk.pdf

Hermann, Charles F. International Crises: *Insights from Behavioral Research.* New York: Free Press, 1972.

Intergovernmental Panel on Climate Change. *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge: Cambridge University Press, 2013.

Kardos, Lajos. *A neuropszichikus információ eredete.* Budapest: Akadémiai Kiadó, 1976.

Karvalics, László Z. *Az infodémiától a tudáskormányzásig: Világjárvány és világrendszer információ kutatói szemmel.* Budapest: L'Harmattan–TIT Kossuth Klub Egyesület, 2022a.

Karvalics, László Z. "Túl a klímaadaptáción: A társadalmi-kulturális fenntarthatóság útvesztőiről és esélyeiről." *In Szociális szolgáltatások ma és holnap az egyenlő esélyű hozzáférés és reziliens működés biztosítása érdekében.* Socio-Summit 2022 – Konferenciakötet, edited by Szilvia Ádám and Katalin Galambos, 117–30. Kőszeg: Felsőbbfokú Tudományok Intézete, 2022b.

Karvalics, László Z. "Utak a globális tudáskormányzáshoz – Az elméleti megfontolásoktól egy hídfőállás koncepciójáig." *Információs Társadalom* 19, no. 1 (2019): 8–32.
https://dx.doi.org/10.22503/inftars.XIX.2019.1.1

Kay, John, and Mervyn King. *Radical Uncertainty: Decision-Making Beyond the Numbers.* New York: W. W. Norton & Company, 2020.

Krzhizhanovskaya, Valeria V., Ilya I. Mokhov, Artem Ozhigin, Bernard Lang, and Robert J. Meijer. "Flood Early Warning System: Design, Implementation and Computational Modules." *Procedia Computer Science* 4 (2011): 106–15.
https://doi.org/10.1016/j.procs.2011.04.012

Luhmann, Niklas. *Trust and Power.* Edited by Christian Morgner and Michael King. Translated by Howard Davis, John Raffan, and Kathryn Rooney. Cambridge, UK: Polity Press, 2017.

Marchezini, Victor. "What Is a Sociologist Doing Here? An Unconventional People-Centered Approach to Improve Warning Implementation in the Sendai Framework for Disaster Risk Reduction." *International Journal of Disaster Risk Science* 11, no. 2 (2020): 218–29. https://doi.org/10.1007/s13753-020-00262-1

Möllering, Guido. "Trust, Institutions, Agency: Towards a Neoinstitutional Theory of Trust." In *Handbook of Trust Research*, edited by Reinhard Bachmann and Akbar Zaheer, 355–76. Cheltenham, UK: Edward Elgar Publishing, 2006.

Plate, Erich J. "Flood Risk and Flood Management." *Journal of Hydrology* 267, nos. 1–2 (2002): 2–11. https://doi.org/10.1016/S0022-1694(02)00135-X

Sumpf, Patrick. *System Trust.* Wiesbaden: Springer Fachmedien, 2019.

Ulmer, Robert, Timothy Sellnow, and Matthew Seeger. *Effective Crisis Communication: Moving from Crisis to Opportunity.* 3rd ed. Thousand Oaks, CA: Sage, 2015.

United Nations Office for Disaster Risk Reduction. *The Sendai Framework Terminology on Disaster Risk Reduction: "Early Warning System."* 2017. Accessed May 13, 2025. https://www.undrr.org/terminology/early-warning-system

United Nations International Strategy for Disaster Reduction. *Developing Early Warning Systems: A Checklist.* In *Third International Conference on Early Warning.* Bonn, Germany, 2006. https://www.unisdr.org/files/608_10340.pdf

Walker, Brian, and David Salt. *Resilience Thinking: Sustaining Ecosystems and People in a Changing World.* Washington, DC: Island Press, 2006.

Weick, Karl E., and Kathleen M. Sutcliffe. *Managing the Unexpected: Resilient Performance in an Age of Uncertainty.* 2nd ed. San Francisco, CA: Jossey-Bass, 2007.

Werner, Micha, Michael Cranston, Tim Harrison, Doug Whitfield, and Jaap Schellekens. "Recent Developments in Operational Flood Forecasting in England, Wales and Scotland." *Meteorological Applications* 16, no. 1 (2009): 13–22. https://doi.org/10.1002/met.124

White, Mathew P., and J. Richard Eiser. "Marginal Trust in Risk Managers: Building and Losing Trust Following Decisions under Uncertainty." *Risk Analysis* 26, no. 5 (2006): 1187–1203. https://doi.org/10.1111/j.1539-6924.2006.00807.x

Zia, Asim, and Courtney Hammond Wagner. "Mainstreaming Early Warning Systems in Development and Planning Processes: Multilevel Implementation of Sendai Framework in Indus and Sahel." *International Journal of Disaster Risk Science* 6 (2015): 189–199. https://doi.org/10.1007/s13753-015-0048-3

Unpacking the effects of user anonymity and user popularity on the intensity and diffusion of hate speech on Twitter (X) in Afghanistan

The spread of hate speech on social media, along with its psychological and social harms, potentially even hate crimes, has raised concerns among citizens and policymakers. In response, scholars have explored strategies to reduce hate speech's virality and thus its harms. Using a corpus of 3,210 comments in Persian and Pashtu posted by Twitter users in Afghanistan, we examined how users' anonymity and popularity affect the intensity and diffusion of hate speech. In a series of binary logistic and multiple regression analyses, anonymity showed positive relationships with hate speech's intensity and diffusion on Twitter, whereas user popularity was negatively associated with these factors. A social network analysis also revealed that anonymous accounts were the core nodes in the hate speech cluster and suggested a peer-to-peer (i.e., anonymous user to anonymous user) pattern of interaction. By contrast, non-anonymous users tended to avoid interaction with their anonymous counterparts.

Keywords: *Afghanistan, anonymity, hate speech diffusion, hate speech intensity, Twitter, user popularity*

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I N F O R M Á C I Ó S T Á R S A D A L O M

1. Introduction

As the exponential rise of online hate speech promoting animosity and violence gains traction as a global phenomenon (Kilvington 2021; Lingam and Aripin 2017; Williams et al. 2020), its psychological and social negative impacts increasingly attract widespread attention from researchers and policymakers alike (Bilewicz and Soral 2020; Castaño-Pulgarín et al. 2021). Studies have shown that the spread of hate speech in social media feeds and comment sections is facilitated by the technical features and affordances of these platforms —that is, "social media affordances" (Ben-David and Fernández 2016)—with anonymity on social media being one of the most debated and oft-cited factors (Brown 2018; Castaño-Pulgarín et al. 2021; Gorenc 2022; Jaidka et al. 2022). Research has also noted that anonymity contributes to the spread of weaponised information (i.e., mal-, dis-, and misinformation), which itself tends to instigate hate speech (Brown 2018; Gorenc 2022; Nascimento, Cavalcanti and Da Costa-Abreu 2023). Conversely, other findings suggest that anonymity does not directly motivate the spread of hate speech but instead contributes to freedom of speech, deliberative democracy, and other positive outcomes (Ellison et al. 2016; Jaidka et al. 2022; von Essen and Jansson 2018). Beyond that, yet another strand of research has indicated that social media affordances are not solely responsible for inciting and spreading hate speech, for the user's status in the network and their malicious intent, combined with ill-structured language, may also weaponise these tools for the diffusion of hate speech (Ben-David and Fernández 2016; Schmid, Kümpel and Rieger 2024).

Previous studies examining online hate speech have predominantly concentrated on the detection of hate speech (Fortuna and Nunes 2018; Kocoń et al. 2021; Williams et al. 2020), while other aspects have remained underexamined (Chakraborty and Masud 2022), including platform affordances and user elements that influence the intensity and diffusion of hate speech on social media. In our study, we aimed to extend this line of research by investigating how anonymity (i.e., a platform affordance) and user popularity (i.e., a user factor) affect hate speech's intensity and diffusion in the comments section of Twitter. The interactive nature of Twitter's comments section enables users to respond to one another, which often leads to heated discussions on controversial topics that may result in incivility and hate speech (Lingam and Aripin 2017; Zannettou et al. 2020). Despite the abundance of insightful research on hate speech, the factors leading to its intensity and diffusion in comments have received scant attention. Moreover, because research has primarily focused on hate speech in English, its dynamics in other languages have remained largely unclear (Fortuna et al. 2019).

Against this backdrop, we conducted a quantitative content analysis on a dataset of 3,210 tweets in Persian and Pashtu from users in Afghanistan in order to examine how the abovementioned factors affect the intensity and diffusion of hate speech on social media. We also employed social network analysis on the hate speech cluster data to answer two questions:

1. How do anonymous and popular accounts that engage in hate speech rank within hate speech clusters on Twitter?

2. How do levels of user anonymity and popularity influence patterns of interaction in hate speech clusters on Twitter?

The data for our study were collected from Twitter users in Afghanistan, an Asian country that has been embroiled in decades of war and conflict. Afghanistan's social milieu, with profound division along ethnic–lingual and religious lines, has fostered a hostile, even toxic online atmosphere that is an apt case for studying hate speech (Pamirzad 2025). Moreover, aligned with past findings encouraging cross-language and cross-cultural exploration of hate speech (Fortuna et al. 2019), our results provide unique insights into an underexamined topic in Afghanistan as well as in the Persian and Pashtu languages, and thus stand to enrich the literature.

In what follows, we review the relevant literature, articulate the study's hypotheses, and describe the methods employed. After that, we present and discuss the results and provide our conclusions, along with their implications for theory and practice.

2. Literature review and hypotheses

2.1. Hate speech and its intensity

Despite being a buzzword, *hate speech* still lacks a universally agreed-upon definition (Gorenc 2022; Guo and Johnson 2020; Schäfer, Sülflow and Reiners 2021; Ștefăniță and Buf 2021; Vári 2018). As a concept, *hate speech* has been defined from various perspectives. Some scholars have defined it as negative content fraught with swearing, insults, verbal abuse, and hateful derogatory words (Kilvington 2021; Lingam and Aripin 2017) that encompasses all forms of expression that propagate, encourage, support, or legitimize religious hatred, xenophobia, racial hatred, aggressive nationalism, and ethnocentrism, as well as hostility and discrimination targeting minorities, migrants, and other social groups (Parvaresh 2023; Schäfer, Sülflow and Reiners 2021). Other definitions of *hate speech* are associated with its forms, which consist of an array of verbal, nonverbal, symbolic, explicit, and implicit communicative actions involving the use of inappropriate language to attack others (Nascimento, Cavalcanti and Da Costa-Abreu 2023; Parvaresh 2023; Schmid, Kümpel and Rieger 2024; Ștefăniță and Buf 2021).

Hate speech has also been defined from a normative perspective as a form of social deviance—that is, an activity that violates social norms—that runs counter to standard cultural behaviours and interactional norms (Castaño-Pulgarín et al. 2021). Furthermore, social networking sites (SNSs) have their own definitions of *hate speech* that they use as a basis for moderating and filtering out content. Twitter and Facebook, for example, state that any tweet or post that directly attacks or advocates the use of violence against individuals based on their race, ethnicity, national origin, gender, age, disability, or serious illness is considered to be hate speech (Ben-David and Fernández 2016; Mathew et al. 2019).

As a multidimensional concept, hate speech has been classified in different ways. Based on its targeting of social groups, it has been classified into four categories:

political, racial, religious, and gender-based hate speech (Castaño-Pulgarín et al. 2021; Guo and Johnson 2020; Schäfer, Sülflow and Reiners 2021). Posting racist comments, racist humour, and racial stereotypes constitutes racial hate speech, while misogynistic comments containing sexist language represent gender-based hate speech (Saresma, Sanna and Varis 2020). Using derogatory terms and hostile rhetoric, as well as demonising and belittling political opponents, are considered to be forms of political hate speech (Trajkova and Neshkovska 2018). By contrast, posting profane comments, slander or defamation, sarcasm, antisemitism, and Islamophobia can represent religious hate speech (Lingam and Aripin 2017; Ştefăniţă and Buf 2021).

