Algorithm Literacy among Youth: Understanding and Navigating Social Media Algorithms

Shahd Ayman Nassif[*]

Prof. Mohamed Ben Moussa[**]

Abstract:

The study investigates how young adults comprehend and navigate the influence of algorithms on social media platforms. Through in-depth interviews with university students and recent graduates aged 18-26 in the United Arab Emirates, participants' awareness, perceptions, and strategies regarding algorithmic content curation were examined. Key themes identified include the recognition of personalization and bias, critical engagement with content, adaptive navigation strategies, balancing algorithmic opportunities and concerns, verifying online information, and safeguarding privacy. Findings underscore the necessity for enhanced digital literacy programs and increased transparency from social media platforms. These insights aim to empower users to effectively navigate the algorithm-driven digital landscape and foster a more informed and secure online community.

Keywords: Algorithm literacy, social media algorithms, digital content curation, youth digital engagement, online information verification

[*]**Master student ,college of communication,University of Sharjah,United Arab emirates ;Research assistant,research institute of humanities and social sciences, university of Sharjah,United arab Emirates**

[**] **Professor,college of communication,university of Sharjah,United arab Emirates**

أمية الخوارزميات بين الشباب: فهم وتصفح خوارزميات وسائل التواصل الاجتماعي

أ.شهد أيمن ناصيف *

أ.د. محمد بن موسى **

الملخص:

تستعرض الدراسة كيفية فهم الشباب وتأثير الخوارزميات على وسائل التواصل الاجتماعي. من خلال مقابلات معمقة مع طلاب جامعيين وخريجين حديثين تتراوح أعمارهم بين 18 و26 عامًا في الإمارات، تم فحص وعيهم واستراتيجياتهم لتنظيم المحتوى الخوارزمي. تضمنت الموضوعات الرئيسية الاعتراف بالشخصنة والتحيز، التفاعل النقدي مع المحتوى، استراتيجيات التنقل التكيفية، موازنة الفرص والمخاوف، التحقق من المعلومات وحماية الخصوصية. تُبرز النتائج الحاجة إلى تعزيز برامج الوعي الرقمي وزيادة الشفافية من منصات التواصل الاجتماعي، بهدف تمكين المستخدمين من التنقل بفعالية في العالم الرقمي وتعزيز مجتمع أكثر اطلاعًا وأمانًا.

أصبحت الخوارزميات جزءًا لا يتجزأ من تشكيل التجارب الرقمية، حيث تحول البيانات المدخلة إلى مخرجات مخصصة. تلعب دورًا محوريًا في تنظيم وتخصيص المحتوى، مما يؤثر بشكل كبير على الإدراك والسلوكيات والخطاب المجتمعي. مع تزايد تأثير الخوارزميات في حياتنا، أصبحت الحاجة لفهم نقدي لهذه الأنظمة أكثر أهمية، خصوصًا بين الشباب.

اعتمدت الدراسة منهجية بحث نوعية لاستكشاف الوعي الرقمي، مع التركيز على وعي الخوارزميات. تم جمع البيانات من خلال مقابلات معمقة شبه منظمة، مما أتاح للمشاركين مشاركة تجاربهم وأفكارهم. تم تحليل البيانات باستخدام تقنية التحليل الموضوعي، حيث تم تحديد الأنماط المتعلقة بالوعي بالخوارزميات.

كشفت المقابلات عن فهم معقد لدور الخوارزميات في الحياة الرقمية. تضمنت الموضوعات الرئيسية الاعتراف بالتخصيص والتحيز، التفاعل النقدي، استراتيجيات التنقل، وموازنة الفرص والمخاوف.

تظهر النتائج أن المستخدمين يصبحون أكثر مهارة في استخدام الخوارزميات لاكتشاف المحتوى، مما يعكس أهمية التعليم الرقمي المتقدم.

الكلمات الدالة: الوعي بالخوارزميات، خوارزميات وسائل التواصل الاجتماعي، تنظيم المحتوى الرقمي، مشاركة الشباب الرقمية، التحقق من المعلومات عبر الإنترنت

* **طالب ماجستير ،كلية الإتصال، جامعة الشارقة ، دولة الإمارات العربية المتحدة ؛ مساعد باحث ،معهد البحوث للعلوم الإنسانية والاجتماعية ،جامعة الشارقة ،دولة الإمارات العربية المتحدة**

** **أستاذ مساعد بكلية الإتصال، جامعة الشارقة**

1. Introduction

The ubiquity of algorithms in shaping digital experiences has become a defining feature of the modern age. These sophisticated computational procedures, which convert input data into tailored outputs, are integral to the functioning of social media platforms, news aggregators, e-commerce websites, and a myriad of other digital services. Algorithms play a pivotal role in curating and personalizing the content we encounter, significantly influencing our perceptions, behaviors, and societal discourse.