Along other lines, scholars interested in detecting hate speech have employed a binary classification—hate speech versus non-hate speech or offensive versus non-offensive content— while considering whether such speech targets a specific group or groups (Fortuna and Nunes 2018; Zampieri et al. 2019). Concerning hate speech's intensity, however, studies have argued that hate speech should be examined beyond that binary classification, for it can range from less offensive and subtly devised to blatantly insulting and violent language (Ruzaite 2018). Bahador (2020) has thus classified hate speech along a spectrum from its lowest (i.e., disagreement) to its highest forms, with the latter being threatening an individual with death or a group with massacre and genocide. This range demonstrates various degrees of the intensity of hate speech, or "hate speech intensity," from mild to highly violent (Fortuna and Nunes 2018; Kocoń et al. 2021; Parvaresh 2023), with the implication that hate speech is not a one-size-fits-all phenomenon but exists on a continuum of hate. In that vein, scholars have compared Gordon W. Allport's (1954) spectrum of racism to the continuum of hate speech (Sachdeva et al. 2022), beginning with prejudiced verbal language as racism's weakest manifestation to actual extermination as its strongest. Consequently, hate speech, beyond its adverse individual-level psychological impacts, including fear, depression, unhappiness, anxiety, desensitisation, and post-traumatic stress (Bilewicz and Soral 2020), can also lead to social avoidance, discrimination, physical attacks, and intended extermination (Bilewicz and Soral 2020; Sachdeva et al. 2022). On social media, an individual may block or unfriend someone to avoid exposing their hate speech (i.e., social avoidance), which can reinforce the discrimination and hostility between social groups (Chakraborty and Masud 2022; Lingam and Aripin 2017). Likewise, high-intensity hate speech that incites and promotes violence and physical harm can spill over into real-life settings by fueling hate crimes such as the attack on a synagogue in Pittsburgh, PA, and the shooting in a mosque in Christchurch, New Zealand (Maarouf, Pröllochs and Feuerriegel 2024; Mathew et al. 2019; Pamirzad 2025).

2.2. Impact of user anonymity on user popularity

The anonymity of users on social media, or "user anonymity," involves using these tools without sharing identifiable information (Backes et al. 2016; Curlew 2019;

Gulyás 2017). Users may choose anonymity based on different reasons; some prefer to remain anonymous or semi-anonymous in order to keep the size of their network manageable and only known to people in real life, whereas others may choose to be anonymous even among their friends and relatives (Ellison et al. 2016; Ma, Hancock and Naaman 2016). Therefore, unlike in the real world, social media anonymity affords users flexibility in selecting their identities. Such a customizable identity may help users to reduce mobbing on their online networks; however, it can also facilitate the spread of hate speech or counter-normative actions by some users (Castaño-Pulgarín et al. 2021). Moreover, users may choose anonymity as a strategy of online activism to reduce threats and perceived risks in repressive political environments (Ellison et al. 2016; Jardine 2018). Considering the pro- and antisocial potential of anonymity, various social media platforms have adopted different measures. For instance, Facebook, addressing the negative aspect of anonymity, has adopted a real-name authentication policy to increase the quality of content and accountability and decrease misconduct such as spamming, bullying, hacking, and spreading hate speech (Peddinti, Ross and Cappos 2017). Conversely, Twitter accentuates positive aspects of anonymity as contributing to freedom of speech and thus allows users to choose their preferred level of identifiability (Backes et al. 2016).

Although the positive and negative aspects of user anonymity have been explored (Brown 2018; Ellison et al. 2016; Jaidka et al. 2022; Kilvington 2021; Ma, Hancock and Naaman 2016; Zannettou et al. 2020), its impacts on the popularity of users on social media, or "user popularity," have not received sufficient attention. *User popularity* refers to the size of a user's network and their number of followers, which enhances their centrality in the network (Garcia et al. 2017; Vedadi and Greer 2021). Research has shown that user popularity on social media is linked to personalisation, authenticity, trust, and perceived realness (Rutledge 2021; Yuan and Lou 2020). Popular users, also known as opinion leaders, use personalisation to enhance and elevate their standing within the network. By actively engaging with their followers, they create an authentic, relatable online presence. By contrast, anonymity is rooted in uncertainty and disingenuousness. Anonymous users who withhold identifiable information cast themselves as enigmatic figures with unknown personalities (Alexopoulou and Pavli 2021).

Even so, some anonymous Twitter accounts defy this norm of identifiability by becoming popular nevertheless. The @YourAnonNews account, for instance, boasts more than 7.5 million followers on Twitter, possibly due to their statuses and the content that they publish, which aligns with the highly polarised global landscape. Events such as Israel–Palestine and Russia–Ukraine conflicts have profoundly divided people worldwide (Milmo 2022), and the polarising posts of anonymous accounts resonate with the polarised public and thus explain their popularity. On a micro level, however, we maintain the conventional argument that identifiability is the primary source of user popularity (Yuan and Lou 2020). Thus, we first hypothesised that:

H1: User anonymity is negatively associated with user popularity on Twitter.

2.3. User anonymity's impact on the intensity and diffusion of hate speech

User anonymity refers to the avoidance of disclosing personal or socially identifiable information on social media (Backes et al. 2016; Gulyás 2017). It is a continuum from identifiability to anonymity (Eklund et al. 2022)—for instance, from complete anonymity on Yik Yak, Whisper, and Secret, where no traceable information of users exists, to partial anonymity and pseudonymity on conventional platforms such as Twitter (Curlew 2019; Ellison et al. 2016; Peddinti, Ross and Cappos 2017). User anonymity can be further classified into personal identity and social identity anonymity (Jaidka et al. 2022). Whereas *personal identity anonymity* refers to the absence of identifiable information about individuals (e.g., name, email address, and phone number), *social identity anonymity* refers to the absence of users' identifiable information about their social, political, and ideological connections. People can be personally anonymous but socially identifiable by exposing signs of affiliation to a social or political group on their accounts. Though they may use pseudonyms, their profile pictures, posted content, hashtags, and bios can reveal their social identities (Jaidka et al. 2022).

Studies have revealed social media anonymity's positive and negative aspects and its use for pro- or antisocial purposes (Ellison et al. 2016). As for positives, it enables people to discuss topics that they might otherwise avoid by protecting their privacy and thus facilitates freedom of speech in suppressive political environments. Such freedoms include criticising an official or flagging flaws and corruption in the system, for anonymity strengthens the user's feeling of perceived safety (Brown 2018). Studies have also indicated that anonymity benefits women, likely by decreasing their identifiability and making them less prone to harassment on social media (Ma, Hancock and Naaman 2016).

Concerning the spread of hate speech, or "hate speech diffusion," studies have additionally shown that anonymity's effect varies based on its type. Research has revealed that having an anonymous personal identity while maintaining a non-anonymous social identity increases the quality of political discussion by fostering rationality and civil discourse (Jaidka et al. 2022). However, most studies have added that anonymity is also associated with offensive and aggressive behaviours; it incites violence, promotes discrimination against individuals and social, political, and gender groups, and motivates extremism, bigotry, and propaganda (Brown 2018; Castaño-Pulgarín et al. 2021; Gorenc 2022; Zannettou et al. 2020). This stream of research has also suggested that anonymity provides users with a sense of safety by making them feel less obliged and accountable to observe conventional behavioural norms and boundaries, which raises their likelihood of disseminating hate speech. Similarly, anonymous users can become deindividuated and disinhibited and turn more violent and aggressive, which amplifies the intensity of hate speech (Brown 2018; Ellison et al. 2016; Kilvington 2021; Zannettou et al. 2020). Consequently, we also hypothesised that:

H2: User anonymity is positively associated with hate speech diffusion on Twitter.
H2a: User anonymity is positively associated with hate speech intensity on Twitter.

2.4. User popularity's impact on hate speech intensity and diffusion

On social media, *user popularity* refers to the size of a user's network, implying their reach and influence based on the number of followers and their centrality within a network (Balaban et al. 2020). Popular users enjoy a high degree of prominence, and their involvement in hate speech diffusion can significantly impact the overall network (Riquelme and González-Cantergiani 2016). Research has shown that promoters of hate speech on Twitter have large numbers of followers, followees, group memberships, and like counts, which indicate the involvement of popular accounts in hate speech diffusion. However, it has remained unknown whether the association between user popularity and hate speech diffusion is statistically significant (Perera et al. 2023). Furthermore, user popularity's influence on hate speech intensity has yet to be investigated.

According to previous studies, users gain popularity through sincere relationship-building with their followers based on respect, mutual trust, and personal affection (Men et al. 2018; Yuan and Lou 2020). Studies have also shown that fame on social media is riskier than offline, because the association between online popular users and their followers hinges on a sense of personal closeness intertwined with the followers' emotions (Rutledge 2021). Thus, any mistakes the popular users commit can sway followers and swiftly diminish their popularity (Rutledge 2021). Thus, popular users may be less likely to participate in hate speech diffusion in order to avoid losing users' trust, respect, and affection. Moreover, to avoid being targeted with reciprocal hostility due to posting hate comments, which could damage their fame (Ellison et al. 2016; Kilvington 2021), popular users are unlikely to spread hate speech at an intense level. Thus, we additionally hypothesised that:

H3: User popularity is negatively associated with hate speech diffusion on Twitter.
H3a: User popularity is negatively associated with hate speech intensity on Twitter.

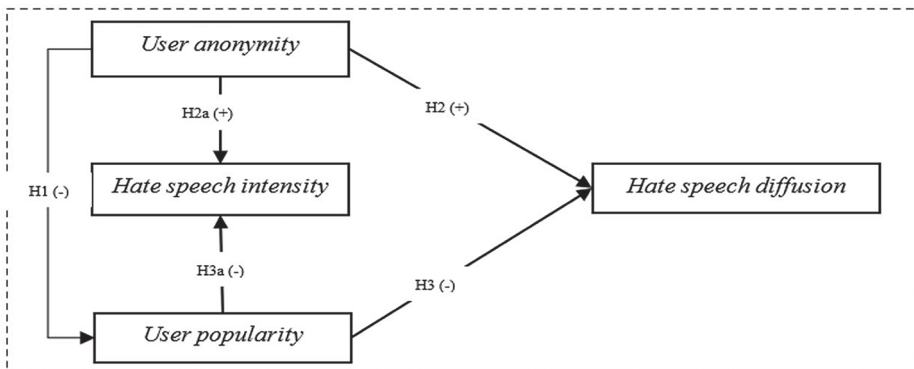Figure 1. summarises our research model in relation to our hypotheses.

Figure 1. Research model with hypotheses

3. Method

3.1. Sampling and data collection

In recent years, hate speech has increased markedly online, and Twitter has become a widely studied platform regarding the phenomenon (Matamoros-Fernández and Farkas 2021). In Afghanistan, following the Taliban's takeover in 2021, unprecedented social and political restrictions have resulted in censorship and self-censorship, and many social media users have opted to create fake accounts on social media, particularly Twitter. Since then, hate speech has dramatically increased among Twitter users in Afghanistan (Pamirzad 2025), and some mainstream media analysts and popular users have even been involved. Using the keyword inquiry approach, we chose certain contentious viral events susceptible to inciting hatred and searched for the most often recurring terms related to political, social, ethnic, and religious hate speech in Afghanistan's sociopolitical context. The cases include an online campaign named "من افغان نیستم" ('I am not Afghan'), Afshar "افشار" (i.e., a massacre in 1993 that is remembered every February), and a poem recitation in March 2024 that caused heated discussions and hatred (Pamirzad 2025). Both keyword searching and tracking polarised events that have incited hate speech and hostility online have been used in past studies to extract data.

To narrow our sample, we adopted a criterion that allowed only posts that received more than 20 comments related to keywords and case inquiry to be included. The criterion was adopted based on the idea that comments are a quantitative measure of the virality and profundity of discussions on social media, whereas posts with fewer comments lack such features (Konovalova et al. 2023; Pamirzad 2025), which may not contribute to the depth of knowledge. Consequently, 62 posts that met that condition were selected, and their comments were extracted in June 2024, with comments spanning the period from April 2019 to March 2024. After discarding the duplicates, the final sample in our manual content analysis contained 3,210 comments. Twitter Replies Exporter, a browser extension, was used to extract the data, and SPSS version 27 was used for quantitative analysis. Moreover, a network file was designed using comment sources as nodes and replies received as edges, and Gephi 0.10 software was used for network analysis.

3.2. Operationalisation of variables

For user anonymity, we adopted the approach proposed by Esteve, Moneva and Miró-Llinares (2019) and Peddinti, Ross and Cappos (2017), which categorises users' metadata into four levels of anonymity: anonymous, partly anonymous, identifiable (i.e., non-anonymous), and unclassifiable. Further refining that classification, we followed Jaidka et al. (2021) by differentiating personal from social anonymity. According to Jaidka et al., if an individual is personally anonymous but has a link, a brief bio, or a symbolic feature that signals their social membership, they can be

regarded as partly anonymous. For that reason, we classified anonymity into three categories—non-anonymous, semi-anonymous, and anonymous—and coded the variable using users' metadata in the dataset (see Table 1).

Type of anonymity and codes	Definition	Sources
Non-anonymous (0)	Users with conventional names (i.e., names for humans, particularly in Persian and Pashto), congruency between their name and Twitter ID, clear social identities, or jobs in their bios	Esteve et al. (2019) and Peddinti et al. (2017)
Semi-anonymous (1)	Users with ambiguous personal information (e.g., first and last names) but socially identifiable details (e.g., ethnicity, political party, location, or employer)	Jaidka et al. (2021) and Peddinti et al. (2017)
Anonymous (2)	Users without traceable information on their profiles (e.g., first and last names) or with unconventional names (e.g., names of objects or unknown characters that are not consistent with human names, particularly in Persian and Pashtu), and users without clues in their bios	Esteve et al. (2019) and Peddinti et al. (2017)

Table 1. Coding manual for user anonymity

User popularity refers to the extent of a user's in-degrees and centrality in a network (Balaban et al. 2020), measured by the number of followers. We used the number of users' followers to measure popularity and log-transformed it to achieve a normal distribution (*M* = 4.78, *SD* = 2.03; Zhang et al. 2023). Moreover, using the visual binning function in SPSS, we transformed the index into four clusters, with cutoff points based on ±1 *SD* in relation to the mean to measure different levels of popularity. Below the mean, the lowest cluster was labelled *unpopular* (*n* = 491), and the second-lowest, somewhat unpopular (n = 1,162); above the mean, the first cluster was labelled somewhat popular (n = 1,045), and the cluster above it, *highly popular* (*n* = 512).

Hate speech intensity refers to the strength of the tone, meaning, and expression of hatred, as well as the targeted group's perception of such meaning. As shown in Table 2, we adopted, integrated, and modified the hate speech intensity classifications of Bahador (2020), Fortuna, Soler-Company and Wanner (2020), and operationalised the variable.

Levels and codes of hate speech intensity	Definition
No hate speech (0)	Comments that do not contain any hate speech
Mild hate speech (1)	Comments that contain offensive, derogatory terms and slurs but do not advocate prejudice, violence, or harm
Moderate hate speech (2)	Comments that contain discriminatory words targeting individuals based on their immutable characteristics (e.g., nationality, religion, ethnicity, gender, age, and sexual orientation) and express dislike or loss of empathy
Strong hate speech (3)	Comments that use harmful stereotypical expressions containing prejudice, demonisation, dehumanisation, and belittlement toward a specific group
Severe hate speech (4)	Violent, abusive comments about a specific individual or group, justifying violence, explicit threats, and/or the incitement of violence against them
Extreme hate speech (5)	Comments containing blatant, abusive, and/or insulting language that promote and glorify violence against a specific group, including threats of death or genocide

Table 2. Coding manual for hate speech intensity based on definitions in Bahador (2020) and Fortuna et al. (2020)

Hate speech diffusion refers to the spread of hate speech in the network (Tonto-dimamma et al. 2021). In our study, we were particularly interested in identifying agents of hate speech diffusion. Following the approaches of Fortuna and Nunes (2018) and Zampieri et al. (2019), we recoded the data coded for hate speech intensity into a binary variable, such that comments containing hate speech were assigned a value of 1 and those without hate speech were assigned a value of 0.

3.3. Intercoder reliability

After we designed the codebook and trained an undergraduate assistant, 5% of the data (*n* = 160) was independently coded by the first author and the assistant to ensure intercoder reliability. The Fleiss interrater test was conducted to ensure reliability in user anonymity and hate speech intensity; it is appropriate for multiple coders or variables with more than two categories (Fleiss, Nee and Landis 1979). The overall agreement on user anonymity was .80 with the categories *anonymous* (.88), *semi-anonymity* (.75), and *non-anonymity* (.76). Similarly, the overall agreement

for hate speech intensity was .78 with the categories *no hate speech* (.93), *mild hate speech* (.70), *moderate hate speech* (.72), *strong hate speech* (.71), *severe hate speech* (.70), and *extreme hate speech* (.91). The overall results fall between the acceptable range of moderate to substantial agreement (Fleiss, Nee, and Landis 1979).

4. Results

4.1. Descriptive statistics

In our sample, 52.1% of users were anonymous, 8.8% were semi-anonymous, and 39.1% were non-anonymous. Whereas 50.1% of the sample represented no hate speech, 14.0% represented severe hate speech, 11.3% represented extreme hate speech, 6.7% represented strong hate speech, 11.8% represented moderate hate speech, and 6.1% represented mild hate speech. The majority of highly popular semi-anonymous accounts were involved in spreading extreme hate speech, whereas most highly popular non-anonymous users were engaged in mild and moderate hate speech. Table 3 summarises the correlations between independent and dependent variables included in the data analysis.

Variable	1	2	3	4	5	6	7	8
1. Hate speech intensity								
2. Hate speech diffusion	.861**							
3. Anonymous	.052**	.062**						
4. Semi-anonymous	.010	−.003	−.323**					
5. Non-anonymous	−.059**	−.062**	−.836**	−.248**				
6. Unpopular	.039*	.042*	−.054**	−.017	.065**			
7. Somewhat unpopular	.024	.014	.025	−.027	−.010	−.306**		
8. Somewhat popular	−.004	−.002	.054**	−.003	−.053**	−.304**	−.522**	
9. Highly popular	−.065**	−.056**	−.049**	.055**	.019	−.186**	−.319**	−.318**

Table 3. Correlations between dependent and independent variables

4.2. Hypothesis testing

A linear regression was conducted to test H1, which proposed that anonymity negatively influences user popularity. The results, $f(2) = 779.47$ ($p < .001$) and adjusted $R2$ = .33, did not support H1 by showing that anonymity anonymous ($b = 0.14$, $p < .05$) and anonymity semi-anonymous ($b = 0.28$, $p < .01$) compared with non-anonymous users positively and significantly affected user popularity when the user popularity index logged ($M = 4.78$, $SD = 2.03$) was used as a scale variable. This contradictory finding may stem from a lack of accountability associated with anonymity that allows users to post hateful content without fear of personal repercussions (Postmes and Spears 1998). That allowance promotes engagement through conflict and forms echo chambers and leads to their popularity (ElSherief et al. 2018).

A binary logistic regression analysis was conducted to test hypotheses H2 and H3, which proposed that user anonymity positively and popularity negatively influence hate speech diffusion. User anonymity (i.e., non-anonymous, semi-anonymous, and anonymous) and user popularity (i.e., highly popular, somewhat popular, somewhat unpopular, and unpopular) as independent variables, and hate speech diffusion with binary categories (i.e., hate speech vs. no hate speech) as the dependent variable were entered into the model. Although the model showed low variance in the dependent variable (Cox and Snell's $R2$ =.09 and Nagelkerke's $R2$ = .011), the Hosmer and Lemeshow test, χ^2 (7) = .689 ($p = .998$), indicated that the model adequately captured the relationship between the independent and dependent variables.

Variable	b (SE)	Wald	Exp (b)	95% CI
Intercept	0.096 (.09)	.940	1.100	
User anonymity (ref. non-anonymous)				
Anonymous	0.282*** (.07)	14.008	1.326	[1.144, 1.537]
Semi-anonymous	0.161 (.13)	1.478	1.175	[.906, 1.524]
User popularity (ref. unpopular)				
Highly popular	−0.471*** (.13)	13.609	0.625	[.486, .802]
Somewhat popular	−0.303** (.11)	7.494	0.739	[.595, .918]
Somewhat unpopular	−0.244* (.11)	5.023	0.784	[.633, .970]

Note. All entries are unstandardized coefficients with standard errors (*SE*) in parentheses.
*$p < .05$, **$p < .01$, ***$p < .001$.

Table 4. Logistic regression predicting the effects of user anonymity and popularity on hate speech diffusion

The results in Table 4, which partly support H2, indicate that user anonymity positively influenced hate speech diffusion. For every unit of increase in anonymous users compared with non-anonymous users as the reference category, the odds ratio of hate speech diffusion increased by 32.6% (Exp (.282) ≈ 1.326, $p < .001$); however, the semi-anonymous users were non-significant predictors of hate speech diffusion. Similarly, the findings supporting H3 showed that for every unit of increase in highly popular users, somewhat popular users, and somewhat unpopular users compared with unpopular users, the odds ratio of hate speech diffusion decreased by 37.5% (Exp (−.471) ≈.625, $p < .001$), 26.1% (Exp (−.303) ≈.739, $p < .01$), and 21.6% (Exp (−.244) ≈.784, $p < .05$), respectively.

Furthermore, a multiple linear regression (MLR) analysis was conducted to examine the association of user anonymity (H2a) and user popularity (H3a) with hate speech intensity.

Variable	b (SE)	t	95% CI
Intercept	1.741 (.092)	18.895	[1.560, 1.921]
User anonymity (Ref. non-anonymous)			
Anonymous	0.235** (.07)	3.333	[.097, .373]
Semi-anonymous	0.226† (.12)	1.820	[−.018, .470]
User popularity (Ref. unpopular)			
Highly popular	−0.545*** (.12)	−4.584	[−.778, −.312]
Somewhat popular	−0.302** (.10)	−2.923	[−.504, −.099]
Somewhat unpopular	−0.211* (.10)	−2.081	[−.410, −.012]
R^2	**.010**		
f test	**(5, 3204) = 6.720*****		
N	**3,210**		

Note. All entries are unstandardized coefficients with standard errors (*SE*) in parentheses. CI = confidence interval. $^†p < .1$, $^*p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Table 5. MLR predicting the effects of user anonymity and user popularity on hate speech intensity

As shown in Table 5, user anonymity, $_\text{anonymous}$ ($b = 0.235$, $p < .01$), compared with non-anonymous as the reference category, significantly and positively predicted hate speech intensity. Similarly, user anonymity, specifically $_\text{semi-anonymous}$ (B = 0.226, $p < .1$), compared with non-anonymous as the reference category, positively influenced hate speech intensity, albeit marginally. Thus, H2a was supported. Moreover, user popularity, $_\text{highly popular}$ (B = −.545, $p < .001$) compared with the unpopular as the reference category, significantly and negatively influenced hate speech intensity.

Similarly, user popularity $_{somewhat\ popular}$ (B = −.302, p < .01) and $_{somewhat\ unpopular}$ (B = −.211, p < .05), compared with the reference category, significantly and negatively influenced hate speech intensity. Therefore, H3a was also supported.

4.3. Social network analysis

A social network analysis was conducted to answer the research questions about the rank of anonymous and popular accounts within the hate speech cluster and how user anonymity and popularity influence patterns of interaction on the social network. The social network was designed by assigning the users' comments as nodes and the resulting interactions as edges.

ID	Anonymity	Popularity	Hate speech intensity	Closeness centrality	Betweenness centrality
18	Non-anonymous	Somewhat popular	Strong	0.42	8,278.31
153	Anonymous	Highly popular	Moderate	0.37	4,614.60
126	Anonymous	Unpopular	Moderate	0.38	3,941.54
129	Anonymous	Highly popular	Moderate	0.34	3,815.92
16	Anonymous	Highly popular	Moderate	0.33	3,319.39
34	Non-anonymous	Highly popular	Moderate	0.38	3,230.55
23	Anonymous	Somewhat popular	Strong	0.36	2,894.82
109	Non-anonymous	Somewhat unpopular	Strong	0.32	2,039.80
32	Non-anonymous	Somewhat popular	Strong	0.28	1,817.11
106	Anonymous	Highly popular	Moderate	0.30	1,736.87

Table 6. Description of network metrics

Table 6 shows the network's top 10 nodes, including anonymous and non-anonymous users, based on their high betweenness centrality. After filtering out the no-hate-speech category of data, six of the top 10 influential nodes in the network were anonymous users. This outcome highlights the centrality of anonymous accounts in the hate speech network (Bloch, Jackson and Tebaldi 2023; Tabassum et al. 2018) and their intermediary role in sustaining and fueling relevant hateful discussions. Concerning hate speech intensity, the top 10 nodes involved in hate speech showed varying levels, from moderate to strong hate speech.
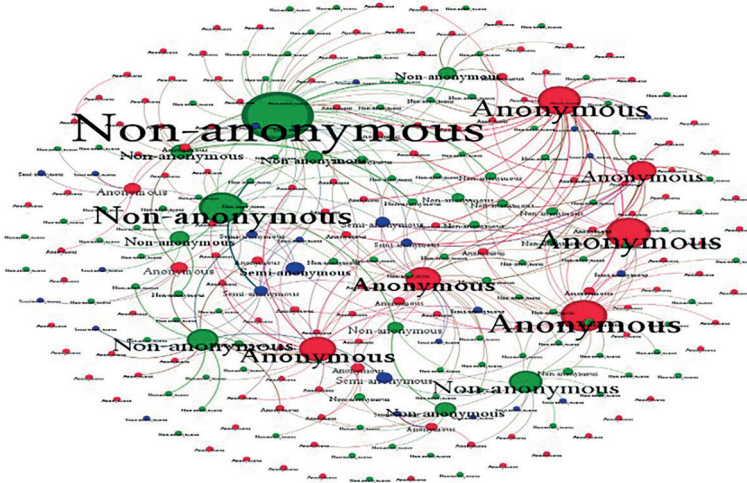
Figure 2. The nodes are coloured by categories of anonymity; red nodes indicate anonymous, green non-anonymous, and blue semi-anonymous users in the network. Edges share the node colour if both endpoints match, or use a mixed colour when categories differ.