As algorithms become increasingly entrenched in our daily lives, the need for individuals, particularly youth, to develop a critical understanding of these systems has become paramount. Algorithm literacy, defined as the ability to comprehend the implications of algorithms across various domains, has emerged as an essential component of digital literacy. This study aims to explore how youth digital literacy skills shape their understanding and navigation of algorithmically curated content on social media platforms, as well as the strategies they employ to critically assess and counteract potential biases introduced by these algorithms.

The primary research problem addressed in this study is the lack of understanding among youth regarding how algorithms influence the content they see on social media. The significance of this problem lies in the substantial impact these algorithms have on shaping their digital and societal behaviors and perspectives. This study aims to address this issue by exploring the extent of young people's awareness of these algorithms and the strategies they employ to interact with them

2. Literature Review

The increasing influence of algorithms on our digital experiences has become a topic of growing interest and concern. To provide the necessary context for this study, it is important to review the existing literature on the role of algorithms and the significance of understanding them. This literature review explores the fundamental concepts of algorithms, the importance of algorithm literacy, and the implications of algorithmically driven media and societal landscapes. By investigating into these key themes, we can better understand the

challenges and opportunities that arise from the interplay between youth, digital platforms, and the algorithms that shape their experiences.

Algorithms influence our digital experiences, dictating the news we encounter, the entertainment we indulge in on social media, the tracks we play on music streaming services, our connections in online dating realms, and the products we consider and acquire online (Dogruel et al., 2022). They serve as digital gatekeepers, simplifying data acquisition, refining content, and honing predictive analytics, becoming increasingly integral to our daily interactions (Dwivedi et al., 2021). Notably, algorithms have become indispensable in personalizing content, often ranking social media content by relevance over Timing order (Barnhart, 2021). Given the digital age and the deluge of online information, algorithms play a crucial role in sieving and tailoring content to mirror user inclinations (Reed, 2016)

2.1Algorithm Literacy

Algorithm literacy is the ability to critically evaluate the implications of algorithms across various sectors, including economic, social, cultural, and political realms (Ridely et al., 2021). As an extension of information literacy, it underscores the importance of analyzing information sources and understanding their origins (Garingan et al., 2021). Bakke (2020) draws connections among digital, information, and algorithmic literacies, noting the diverse manifestations and levels of digital literacy recognized within the field of computing. Gurstein (2003) defines algorithm literacy as the skill to recognize the impact of algorithm-driven processes on personal and societal goals, as well as the capacity to utilize this knowledge effectively. Similarly, Koeing (2020) suggests that the core objective of algorithmic literacy is to comprehend the societal, political, and economic changes ushered in by technological advancements.

In the modern age, algorithm literacy has become indispensable. This is because algorithms profoundly influence our daily lives, making it essential for individuals to remain cognizant, comprehend, and critically evaluate them, ensuring autonomy when interacting with algorithm-powered systems (Moylan et al., 2023). As algorithms

increasingly shape mediums like communication technology and social media, much research applied to measure the depth of public understanding of these complex systems (Oeldorf et al, 2021). For instance, Swart (2021) investigates the impact of algorithmic curation on how young people consume news, shedding light on their comprehension and engagement with personalized news content. This, in effect, underscores their experiential familiarity with algorithms. Additionally, Lv et al. (2022) delve into teenagers' reluctance to accept algorithmic suggestions on short video platforms. Their findings reveal a relationship between perceived threats to freedom, algorithmic literacy, peer pressure, and the willingness to counteract algorithmic suggestions.

Comparative studies, such as those by Bakke (2020) and Gurstein (2003), emphasize the necessity of integrating algorithmic literacy into broader digital literacy frameworks. While Bakke (2020) focuses on the technical aspects, Gurstein (2003) highlights the socio-political implications, suggesting that a comprehensive approach to digital education must address both dimensions. The research by Oeldorf et al. (2021) and Swart (2021) further illustrates the need for nuanced educational strategies that not only teach the technical skills but also foster critical thinking about the societal impacts of algorithms

2.2Algorithms in Media and Society

Algorithms exert a significant impact on our societal and economic spheres, determining the content that reaches us (Kitchin, 2017). For instance, the way news is algorithmically curated, based on our social circles' behaviours and views, shapes public perception (Just and Latzer, 2016). Cohen (2018) suggests that this algorithmic curation aims to craft a media ecosystem tailored to each user's unique tastes. This pivotal role of algorithms in shaping the digital news landscape has raised concerns about their potential to skew public discourse (Redd, 2016). Schwartz et al (2015) point out that these algorithms, often perceived as "black boxes" by media professionals, can distort information consumption patterns. Indeed, algorithms significantly impact the daily online visual landscape, influencing user preferences, behaviours, and content creation (Schroeder, 2021; Napoli, 2013). Algorithms, particularly those employed on social media platforms,

have been known to be manipulated which in turn impacts society (Perez et al,2021). Recommendation algorithms play a crucial role in mediating online speech and thus shaping societal norms and discourse (Naryanan,2023). Recently, using algorithms in media has led to worries about the 'filter bubble' effect. This means people often see only what they already believe in, missing out on different views (Devito et al., 2017). As more people depend on these algorithms for news, it's important to know if we can trust these sources (Shin, 2022).

In examining the influence of algorithms on public opinion, it is crucial to consider the dual role played by virtual groups and algorithms themselves in shaping discourse. Regazz and Bouamama (2022) highlight how platforms like Facebook employ sophisticated algorithms that not only curate content based on user interactions but also reinforce the dominance of majority opinions through mechanisms such as likes, shares, and comments. This dynamic creates a "dictatorship" of sorts, where certain viewpoints are amplified while others are suppressed, contributing to a phenomenon known as the "spiral of silence." The study utilizes digital ethnography to analyze how these processes occur, revealing the complex interplay between user behavior and algorithmic design in dictating the visibility and prominence of public opinions on social media.

Comparative studies highlight varying perspectives on the role of algorithms in media. For example, Cohen's (2018) optimistic view of algorithms enhancing user experiences contrasts with Schwartz et al. (2015), who emphasize the risks of algorithmic biases. Schroeder (2021) and Napoli (2013) further explore these issues, noting that algorithms can reinforce existing societal biases, which can distort information consumption patterns.

2.3Digital literacy:

Bawden (2008) defines digital literacy as the mastery of accessing, organizing, interpreting, and sharing information, underscoring the technical prowess required in the digital age. It is further elaborated by Saputra et al. (2020) as an amalgamation of knowledge and skills vital for understanding, critiquing, and utilizing information, with a strong emphasis on ethical considerations for communication and interaction

in everyday life. Ribble et al. (2007) argue that digital literacy stands as a main element in grasping technology, enabling individuals to use it effectively and responsibly. Arafah et al. (2022) broaden this concept to include the capacity to decode and comprehend digital signals—both textual and visual—through cognitive processes, facilitating the interpretation and evaluation of digital media content.

The evolution of digital literacy, tracing back to the origins of computer and information literacy, has been documented by Yustika & Iswati (2020), highlighting its critical role in engaging with the global community. Harrgitai (2005) posits that digital literacy is as fundamental as traditional literacies like reading, writing, and arithmetic. Hargittai et al. (2010) stress the necessity for critical scrutiny of digital content, pointing to the disparities in internet skills and the imperative for digital literacy to include the capability to judge the trustworthiness and quality of online information. Jenkins (2009) underscores the significance of digital creativity and communication, spotlighting the participatory culture and the essential skills for content creation and dissemination.

The ramifications of digital literacy span across educational and professional spheres. Eshet (2004) proposes a conceptual framework for digital literacy that incorporates essential skills for navigating the digital era, underlining its significance within educational syllabi to equip students for the digital landscape. Boyd (2014) explores the social dimensions of digital literacy, asserting that navigating social media transcends technical ability, demanding an understanding of social conventions, privacy issues, and the formation of online identities. Livingstone (2008) investigates how digital literacy can facilitate safe online engagement, emphasizing that a nuanced understanding of digital spaces empowers individuals to manage privacy, discern their audience, and interact securely. This insight is particularly relevant in the realm of social media, where understanding the complication of privacy settings and the delineation between public and private spheres is important to digital literacy.

Elsayed (2023) focused on the impact of digital literacy programs in enhancing the ability of young individuals to critically assess and engage with digital content. Their findings suggest that participants

who underwent comprehensive digital literacy training demonstrated significantly improved skills in identifying misinformation, protecting their privacy, and engaging with diverse viewpoints online. This study highlights the importance of structured educational initiatives in fostering critical digital skills among youth.

2.4Who are social media Users?

Social media usage is predominantly high among young adults, particularly those aged 18 to 29, with 90 percent of this demographic actively engaging on various platforms. Globally, women were more likely than men to use social media; however, since 2014, this gender disparity has decreased significantly. In 2015, 68% of women and 62% of men used social media (Perrin, 2015). Similar trends are observed in the UAE, where digital engagement is substantial, but with different gender preferences. According to recent statistics from DataReportal (Digital, 2024), the UAE had 10.73 million social media users in early 2024, equating to 112% of its total population. Gender distribution among social media users in the UAE shows that 39.6% are female, and 60.4% are male. The demographics of social media users in the UAE reveal significant engagement across various age groups, with 18.7% of users aged 18-24 and 32.4% aged 25-34, highlighting the strong presence of young adults on social media platforms in the UAE. Specifically, Meta's ad audience data indicates that the majority of users are aged 25-34 (29.1%), followed by the 18-24 age group (13.1%) and 35-44 age group (17.6%).