Regarding popularity, most anonymous accounts were highly popular, whereas most non-anonymous ones were somewhat popular. Figure 2 also displays a dominant peer-to-peer interaction between anonymous users, as well as interaction avoidance between anonymous and non-anonymous accounts. Meanwhile, semi-anonymous accounts interacted more with non-anonymous users, whereas a cluster of anonymous users also interacted with non-anonymous accounts.

5. Discussion and conclusion

Using a corpus of 3,210 tweets in Persian and Pashtu, we examined how user anonymity and user popularity affect the intensity and diffusion of hate speech among Twitter users in Afghanistan. Our findings suggest that an increase in anonymous users compared with non-anonymous users is associated with a corresponding rise in the diffusion of hateful comments. This finding aligns with the results of past research, which has shown that anonymity affordance on social media engenders a sense of safety that reduces the user's adherence to conventional behavioural norms and their accountability for spreading hate speech (Fortuna and Nunes 2018; Kocoń et al. 2021; Parvaresh 2023; von Essen and Jansson 2018). This finding was further substantiated by the centrality of anonymous users as core nodes and grand connectors in the hate clusters identified in social network analysis (Bloch, Jackson

and Tebaldi 2023; Tabassum et al. 2018). However, our nuanced classification extending beyond the anonymous versus non-anonymous dichotomy revealed that semi-anonymous users, who occupy a rank between anonymity and identifiability, were non-significant predictors of hate speech diffusion. It suggests that certain levels of identity customisation on social media may not inherently lead to adverse outcomes (Jaidka et al. 2022).

The findings also revealed that anonymous users posted more intense hate comments than their non-anonymous counterparts. This outcome can be explained by deindividuation theory, which posits that anonymity prompts the erosion of internal constraints, individual identity, and behavioural accountability (Postmes and Spears 1998). Consequently, individuals become less concerned about guilt, shame, or fear when engaging in aggressive behaviour (Vilanova et al. 2017). According to this theory, anonymous users exhibit less concern about the negative effects of spreading violent and aggressive comments on others and feel less responsible and accountable for their actions (Zapata et al. 2024). Furthermore, beyond the perception of physical safety, anonymity provides a psychological shield that enables individuals inadvertently caught up in hate speech to respond aggressively and simultaneously maintain their social standing. When an individual's personal or social identity is targeted, they may use anonymity to retaliate and vent frustration while concealing their identity to avoid being perceived as impolite and thus safeguard their personality.

When it comes to hate speech, anonymity also fosters a dual psychological protective mechanism. First, anonymous individuals may feel safer and less responsible when engaging in hate speech due to their concealed identity. Second, if they become the target of hate speech themselves, the loss of identity (i.e., deindividuation) shields them from victimisation and reinforces their aggressive behaviour. This explanation gains further relevance considering the peer-to-peer pattern of interaction between anonymous users. Our social network analysis revealed that anonymous users are more likely to interact with one another, which can be attributed to the dual psychological shields that protect them and make them feel less accountable for their behaviour and less aware of reciprocal hatred when targeted (Postmes and Spears 1998). By contrast, non-anonymous users may avoid interaction with anonymous counterparts to prevent becoming the target of aggressive behaviours.

We also investigated user popularity, meaning a user's centrality and influence in a network (Garcia et al. 2017; Vedadi and Greer 2021), regarding its role in hate speech dynamics. Our findings revealed that user popularity was negatively associated with both the intensity and diffusion of hate speech, thereby indicating that the number of hate comments decreased as the number of popular users rose. Similarly, the finding suggests that hate speech intensity dropped significantly as the user's popularity increased. This highlights the potential of popular users in combating the so-called infodemic of hate speech (Masud et al. 2021). Popular users have numerous followers and massive networks on social media, which are considered to be valuable assets in terms of social capital and monetisation (Men et al. 2018; Yuan and Lou 2020). Their positive potential in combating hate speech is promising and

can be leveraged to fight the infodemic. Contrary to previous studies examining high followers, followees, and likes among hate users at the descriptive level (Perera et al. 2023), we found significant evidence that user popularity was inversely associated with hate speech diffusion and intensity. According to previous studies, online popularity is a risk-vulnerable property that can quickly vanish if followers' trust is damaged (Rutledge 2021); hence, our findings can be elucidated based on popular users' perception of risk avoidance. Posting hate speech and targeting others with intensely hateful language by popular users can damage their followers' sentiments and may shrink their audience—that is, the source of their fame and monetisation. Therefore, popular users may avoid engaging in hate speech in order to minimise the risk of becoming the target of hate speech or losing followers (ElSherief et al. 2018). However, some anonymous accounts also become popular, probably because they post hate speech or inflammatory comments. This phenomenon occurs in polarised online echo chambers, where anonymous accounts spearhead hate campaigns, attract like-minded individuals, and thereby increase their centrality (ElSherief et al. 2018).

To conclude, our findings confirm that anonymity is associated with the intensity and diffusion of hate speech. This result is consistent with published findings, which suggest that anonymity promotes users' deindividuation and disinhibition, thereby making them more aggressive and less attentive to the negative impact of their behaviours on others. These findings have practical implications for social media networks. Although studies have shown that discussions on Twitter have been more uncivil than on Facebook (Oz, Pei and Gina 2018), further cross-platform comparative analysis is required to reveal whether the level of incivility on Twitter is associated with its anonymity affordance. If so, then SNSs, particularly Twitter, should adopt a stricter stance against anonymous hate promoters. By contrast, our findings also suggest that user popularity negatively relates to the intensity and diffusion of hate speech, possibly because popular users and opinion leaders on Twitter, primarily politicians, journalists, analysts, and experts, predominantly prefer to be known by their real-life identities. Spreading hate speech, however, contradicts their personae and professions and concurrently damages their reputation. Nonetheless, in other instances, popular accounts, whether anonymous or non-anonymous, become the forerunners of potentially polarising hate-filled discussions.

5.1. Implications and limitations

We have introduced a bifactor model that enriches the literature addressing hate speech on social media by exploring the effects of anonymity affordance and user popularity on the intensity and diffusion of hate speech. Moreover, in response to calls for multilevel anonymity and hate speech intensity (Eklund et al. 2022; Zampieri et al. 2019), we proposed an exploratory taxonomy that warrants further exploration in future research. From a practical perspective, our findings can assist policymakers in formulating legal frameworks and policies regarding anonymity on social media to balance its pro- and antisocial functions and curb the widespread,

harmful virality of hate speech online. Furthermore, these insights can guide SNS companies in adopting filtering policies based on hate speech intensity with varying degrees of tolerance, thereby contributing to a healthy online ecosystem while preserving freedom of speech and relevant criticism (Schäfer, Sülflow and Reiners 2021).

As for our study's limitations, the data were collected from users of Twitter in Afghanistan, which has unique sociocultural features and a hostile, toxic political atmosphere. Therefore, our findings may not be generalizable to other societies and linguistic contexts (Farrand 2023), and further exploration is required to enhance the generalizability of our results. Furthermore, to measure user anonymity, we relied on self-reported profile information, the verification of which is inherently difficult and necessitates innovative techniques in future research (Peddinti, Ross and Cappos 2017). Finally, based on our dataset, we examined the association between dependent and independent variables, rather than causality; further experimental research is required to establish causal relationships.

References

Alexopoulou, Sofia, and Antonia Pavli. "Beneath This Mask There Is More Than Flesh, Beneath This Mask There Is an Idea: Anonymous as the (Super)heroes of the Internet?" *International Journal for the Semiotics of Law – Revue Internationale de Sémiotique Juridique* 34, no. 1 (2021): 237–64.
https://doi.org/10.1007/s11196-019-09615-6.

Asimovic, Nejla, Jonathan Nagler, Richard Bonneau, and Joshua A. Tucker. "Testing the Effects of Facebook Usage in an Ethnically Polarized Setting." *Proceedings of the National Academy of Sciences* 118, no. 25 (2021): e2022819118.
https://doi.org/10.1073/pnas.2022819118

Backes, Michael, Pascal Berrang, Oana Goga, Krishna P. Gummadi, and Praveen Manoharan. "On Profile Linkability Despite Anonymity in Social Media Systems." In *Proceedings of the 2016 ACM on Workshop on Privacy in the Electronic Society*, 25–35. Vienna, Austria: Association for Computing Machinery, 2016.
https://doi.org/10.1145/2994620.2994629

Bahador, Babak. "Classifying and Identifying the Intensity of Hate Speech." *Items* (digital forum). Social Science Research Council, November 17, 2020. Accessed October 12, 2025.
https://items.ssrc.org/disinformation-democracy-and-conflictprevention/classifying-and-identifying-the-intensity-of-hate-speech

Balaban, Delia, Ioana Iancu, Maria Mustățea, Anișoara Pavelea, and Lorina Culic. "What Determines Young People to Follow Influencers? The Role of Perceived Information Quality and Trustworthiness on Users' Following Intentions." *Romanian Journal of Communication and Public Relations* 22, no. 3 (2020): 5–19.
https://doi.org/10.21018/rjcpr.2020.3.306

Ben-David, Anat, and Ariadna Matamoros Fernández. "Hate Speech and Covert Discrimination on Social Media: Monitoring the Facebook Pages of Extreme-Right Political Parties in Spain." *International Journal of Communication* 10 (2016): 27–49.
https://ijoc.org/index.php/ijoc/article/view/3697/1585

Bilewicz, Michał, and Wiktor Soral. "Hate Speech Epidemic: The Dynamic Effects of Derogatory Language on Intergroup Relations and Political Radicalization." *Political Psychology* 41 (2020): 3–33.
https://doi.org/10.1111/pops.12670

Bloch, Francis, Matthew O. Jackson, and Pietro Tebaldi. "Centrality Measures in Networks." *Social Choice and Welfare* 61, no. 2 (2023): 413–53.
https://doi.org/10.1007/s00355-023-01456-4.

Brown, Alexander. "What Is So Special About Online (as Compared to Offline) Hate Speech?" *Ethnicities* 18, no. 3 (2018): 297–326.
https://doi.org/10.1177/1468796817709846

Castaño-Pulgarín, Sergio Andrés, Natalia Suárez-Betancur, Luz Magnolia Tilano Vega, and Harvey Mauricio Herrera López. "Internet, Social Media and Online Hate Speech: Systematic Review." *Aggression and Violent Behavior* 58 (2021): 101608.
https://doi.org/10.1016/j.avb.2021.101608

Chakraborty, Tanmoy, and Sarah Masud. "Nipping in the Bud: Detection, Diffusion and Mitigation of Hate Speech on Social Media." *ACM SIGWEB Newsletter* (Winter 2022): 1–9.
https://doi.org/10.1145/3522598.3522601

Curlew, Abigail E. "Undisciplined Performativity: A Sociological Approach to Anonymity." *Social Media + Society* 5, no. 1 (2019).
https://doi.org/10.1177/2056305119829843

Eklund, Lina, Emma von Essen, Fatima Jonsson, and Magnus Johansson. "Beyond a Dichotomous Understanding of Online Anonymity: Bridging the Macro and Micro Level." *Sociological Research Online* 27, no. 2 (2022): 486–503.
https://doi.org/10.1177/13607804211019760

Ellison, Nicole B., Lindsay Blackwell, Cliff Lampe, and Penny Trieu. "The Question Exists, but You Don't Exist with It: Strategic Anonymity in the Social Lives of Adolescents." *Social Media + Society* 2, no. 4 (2016).
https://doi.org/10.1177/2056305116670673

ElSherief, Mai, Shirin Nilizadeh, Dana Nguyen, Giovanni Vigna, and Elizabeth Belding. "Peer to Peer Hate: Hate Speech Instigators and Their Targets." In *Proceedings of the International AAAI Conference on Web and Social Media* 12, no. 1 (2018): 52–61.
https://doi.org/10.1609/icwsm.v12i1.15038

Esteve, Zoraida, Asier Moneva, and Fernando Miró-Llinares. "Can Metadata Be Used to Measure the Anonymity of Twitter Users? Results of a Confirmatory Factor Analysis." *International E-Journal of Criminal Sciences* 13 (2019): 4.
https://ojs.ehu.eus/index.php/inecs/article/view/21157/19010

Farrand, Benjamin. "'Is This a Hate Speech?' The Difficulty in Combating Radicalisation in Coded Communications on Social Media Platforms." *European Journal on Criminal Policy and Research* 29, no. 3 (2023): 477–493.
https://doi.org/10.1007/s10610-023-09543-z

Fleiss, Joseph L., John C. Nee, and J. Richard Landis. "Large Sample Variance of Kappa in the Case of Different Sets of Raters." *Psychological Bulletin* 86, no. 5 (1979): 974–77. https://doi.org/10.1037/0033-2909.86.5.974

Fortuna, Paula, João Rocha da Silva, Juan Soler-Company, Leo Wanner, and Sérgio Nunes. "A Hierarchically-Labeled Portuguese Hate Speech Dataset." In *Proceedings of the Third Workshop on Abusive Language Online*, 94–104. Florence: Association for Computational Linguistics, 2019. https://doi.org/10.18653/v1/W19-3510

Fortuna, Paula, and Sérgio Nunes. "A Survey on Automatic Detection of Hate Speech in Text." *ACM Computing Surveys* 51, no. 4 (2018): 1–30. https://doi.org/10.1145/3232676

Fortuna, Paula, Juan Soler-Company, and Leo Wanner. "Toxic, Hateful, Offensive or Abusive? What Are We Really Classifying? An Empirical Analysis of Hate Speech Datasets." In *Proceedings of the 12th Conference on Language Resources and Evaluation*, 6786–94. Marseille: European Language Resources Association, 2020. https://aclanthology.org/2020.lrec-1.835

Garcia, David, Pavlin Mavrodiev, Daniele Casati, and Frank Schweitzer. "Understanding Popularity, Reputation, and Social Influence in the Twitter Society." *Policy & Internet* 9, no. 3 (2017): 343–64. https://doi.org/10.1002/poi3.151

Gorenc, Nina. "Hate Speech or Free Speech: An Ethical Dilemma?" *International Review of Sociology* 32, no. 3 (2022): 413–25. https://doi.org/10.1080/03906701.2022.2133406

Gulyás, Gábor György. "Gépi tanulási módszerek alkalmazása deanonimizálásra." *Information Society/Információs Társadalom* 17, no. 1 (2017): 72–86. https://doi.org/10.22503/inftars.XVII.2017.1.5

Guo, Lei, and Brett G. Johnson. "Third-Person Effect and Hate Speech Censorship on Facebook." *Social Media + Society* 6, no. 2 (2020). https://doi.org/10.1177/2056305120923003

Jaidka, Kokil, Alvin Zhou, Yphtach Lelkes, Jana Egelhofer, and Sophie Lecheler. "Beyond Anonymity: Network Affordances, Under Deindividuation, Improve Social Media Discussion Quality." *Journal of Computer-Mediated Communication* 27, no. 1 (2022): zmab019. https://doi.org/10.1093/jcmc/zmab019

Jardine, Eric. "Tor, What Is It Good For? Political Repression and the Use of Online Anonymity-Granting Technologies." *New Media & Society* 20, no. 2 (2018): 435–52. https://doi.org/10.1177/1461444816639976

Kilvington, Daniel. "The Virtual Stages of Hate: Using Goffman's Work to Conceptualise the Motivations for Online Hate." *Media, Culture & Society* 43, no. 2 (2021): 256–72. https://doi.org/10.1177/0163443720972318

Kocoń, Jan, Alicja Figas, Marcin Gruza, Daria Puchalska, Tomasz Kajdanowicz, and Przemysław Kazienko. "Offensive, Aggressive, and Hate Speech Analysis: From Data-Centric to Human-Centered Approach." *Information Processing & Management* 58, no. 5 (2021): 102643. https://doi.org/10.1016/j.ipm.2021.102643

Konovalova, Ekaterina, Guillaume Le Mens, and Nicolas Schöll. "Social Media Feedback and Extreme Opinion Expression." *PLOS One* 18, no. 11 (2023): e0293805. https://doi.org/10.1371/journal.pone.0293805

Lingam, Revathy-Amadera, and Norizah Aripin. "Comments on Fire! Classifying Flaming Comments on YouTube Videos in Malaysia." *Jurnal Komunikasi: Malaysian Journal of Communication* 33, no. 4 (2017): 104–118. https://doi.org/10.17576/JKMJC-2017-330407

Ma, Xiao, Jeff Hancock, and Mor Naaman. "Anonymity, Intimacy and Self-Disclosure in Social Media." In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, 3857–69. New York: Association for Computing Machinery, 2016. https://doi.org/10.1145/2858036.2858414

Maarouf, Abdurahman, Nicolas Pröllochs, and Stefan Feuerriegel. "The Virality of Hate Speech on Social Media." *Proceedings of the ACM on Human-Computer Interaction* 8, no. CSCW1 (2024): 1–22. https://doi.org/10.1145/3641025

Masud, Sarah, Subhabrata Dutta, Sakshi Makkar, Chhavi Jain, Vikram Goyal, Amitava Das, and Tanmoy Chakraborty. "Hate Is the New Infodemic: A Topic-Aware Modeling of Hate Speech Diffusion on Twitter." In *Proceedings of the 2021 IEEE 37th International Conference on Data Engineering*, 504–15. New York: IEEE, 2021. https://doi.org/10.1109/ICDE51399.2021.00050

Matamoros-Fernández, Ariadna, and Johan Farkas. "Racism, Hate Speech, and Social Media: A Systematic Review and Critique." *Television & New Media* 22, no. 2 (2021): 205–24. https://doi.org/10.1177/1527476420982230

Mathew, Binny, Ritam Dutt, Pawan Goyal, and Animesh Mukherjee. "Spread of Hate Speech in Online Social Media." In *Proceedings of the 10th ACM Conference on Web Science*, 173–82. Boston: Association for Computing Machinery, 2019. https://doi.org/10.1145/3292522.3326034

Men, Linjuan Rita, Wan-Hsiu Sunny Tsai, Zifei Fay Chen, and Yi Grace Ji. "Social Presence and Digital Dialogic Communication: Engagement Lessons from Top Social CEOs." *Journal of Public Relations Research* 30, no. 3 (2018): 83–99. https://doi.org/10.1080/1062726X.2018.1498341

Milmo, Dan. "Anonymous: The Hacker Collectives That Declare War Against Russia." *The Guardian*, February 27, 2022. https://www.theguardian.com/world/2022/feb/27/anonymous-the-hacker-collective-that-has-declared-cyberwar-on-russia

Nascimento, Francimaria RS, George DC Cavalcanti, and Márjory Da Costa-Abreu. "Exploring Automatic Hate Speech Detection on Social Media: A Focus on Content-Based Analysis." *SAGE Open* 13, no. 2 (2023). https://doi.org/10.1177/21582440231181311

Oz, Mustafa, Pei Zheng, and Gina Masullo Chen. "Twitter Versus Facebook: Comparing Incivility, Impoliteness, and Deliberative Attributes." *New Media & Society* 20, no. 9 (2018): 3400–19. https://doi.org/10.1177/1461444817749516

Pamirzad, Qurban Hussain. "A Qualitative Exploration of Hate Speech Manifestation in Afghanistan's Twitter-Sphere." *Jurnal Komunikasi: Malaysian Journal of Communication* 41, no. 3 (2025): 1–20. https://doi.org/10.17576/JKMJC-2025-4103-01

Parvaresh, Vahid. "Covertly Communicated Hate Speech: A Corpus-Assisted Pragmatic Study." *Journal of Pragmatics* 205 (2023): 63–77. https://doi.org/10.1016/j.pragma.2022.12.009

Peddinti, Saikat T., Keith W. Ross, and Justin Cappos. "User Anonymity on Twitter." *IEEE Security & Privacy* 15, no. 3 (2017): 84–87. https://doi.org/10.1109/MSP.2017.74

Perera, Suresha, Nadeera Meedin, Maneesha Caldera, Indika Perera, and Supunmali Ahangama. "A Comparative Study of the Characteristics of Hate Speech Propagators and Their Behaviours over Twitter Social Media Platform." *Heliyon* 9, no. 8 (2023): e19097. https://doi.org/10.1016/j.heliyon.2023.e19097

Postmes, Tom, and Russell Spears. "Deindividuation and Antinormative Behavior: A Meta-Analysis." *Psychological Bulletin* 123, no. 3 (1998): 238–59. https://doi.org/10.1037/0033-2909.123.3.238

Riquelme, Fabián, and Pablo González-Cantergiani. "Measuring User Influence on Twitter: A Survey." *Information Processing & Management* 52, no. 5 (2016): 949–75. https://doi.org/10.1016/j.ipm.2016.04.003.

Rutledge, Pamela. "The Fragility of Social Media Fame." *Psychology Today,* March 30, 2021. https://www.psychologytoday.com/us/blog/positively-media/202103/the-fragility-social-media-fame

Ruzaite, Jurate. "In Search of Hate Speech in Lithuanian Public Discourse: A Corpus-Assisted Analysis of Online Comments." *Lodz Papers in Pragmatics* 14, no. 1 (2018): 93–116. https://doi.org/10.1515/lpp-2018-0005

Sachdeva, Pratik, Renata Barreto, Geoff Bacon, Alexander Sahn, Claudia von Vacano, and Chris Kennedy. "The Measuring Hate Speech Corpus: Leveraging Rasch Measurement Theory for Data Perspectivism." In *Proceedings of the 1st Workshop on Perspectivist Approaches to NLP @LREC2022*, 83–94. Marseille: European Language Resources Association, June 2022. https://aclanthology.org/2022.nlperspectives-1.11

Saresma, Tuija, Sanna Karkulehto, and Petri Varis. "Gendered Violence Online: Hate Speech as an Intersection of Misogyny and Racism." In *Violence, Gender and Affect: Interpersonal, Institutional and Ideological Practices*, edited by Marita Husso, Sanna Karkulehto, Tuija Saresma, Aarno Laitila, Jari Eilola, and Heli Siltala, 221–243. Cham: Springer Nature, 2020. https://doi.org/10.1007/978-3-030-56930-3_11

Schäfer, Svenja, Michael Sülflow, and Liane Reiners. "Hate Speech as an Indicator for the State of the Society: Effects of Hateful User Comments on Perceived Social Dynamics." *Journal of Media Psychology* 34, no. 1 (2022): 3–15. https://doi.org/10.1027/18641105/a000294

Schmid, Ursula Kristin, Anna Sophie Kümpel, and Diana Rieger. "How Social Media Users Perceive Different Forms of Online Hate Speech: A Qualitative Multi-Method Study." *New Media & Society* 26, no. 5 (2024): 2614–32. https://doi.org/10.1177/14614448221091185

Ștefăniță, Oana, and Diana-Maria Buf. "Hate Speech in Social Media and Its Effects on the LGBT Community: A Review of the Current Research." *Romanian Journal of Communication and Public Relations* 23, no. 1 (2021): 47–55.

https://doi.org/10.21018/rjcpr.2021.1.322

Tabassum, Shazia, Fabiola SF Pereira, Sofia Fernandes, and João Gama. "Social Network Analysis: An Overview." *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery* 8, no. 5 (2018): e1256.
https://doi.org/10.1002/widm.1256

Tontodimamma, Alice, Eugenia Nissi, Annalina Sarra, and Lara Fontanella. "Thirty Years of Research into Hate Speech: Topics of Interest and Their Evolution." *Scientometrics* 126 (2021): 157–79.
https://doi.org/10.1007/s11192-020-03737-6

Trajkova, Zorica, and Silvana Neshkovska. "Online Hate Propaganda During Election Period: The Case of Macedonia." *Lodz Papers in Pragmatics* 14, no. 2 (2018): 309–34.
https://doi.org/10.1515/lpp-2018-0015

Vári, László. "Szabadság határokkal, avagy európai útmutató a szólásszabadság jogszerű gyakorlásához." *Információs Társadalom: Társadalomtudományi Folyóirat* 18, no. 3–4 (2018): 25–45.
https://doi.org/10.22503/inftars.XVIII.2018.3-4.2

Vedadi, Ali, and Timothy H. Greer. "The Relationship Between Intention to Use, Popularity Information about a Technology, and Trust in Predecessors and Vendors." *Information Resources Management Journal* 34, no. 1 (2021): 43–65.
http://doi.org/10.4018/IRMJ.2021010103

Vilanova, Felipe, Francielle Machado Beria, Ângelo Brandelli Costa, and Silvia Helena Koller. "Deindividuation: From Le Bon to the social identity model of deindividuation effects." *Cogent Psychology* 4, no. 1 (2017): 1308104.
https://doi.org/10.1080/23311908.2017.1308104

von Essen, Emma, and Joakim Jansson. "Haters Gonna Hate? Anonymity, Misogyny and Hate Against Foreigners in Online Discussions on Political Topics." In J. Jansson, *We Are (Not) Anonymous: Essays on Anonymity, Discrimination and Online Hate* (PhD diss., Stockholm University, 2018).

Williams, Matthew L., Pete Burnap, Amir Javed, Han Liu, and Sefa Ozalp. "Hate in the Machine: Anti-Black and Anti-Muslim Social Media Posts as Predictors of Offline Racially and Religiously Aggravated Crime." *The British Journal of Criminology* 60, no. 1 (2020): 93–117.
https://doi.org/10.1093/bjc/azz049

Yuan, Shupei, and Chen Lou. "How Social Media Influencers Foster Relationships with Followers: The Roles of Source Credibility and Fairness in Parasocial Relationship and Product Interest." *Journal of Interactive Advertising* 20, no. 2 (2020): 133–47.
https://doi.org/10.1080/15252019.2020.1769514

Zampieri, Marcos, Shervin Malmasi, Preslav Nakov, Sara Rosenthal, Noura Farra, and Ritesh Kumar. "Predicting the Type and Target of Offensive Posts in Social Media." In *Proceedings of the 2019 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies, Volume 1 (Long and Short Papers)*, 1415–20. Minneapolis: Association for Computational Linguistics, June 2019.
https://doi.org/10.18653/v1/N19-1144

Zannettou, Savvas, Mai Elsherief, Elizabeth Belding, Shirin Nilizadeh, and Gianluca Stringhini. "Measuring and Characterizing Hate Speech on News Websites." In *Proceedings of the

12th ACM Conference on Web Science, 125–134. Southampton: Association for Computing Machinery, 2020.
https://doi.org/10.1145/3394231.3397902

Zapata, Jimena, Justin Sulik, Clemens von Wulffen, and Ophelia Deroy. "Bystanders' Collective Responses Set the Norm Against Hate Speech." *Humanities and Social Sciences Communications* 11, no. 1 (2024): 335.
https://doi.org/10.1057/s41599-024-02761-8

Zhang, Min, Dongxin Zhang, Yin Zhang, Kristin Yeager, and Taylor N. Fields. "An Exploratory Study of Twitter Metrics for Measuring User Influence." *Journal of Informetrics* 17, no. 4 (2023): 101454.
https://doi.org/10.1016/j.joi.2023.101454

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The influence of online game aesthetics
on players' loyalty

The aesthetics of online games play a crucial role in shaping how players perceive, experience, and engage with digital entertainment. However, the specific impact of games on preferences for various forms of digital entertainment remains unclear. Our study aims to fill that gap by examining how online game aesthetics influence patterns of digital entertainment consumption. Using a quantitative explanatory approach, we collected data via a questionnaire completed by players of online games in Brazil. Analysis via partial least squares modeling revealed that game aesthetics directly impact variables such as positive image and satisfaction, as well as indirectly influence avatar identification and players' loyalty.

Keywords: *online gaming, aesthetics, digital entertainment consumption, Brazil*

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1. Introduction

Despite the gaming industry's extraordinary growth in the past two decades, shifting market dynamics, rising development costs, and evolving player expectations continue to present new challenges. Although emerging technology such as cloud gaming, augmented reality, and virtual reality offer future potential, the immediate success of games can be expected to increasingly depend on innovative monetization strategies and deeper audience engagement (Paizanis et al. 2024). In that context, though much of the research on player engagement has focused on problematic use (Bányai et al. 2018), in our study we examined the positive drivers of loyalty, including game aesthetics.

A crucial element in sustaining the interest of players of online games—hereafter, "players"—lies in the immersive power of game design. In particular, the visual and auditory design of online games—in a word, their aesthetics—not only shapes gameplay but also influences how players perceive and emotionally engage with the experience (Souza 2016). Furthermore, research on gamification has shown that although visual elements enhance performance, auditory and audiovisual components primarily influence immersion and flow, and players generally prefer a combination of both for a more engaging experience (Schubhan 2024). From captivating visuals to immersive soundtracks and memorable character designs, each aesthetic component fosters a profound sense of immersion and emotional connection to the virtual world. Taken together, those game aesthetics play a pivotal role in shaping how players interact with and consume digital entertainment.

Given technological advancements, online games have become more and more visually sophisticated and now offer richly detailed, immersive environments. According to Menezes (2018), aesthetics constitute a significant factor in patterns of consumption. As a result, visual quality has become crucial in players' decisions regarding where to invest their time and resources, which, in turn, has increasingly impacted the industry in immediate ways.

As the growing demand for visually impressive games drives innovations in graphics technology and establishes higher aesthetic standards, both the digital entertainment ecosystem and players' consumption behaviors have transformed (Menezes 2018). Investigating how those distinctive aesthetics influence players' preferences across various entertainment formats presents a promising area of research that can offer valuable insights for game developers, marketers, and scholars.

Along those lines, in our study we sought to answer a critical question: How does the aesthetics of online games influence consumption patterns when it comes to digital entertainment?

2. Patterns of digital entertainment consumption and the cultural dimension of aesthetics

Patterns of digital consumption have evolved considerably in recent decades due to a host of factors. Among them, the rise of mobile devices has generated distinct

consumption preferences across generational lines. For instance, whereas baby boomers (i.e., born from 1946 to 1964) primarily consume media via television, millennials (i.e., born from 1981 to 1996) and members of Generation Z (i.e., born 1997 to 2012) show a strong preference for media consumption using mobile devices (Ali 2021).

The segmentation of consumers by generation provides a useful framework for analyzing shifts in patterns of cultural consumption, with digital consumption constituting a major aspect of cultural engagement today. According to Canclini's (1993) approach, the adoption and use of cultural products are deeply embedded in cultural processes. That perspective frames cultural consumption not merely as an individual choice but as an activity with broader sociocultural significance. Beyond that, Canclini's view suggests that cultural consumption is imbued with symbolic meaning.

Canclini's (2005) development of the discussion on the relationship between cultural consumption and cultural processes encourages the exploration of how changes in the appropriation of cultural products interact with exercises of citizenship. In that vein, in our study we drew on Canclini's insights to conceptualize games as a form of cultural consumption and to investigate the cultural processes and forms of sociability within which gaming is situated.

In parallel, research by Rodrigues, Lopes, and Mustaro (2007), among other scholars, has examined how gaming communities form and the cultural implications of that process. The diverse cultural nuances in the experiences of those virtual communities underscore the need to move beyond generational categories, from baby boomers onward, to develop methodologies that more accurately capture specific dynamics within the gaming world. Thus, along those lines, in our study we focused on how aesthetics, as a cultural dimension, shapes patterns of consumption in the gaming industry. In what follows, we present the conceptual model that guided our research.

3. Conceptual model

As digital gaming has become an integral part of many individuals' daily lives, interest in understanding the behaviors associated with its use has grown. To examine those interactions in greater depth, in this article we propose a research model, shown in Figure 1. The hypotheses presented seek to not only analyze behavioral patterns but also enhance understandings of users' motivations, impacts, and preferences. Altogether, the approach stands to facilitate a more comprehensive perspective on the growing cultural significance of digital games, foster reflection on their evolving role in society, and provide insights into potential future trends.

In our model, game aesthetics are conceptualized as a combination of various elements, including sound effects, storyline, graphics, animations, avatars, and environment design (Wu and Hsu 2018). *Avatar identification,* as defined by Teng (2017), refers to the extent to which players perceive their avatars as extensions of themselves. Thus, a positive avatar image is characterized by the degree to which

the avatar is regarded favorably—for example, as likeable, attractive, or visually appealing—especially by peers (Teng 2019). Meanwhile, satisfaction, as described by Yang, Wu, and Wang (2009), reflects the quality of a product or service in light of users' interactions and plays a crucial role in shaping consumer behavior and loyalty. In essence, satisfaction determines whether users will continue engaging with a particular product or service.
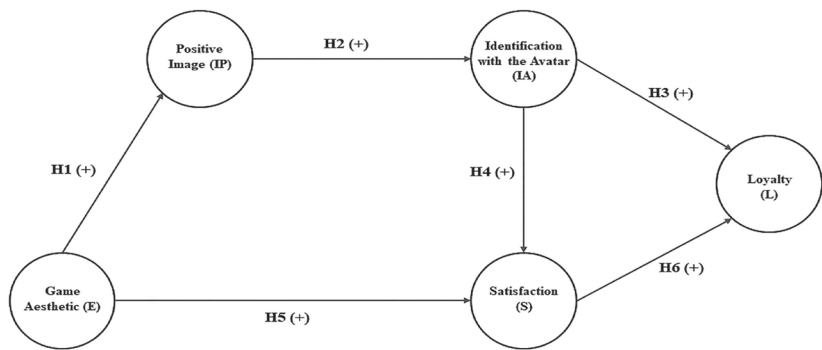

Figure 1. Conceptual model of the research

3.1. Formulation of hypotheses

Game aesthetics are fundamental in shaping the positive perception of avatars within games. According to Wu and Hsu (2018), elements such as visual design, customization options, and the avatar's overall appearance play significant roles in fostering players' identification with and emotional attachment to their virtual characters. High-quality aesthetics can enhance the appeal of an avatar by making it more captivating and engaging for players, which directly contributes to a more positive perception of the avatar within the world of the game (Teng 2019). Thus, game aesthetics not only influence the avatar's image but also enrich the overall experience for players and strengthen their connection to the virtual world created. We therefore hypothesized the following:

H1: Game aesthetics are positively associated with a favorable image of an avatar.

Steele (1999) has argued that, along with a desire to perceive themselves as unique individuals, people also strive to be viewed positively by others, which leads them to identify with objects that reflect a favorable image. That principle is particularly

relevant in online gaming, in which players often seek avatars that they perceive as being well-regarded by others, given that those avatars serve as their representation within the virtual environment (Behrend et al. 2012). Players' positive evaluations of their avatars thus depend on the extent to which those avatars can be seen as favorable reflections of themselves.

Consequently, the drive to uphold a positive self-image shapes players' choices of avatars in online games. By selecting an avatar with a favorable image, the player establishes a strong connection between the avatar's representation and their own self-identification, which, in turn, reinforces their own positive self-image. Thus, we also proposed:

H2: A favorable avatar image is positively associated with avatar identification.

Identification with an avatar can be significantly influenced by the avatar's image, which determines whether the experience is positive and engaging. By enhancing immersion and fostering a sense of belonging in virtual worlds, avatars serve as tools for expressing identity. In online games, players may control their avatars from either a first-person perspective (i.e., seeing through the avatar's eyes) or a third-person perspective (i.e., observing the avatar externally). By offering predefined avatars and/or allowing customization, games enable players to craft avatars that reflect their personal traits and/or aspirational ideals. Such possibilities align with theories of digital identity, which hold that online environments enable the creation of new, aspirational selves (Zoltán 2020). When players can customize their avatars in those ways, they tend to develop a stronger attachment both to their avatars and to the game overall.

Research has indicated that players often experience strong identification and emotional attachment through various aspects of their avatars, which makes avatar identification a powerful psychological component in gaming. That connection, in extending to the players' self-conception and personal narrative, becomes a central factor in enjoyment (Wolfendale 2007; Mancini and Sibilla 2017; Liew et al. 2018; Stavropoulos et al. 2020). Therefore, *avatar identification*, as defined by Van Looy, Courtois, and De Vocht (2010, 206), is the "temporary alteration in the player's self-perception induced by mental association with their character in the game," wherein the avatar functions as an extension of the player's identity.

Unlike traditional media such as television and film, games require active engagement, for players inhabit the fictional world directly and assume an active role within its narrative. According to Van Looy, Courtois, and De Vocht (2010), that dynamic causes players to refer to their avatars as "I" and the game world as "here." Such an immersive connection intensifies personal investment in the game, which can lead to greater overall satisfaction with it.

Trepte and Reinecke (2010) have also suggested that avatar identification enhances social interactions within online gaming communities, thereby resulting in increased player gratification. When players identify strongly with their avatars, they are more likely to participate in collaborative and competitive activities, which strengthens their social ties with other players and fosters an environment of support and recognition among peers. That sense of connection and community is

crucial in enhancing enjoyment in gaming, and the stronger a player's identification with their avatar, the deeper their immersion in the game, which results in greater motivation, a greater intention to play again, and stronger loyalty.

Considering all the above, we additionally hypothesized that:

H3: Avatar identification is positively associated with players' loyalty.
H4: Avatar identification is positively associated with players' satisfaction.
H6: Players' satisfaction is positively associated with players' loyalty.

Because game aesthetics can also significantly influence a game's profitability and the level of player immersion, they are essential to the gaming experience. Wu and Hsu (2018) have described game aesthetics as encompassing a range of elements, including sound effects, narrative, graphics, animations, avatars, and scenography. Crouch et al. (2004) have further argued that a game's aesthetic appeal can shape gameplay by evoking specific associations, perceptions, and emotions, which consequently affect how players connect with and engage in the game. In essence, the manner in which those aesthetic elements are presented can either amplify or diminish players' emotional responses, thereby shaping their desire to continue playing and directly influencing their satisfaction with the game.

Because well-designed aesthetics are likely to evoke positive emotions and enhance player satisfaction, we proposed the following final hypothesis as well:

H5: Game aesthetics are positively associated with players' satisfaction.

4. Methods

Our study was quantitative and explanatory because we formulated hypotheses and sought to identify the factors that contribute to or determine the subject of investigation (Gerhardt and Silveira 2009). In particular, we aimed to examine whether the aesthetics of digital games impact players' loyalty.

The research was conducted in Brazil, which ranks as the tenth-largest gaming market worldwide, with more than 100 million players who collectively spent $2.7 billion on gaming in 2022, thereby representing approximately 3% of the global player base (Newzoo 2024). Newzoo (2024) has also highlighted that Brazil leads the Latin American gaming market and is the second-largest market in the Global South, second only to China. Given Brazil's current trends in gaming consumption, the country has the potential to rise to sixth place globally in digital game consumption and, in doing so, surpass the United Kingdom.

We employed an online questionnaire hosted on Google Forms as our primary data collection tool. The questionnaire included 22 questions focused on the variables outlined in our hypotheses and generated data from October 2023 to March 2024.

To construct our research model, we integrated insights from Sanchez-Franco and Rondan-Cataluña (2010), Teng (2019), and Wu and Hsu (2018). The measurement scale was translated from English to Portuguese to ensure clarity for respondents. All items were assessed on a 5-point Likert scale, with 1 representing strongly

disagree and 5 representing strongly agree. Although originally developed in English, the questionnaire was translated into Portuguese by native Brazilian Portuguese speakers in order to enhance comprehension. Table 1 displays the variables along with their corresponding indicators.

Source	Variable	Indicator
Teng (2019)	Positive image	**IP1:** My avatar has a positive image. **IP2:** Overall, to me, my avatar has a positive image. **IP3:** My decision to use my avatar was good. **IP4:** My avatar is useful when I am playing the game. **IP5:** My experience using my avatar is positive. **IP6:** My avatar is very valuable in the game.
	Identification with the avatar	**IA1:** I have strong feelings of ownership toward my avatar. **IA2:** I feel like my avatar is an extension of myself. **IA3:** My avatar gives me a form of self-expression. **IA4:** My avatar is extremely important to me.
	Loyalty	**L1:** The online game is my top choice when I consider playing games online. **L2:** I will recommend the online game to others who want to play an online game.
Wu and Hsu (2018)	Game aesthetics	**E1:** I feel that the sound effects of the online game are good. **E2:** I feel that the graphics of the online game are good. **E3:** I feel that the narrative of the online game is good. **E4:** I feel that the animation of the online game is good. **E5:** I feel that the avatar design of the online game is good. **E6:** I feel that the scenography of the online game is good.
Sanchez-Franco and Rondan-Cataluña (2010)	Satisfaction	**S1:** I think that I made the right decision by playing the digital game. **S2:** The experience that I have had with the online game has been satisfactory. **S3:** Overall, I am satisfied with how efficiently the online game has been functioning. **S4:** Overall, I am satisfied with the service that I have received from the online game.

Table 1. Variables and indicators of the proposed model (Sanchez-Franco and Rondan-Cataluña 2010; Teng 2019; Wu and Hsu 2018)

Data analysis was conducted through structural equation modeling using partial least squares, as suggested by Ramírez, Mariano, and Salazar (2014), with SmartPLS 4 software (Ringle, Silva and Bido 2015). The analytical approach allowed testing relationships between variables in the proposed model, assessing the adequacy of parameters based on the literature, and determining the percentage of variance that the model explains in relation to our study's focus.

To determine the minimum sample size required for research using partial least squares, we utilized G*Power 3.1 (Faul et al. 2009). That process generally involves identifying the latent variable with the highest number of connections or predictors. In our study, we focused on two variables: satisfaction (S) and loyalty (L), each with two connections.

Two parameters also needed to be considered: test power and effect size. Following the recommendations of Hair et al. (2021), the desired power level was set at 0.80 and the effect size at 0.15. The results from the software, as illustrated in Figure 2, indicated that the minimum sample size required for the study was 68.
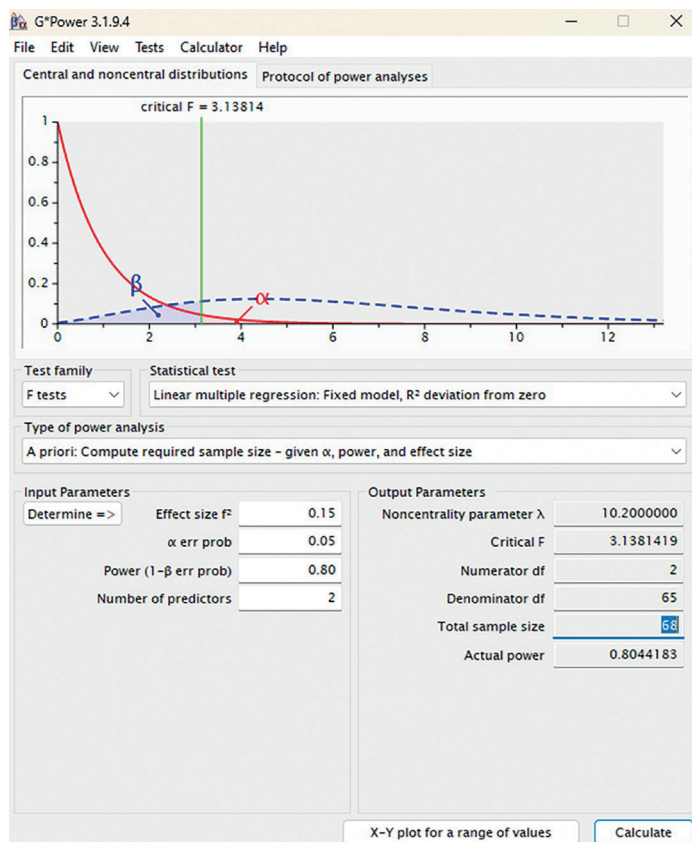

Figure 2. Results using G*Power 3.1

5. Results

A total of 164 valid responses were obtained (Table 2), with 100 respondents identifying as cisgender women (61%) and 53 as cisgender men (32.2%). Most respondents were 20–24 years old (37.2%) or 25–29 years old (34.8%). Players reported using various devices to play games: 79.3% on a computer, 54.3% on a smartphone, and 42.7% on a console. When asked about their average weekly gaming time, 22.6% reported playing between 3 and 6 hours, 20.7% between 6 and 10 hours, and 17.1% between 12 and 20 hours. Notably, ones who reported playing for more than 20 hours per week were typically professionals in the digital gaming industry, whereas ones who reported playing less than 3 hours per week were more casual gamers.

	Category	*n*	%
Gender	Cisgender woman	100	61
	Cisgender man	53	32.3
	Transgender woman	2	1.2
	Transgender man	2	1.2
	Nonbinary	4	2.4
	I prefer not to identify myself	3	1.8
Age in years	18–19	9	5.5
	20–24	61	37.2
	25–29	57	34.8
	30–34	23	14
	35–40	10	6.1
	>40	4	2.4
	Smartphone	89	54.3
	Console	70	42.7
	Computer	130	79.3
	Notebook	50	30.5
Devices	Tablet	6	3.7
	Portable console	12	7.3
	Smart TV	4	2.4
	Virtual reality device	5	03
	Other	3	1.8

Hours played per week	<1	7	4.3
	1–3	20	12.2
	3–6	37	22.6
	6–10	34	20.7
	10–12	12	7.3
	12–20	28	17.1
	20–40	16	9.8
	>40	10	6.1

Table 2. Descriptive results

For model fit assessment, the standardized root mean square residual was 0.083, which indicates a good fit according to Hair et al. (2021). Reliability analysis revealed that the composite reliability values for the latent variables ranged from 0.802 to 0.921, thereby reflecting the satisfactory reliability of the constructs. Moreover, all heterotrait–monotrait ratios were less than 1.0, which confirmed discriminant validity. Thus, the reliability and validity of the constructs in the model were considered to be adequate.

Next, the Pearson determination coefficient (R^2) was evaluated to measure the proportion of variance in the endogenous variables explained by the structural model (Ramírez, Mariano and Salazar 2014). According to Ramírez, Mariano, and Salazar, R^2 values are deemed acceptable if they exceed 0.1. The analysis yielded R^2 values of 0.12 for the positive image, 0.57 for avatar identification, 0.21 for satisfaction, and 0.53 for loyalty. Those values indicate that the structural model explained 53.9% of the variance in players' loyalty to the digital game, as depicted in Figure 3.

Beta coefficients (β), illustrated in Figure 3, represent the strength of the relationships between variables. The significance of the predictor variables was assessed based on whether β values were either greater than or equal to 0.2 or less than or equal to –0.2. Bootstrapping with a 95% confidence interval was performed to ensure the stability of the estimates (Ramírez et al. 2014). Significance was determined using *t* values, with values greater than or equal to 1.96 considered to be significant and *p* values less than or equal to 0.05 indicating statistical significance (Hair et al. 2021).

The results, presented in Table 3 and Figure 3, supported all the proposed hypotheses.
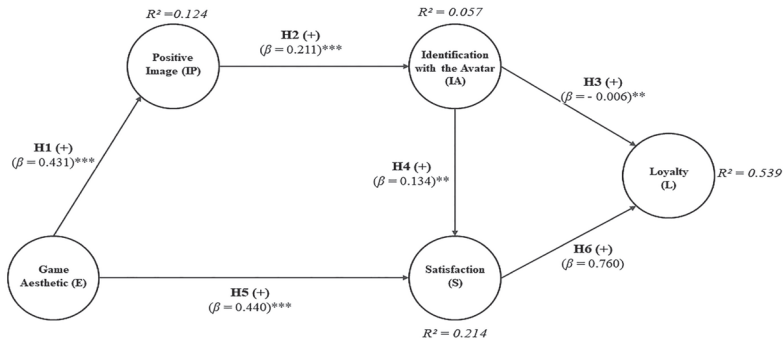
Figure 3. Results of the conceptual model of the research from SmartPLS 4

Hypothesis	Path coefficient	Confidence interval		t	Supported?
		2.5%	97.5%		
E -> IP	0.353	0.226	0.510	4.899***	Yes
E -> S	0.380	0.218	0.550	4.463***	Yes
IP -> IA	0.239	0.117	0.385	3.435***	Yes
IA -> S	0.192	0.052	0.336	2.583**	Yes
IA -> L	0.154	0.058	0.250	3.089**	Yes
S -> L	0.676	0.580	0.765	14.055***	Yes

Note. $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$.

Table 3. Results from SmartPLS 4

In particular, game aesthetics were positively related to the positive image of the avatar, which supported H1 with a path coefficient of 0.353 (2.5% CI: 0.226, 97.5% CI: 0.510, *t*: 4.899***). The positive image of the avatar was also positively related to avatar identification, which validated H2 with a path coefficient of 0.239 (2.5% CI: 0.117, 97.5% CI: 0.385, *t*: 3.435***). Avatar identification was positively associated with both players' loyalty and player satisfaction, which supported H3 with a path coefficient of 0.154 (2.5% CI: 0.058, 97.5% CI: 0.250, *t*: 3.089**) and supported H4 with a path coefficient of 0.192 (2.5% CI: 0.052, 97.5% CI: 0.336, *t*: 2.583**), respectively. Player satisfaction had a strong positive relationship with loyalty, which supported H6 with a path coefficient of 0.676 (2.5% CI: 0.580, 97.5% CI: 0.765, *t*: 14.055***).

Last, game aesthetics positively influenced players' satisfaction, which supported H5 with a path coefficient of 0.380 (2.5% CI: 0.218, 97.5% CI: 0.550, *t*: 4.463***). Those findings underscore the significance of game aesthetics and user satisfaction as pivotal factors in enhancing the positive image of the avatar, avatar identification, and ultimately, players' loyalty.

6. Discussion

In all, our investigative model can elucidate how the aesthetics of online games influence patterns of consumption in digital entertainment among players in Brazil. First, loyalty to digital games is primarily driven by satisfaction and avatar identification, in that order of importance. Satisfaction emerged as the most critical factor in explaining loyalty, for greater enjoyment from playing a specific game directly correlated with increased loyalty to it, a finding supported by Teng et al. (2022).

Second, the various components of aesthetics—sound, graphics, narratives, animations, scenography, and avatar design—were found to play significant roles in shaping attitudes and behaviors toward digital game consumption. In general, players are increasingly inclined to seek games with higher aesthetic quality (Wu and Hsu 2018). Consequently, a game that boasts superior aesthetic standards enhances the visual appeal of the avatar, which, in turn, strengthens its attractiveness, connection, and engagement, thereby leading to a more positive perception (H1).

Moreover, it is crucial to highlight that consistency in the aesthetics of digital games, including the avatar, contributes to a more immersive, cohesive gaming experience. When the visual style of the avatar better aligns with the game's narrative, players tend to develop a more favorable impression of their presence within the world of the game, as noted by Alexiou and Schippers (2018).

Third, research by Steele (1999) and Behrend et al. (2012) has indicated that players develop a stronger sense of empathy and emotional attachment to their avatars when they have a more positive perception of them. In some instances, players may even project their emotions and personal experiences onto their avatars, particularly if others in the digital game environment also view those avatars favorably. That dynamic can enhance players' self-perception. As discussed earlier, there has been an increased emphasis on elevating the aesthetic standards of games, which has resulted in avatars that are more realistic and authentic and, in turn, facilitated the mentioned identification, a finding that supported H2.

When players have the opportunity to customize the aesthetics of their avatars, it also enables them to express their identities within the game. Such personalization fosters a deeper emotional connection to both the avatar and the game itself, which raises the likelihood that players will remain satisfied and loyal over time, as suggested by H3 and H4 (Alexiou and Schippers 2018). Thus, stronger identification with the game's avatar contributes to a more stable, more engaged player base, which prompts continued support for the game via in-game purchases as well as increased community participation and recommendations to others.

Last, we found that the aesthetics of digital games positively impact overall satisfaction with games, which consequently influences players' loyalty (i.e., H5 and H6). Because aesthetics often serve as players' first impression of games, visual appeal is critical. In short, an attractive aesthetic can enhance initial perceptions and increase the likelihood that players will continue to engage with the game (Crouch et al. 2004).

Altogether, well-crafted aesthetics can create a rich, immersive experience that elicits specific associations, perceptions, and emotions. The more immersive the experience, the greater the likelihood that players will continue their engagement with the game. In essence, aesthetics that are both effective and appealing can play a vital role in a digital game's longevity and success.

7. Final remarks

This article introduces the first model that illustrates how the aesthetics of digital games influence players' loyalty and satisfaction and thus emphasizes the critical role that aesthetics play in shaping consumers' interactions with digital entertainment. In particular, games that feature visually appealing aesthetics foster emotional connections that can lead to prolonged playtime and repeated engagement with the games. Such visual allure not only enhances the experience of users but also aids in establishing a distinct brand identity that helps the game to stand out in a crowded marketplace.

The academic implications of the phenomenon are substantial. Investigating how game aesthetics affect players' satisfaction and loyalty can illuminate the motivations driving consumer behavior on digital entertainment platforms. Moreover, those insights can guide best practices within the gaming industry by enabling developers and designers to craft experiences that not only attract new players but also keep existing ones engaged in the long term. Added to that, our analysis enriches the literature on digital consumption while offering practical insights for developing future products in the rapidly evolving gaming market.

Considering our findings, future research should explore aesthetic influences in other countries and examine the psychological and economic factors that underlie aesthetic choices when it comes to games. However, it is also important to acknowledge some limitations of our study, including the low number of women who responded and the underrepresentation of participants more than 40 years old.

References

Alexiou, Andreas, and Michaéla C. Schippers. "Digital Game Elements, User Experience and Learning: A Conceptual Framework." *Education and Information Technologies* 23 (2018): 2545–67.
https://doi.org/10.1007/s10639-018-9730-6

Ali, Aran. "How Media Consumption Has Changed Over the Last Decade (2011–2021)." *Visual Capitalist*, April 28, 2021.
https://www.visualcapitalist.com/how-media-consumption-has-changed-in-2021/#google_vignette

Bányai, Fanni, Ágnes Zsila, Zsolt Demetrovics, and Orsolya Király. "A problémás videojáték-használat újabb elméleti és gyakorlati megközelítései." *Information Society/Információs Társadalom* 18, no. 1 (2018): 93–106.
https://dx.doi.org/10.22503/inftars.XVIII.2018.1.6

Behrend, Tara, Steven Toaddy, Lori Foster Thompson, and David J. Sharek. "The Effects of Avatar Appearance on Interviewer Ratings in Virtual Employment Interviews." *Computers in Human Behavior* 28, no. 6 (2012): 2128–33.
https://doi.org/10.1016/j.chb.2012.06.017

Canclini, Néstor García. *Consumidores e Cidadãos: Conflitos Multiculturais da Globalização.* Rio de Janeiro: Editora UFRJ, 2005.

Canclini, Néstor García. *El Consumo Cultural en México.* México: Pensar la Cultura, 1993.

Crouch, Geoffrey I., Richard R. Perdue, Harry J. P. Immermans and Muzaffer Uysal. *Consumer Psychology of Tourism, Hospitality and Leisure Vol. 3*. Melbourne: CAI Publishing, 2004.

Faul, Franz, Edgar Erdfelder, Axel Buchner, and Albert-Georg Lang. "Statistical Power Analyses Using G*Power 3.1: Tests for Correlation and Regression Analyses." *Behavior Research Methods* 41, no. 4 (2009): 1149–60.
https://doi.org/10.3758/BRM.41.4.1149

Gerhardt, Tatiana Engel, and Denise Tolfo Silveira. *Métodos de Pesquisa.* Rio Grande do Sul: UFRGS Editora, 2009.

Hair, Joseph F., Jr., G. Tomas M. Hult, Christian M. Ringle, Marko Sarstedt, Nicholas P. Danks, and Soumya Ray. *Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R: A Workbook.* Germany: Springer Nature, 2021.

Liew, Lucas W. L., Vasilis Stavropoulos, Baxter L. M. Adams, Tyrone L. Burleigh, and Mark D. Griffiths. "Internet Gaming Disorder: The Interplay between Physical Activity and User–Avatar Relationship." *Behaviour & Information Technology* 37, no. 6 (2018): 558–74.
https://doi.org/10.1080/0144929X.2018.1464599

Mancini, Tiziana, and Federica Sibilla. "Offline Personality and Avatar Customisation: Discrepancy Profiles and Avatar Identification in a Sample of MMORPG Players." *Computers in Human Behavior* 69 (2017): 275–83.
https://doi.org/10.1016/j.chb.2016.12.031

Menezes, João Ricardo de Bittencourt. 2018. "Em Busca da Imagem Videojográfica: Uma Cartografia das Imagens de Jogos Digitais de 1976 a 2017." PhD Thesis, Universidade do Vale do Rio dos Sinos.
https://repositorio.jesuita.org.br/handle/UNISINOS/7446

Newzoo. "Free Version Newzoo's Global Games Market Report 2023." *Newzoo* (February 8, 2024).
https://newzoo.com/resources/trend-reports/newzoo-global-games-market-report-2023-free-version

Paizanis, Giorgo, Rob Schonfeld, Ernesto Pagano, and Nicolas Schmidt. *Leveling Up for the New Reality: The Gaming Report*. Boston Consulting Group, 2024.
https://www.bcg.com/publications/2024/leveling-up-new-reality

Ramírez, Patrício E., Ari Melo Mariano, and Evangelina A. Salazar. "Propuesta Metodológica para Aplicar Modelos de Ecuaciones Estructurales con PLS: El Caso del Uso de las Bases de Datos Científicas en Estudiantes Universitarios." *Revista ADMPG* 7, no. 2 (2014): 133–39. https://revistas.uepg.br/index.php/admpg/article/view/14062

Ringle, Christian, Dirceu da Silva, and Diógenes Bido. "Structural Equation Modeling with SmartPLS." *Brazilian Journal of Marketing* 13, no. 2 (2015): 56–73. https://doi.org/10.5585/remark.v13i2.2717

Rodrigues, Lia Carrari, Rodrigo A. S. Pereira Lopes, and Pollyana Notargiacomo Mustaro. "Impactos Sócio-Culturais da Evolução dos Jogos Eletrônicos e Ferramentas Comunicacionais: Um Estudo sobre o Desenvolvimento de Comunidades Virtuais de Jogadores." In *Proceeding of the VI Brazilian Symposium on Computer and Digital Entertainment*. São Paulo, Brasil: SBGames, 2007. https://www.sbgames.org/papers/sbgames07/gameandculture/full/gc2.pdf

Sanchez-Franco, Manuel J., and Francisco Javier Rondan-Cataluña. "Virtual Travel Communities and Customer Loyalty: Customer Purchase Involvement and Web Site Design." *Electronic Commerce Research and Applications* 9, no. 2 (2010): 171–82. https://doi.org/10.1016/j.elerap.2009.05.004

Schubhan, Marc, Maximilian Altmeyer, Katja Rogers, Donald Degraen, Pascal Lessel, and Antonio Krüger. "Auditory, Visual, or Both? Comparing Visual and Auditory Representations of Game Elements in a Gamified Image-Tagging Task." *Proceedings of the ACM on Human-Computer Interaction* 8 (2024): 294. https://doi.org/10.1145/3677059

Souza, Vinícius Nunes Rocha. 2016. "Análise da Imagem Visual em Videogames." Master's thesis, Universidade Federal do Rio Grande do Sul. https://lume.ufrgs.br/handle/10183/149358

Stavropoulos, Vasileios, Rapson Gomez, Astrid Mueller, Murat Yucel, and Mark Griffiths. "User-Avatar Bond Profiles: How Do They Associate with Disordered Gaming?." *Addictive Behaviors* 103 (2020): 106245. https://doi.org/10.1016/j.addbeh.2019.106245

Steele, Claude M. "The Psychology of Self-Affirmation: Sustaining the Integrity of the Self." In *The Self in Social Psychology*, edited by R. F. Baumeister, 372–90. New York: Psychology Press, 1999.

Teng, Ching-I. "How Avatars Create Identification and Loyalty among Online Gamers: Contextualization of Self-Affirmation Theory." *Internet Research* 29, no. 6 (2019): 1443–68. https://doi.org/10.1108/INTR-05-2018-0222

Teng, Ching-I. "Impact of Avatar Identification on Online Gamer Loyalty: Perspectives of Social Identity and Social Capital Theories." *International Journal of Information Management* 37, no. 6 (2017): 601–10. https://doi.org/10.1016/j.ijinfomgt.2017.06.006

Teng, Ching-I., Tzu-Ling Huang, Zhuo-Han Yang, Wen-Jie Wu, and Gen-Yih Liao. "How Strategic, Offensive, and Defensive Engagement Impact Gamers' Need Satisfaction, Loyalty, and Game Usage." *International Journal of Information Management* 66 (2022): 102515. https://doi.org/10.1016/j.ijinfomgt.2022.102515

Trepte, Sabine, and Leonard Reinecke. "Effects of Life-Satisfaction, Game Competitiveness, and Identification with the Avatar." *Journal of Media Psychology* 22, no. 4 (2010): 171–84. https://doi.org/10.1027/1864-1105/a000022

Van Looy, Jan, Cédric Courtois, and Melanie De Vocht. "Player identification in online games: Validation of a scale for measuring identification in MMORPGs." *In Proceedings of the 3rd International Conference on Fun and Games* (2010): 126–34. https://doi.org/10.1145/1823818.1823832

Wolfendale, Jessica. "My Avatar, My Self: Virtual Harm and Attachment." *Ethics and information technology* 9 (2007): 111–19. https://doi.org/10.1007/s10676-006-9125-z

Wu, Shu-Ling, and Chiu-Ping Hsu. "Role of Authenticity in Massively Multiplayer Online Role Playing Games (MMORPGs): Determinants of Virtual Item Purchase Intention." *Journal of Business Research* 92 (2018): 242–49. https://doi.org/10.1016/j.jbusres.2018.07.035

Yang, Hao-Erl, Chi-Chuan Wu, and Kuang-Cheng Wang. "An Empirical Analysis of Online Game Service Satisfaction and Loyalty." *Expert Systems with Applications* 36, no. 2 (2009): 1816–25. https://doi.org/10.1016/j.eswa.2007.12.005

Zoltán, Bódi. "Digitális identitás – nyelvi identitás – digitális kommunikációs környezet." *Information Society/Információs Társadalom* 20, no. 3 (2020): 7–26. https://dx.doi.org/10.22503/inftars.XX.2020.3.1