Hasan et al. (2023) conducted a study to uncover audience perceptions of algorithmic organization on Facebook, aiming to understand their awareness of algorithms and the values they believe should be present within them. The study revealed a high level of algorithmic awareness among participants but found that users did not fully grasp the extent of human intervention behind these algorithms and its impact on their decisions. Users acknowledged the challenges in algorithmic organization, such as misjudging the importance of content and pushing unrelated content to users.

Moreover, the study noted that positive perceptions toward values like justice, impartiality, accountability, and transparency in algorithms

decreased among users. Wesam et al. emphasized the need for users to play a proactive role in reporting inappropriate content and understanding how algorithms work, including the customization and recommendation processes, to address issues of content repetition and bias. This highlights the critical role of user education in improving algorithmic literacy and fostering a more transparent and accountable digital environment.

2.5 Digital literacy and Youths

A systematic exploration conducted by Smart Learning Environments, which reviewed 43 scholarly articles, underscored a growing interest in the study of digital literacy. This investigation, primarily utilizing qualitative methodologies, unveiled key themes such as literacies, competencies, skills, and critical thinking. It underscored the complexity of digital literacy, highlighting that it extends well beyond simple tech-savviness (Tinmaz et al., 2022). Furthermore, the significance of digital literacy within educational settings, particularly through online and blended learning frameworks, has received considerable attention. Kusuma et al. (2022), emphasized the importance of digital literacy as a crucial component for success in online education. Their findings suggest that students who possess advanced digital literacy skills are more efficient in sourcing, comprehending, and communicating information digitally. This skill set is increasingly recognized as indispensable for academic success, particularly within the evolving landscape of online and hybrid learning models. A significant study by Sawartay et al. (2021) published in Frontiers in Psychology delved into the myriad online dangers that young individuals face, categorizing these hazards into issues related to content, conduct, and contact. The research stressed the pivotal role of digital literacy in navigating these challenges, calling for a holistic educational approach that incorporates privacy management, ethical conduct online, and awareness of safety protocols.

3. Research Questions

1. How do youth digital literacy skills influence their understanding and navigation of algorithmically curated news

content on social media platforms, and what strategies do they employ to critically assess and counteract potential biases introduced by these algorithms?"

2. How does understanding of social media algorithms and digital literacy skills impact youth ability to critically evaluate and navigate information on social media platforms?"
3. How does Algorithm literacy shape users understand, trust, and engagement with personalized content recommendation algorithms on digital platforms?

4. Methodology:

4.1 Research design and instruments.

This study adopts a qualitative research approach to explore digital literacy, with a particular focus on algorithm literacy among youth. The qualitative method is chosen for its strength in capturing rich, detailed narratives that can reveal the complexities of human behaviour and attitudes towards digital algorithms. This approach facilitates an in-depth understanding of participants' perceptions, experiences, and the contextual factors influencing their digital literacy. Data was collected through semi-structured in-depth interviews. This method allows for flexibility in the discussion, enabling participants to share their experiences and thoughts in their own words while still guiding the conversation with a set of prepared questions. These questions focused on participants' understanding of digital algorithms, their interactions with digital platforms, and their perceptions of how these algorithms influence their content consumption and online behaviour. Interviews were be conducted in a quiet, private setting to ensure confidentiality and comfort for the participants. Each interviews lasted approximately 20 minutes. With the participants' consent, interviews were audio-recorded to facilitate accurate transcription and analysis. Participants were informed that they can withdraw from the study at any time without any consequences. The data from the interviews was analysed using thematic analysis technique. This method involves transcribing the interviews, reading through the transcript’s multiple times, and identifying patterns or themes related to algorithm literacy among youth. A method well-suited for identifying, analysing, and reporting

patterns (themes) within qualitative data. This analysis involved a rigorous process of coding the data, identifying significant themes, and interpreting the findings in the context of the study's objectives. The aim is to distil a comprehensive understanding of how young people perceive and interact with social media algorithms and the implications of these interactions. This study has been designed with ethical considerations at its core. Prior to participation, all participants were provided with an information sheet detailing the study's purpose, what participation involves, and their rights, including confidentiality and the right to withdraw. Informed consent was obtained from all participants.

4.2Thematic Analysis:

The thematic analysis was conducted using Braun and Clarke's (2006) six-step methodology, which provides a rigorous framework for interpreting complex data. The steps followed include: 1) becoming familiar with the data through repeated readings and note-taking; 2) generating initial codes by identifying features of the data systematically; 3) searching for themes by collating codes into potential themes; 4) reviewing themes to ensure they accurately reflect the coded extracts and the entire data set; 5) defining and naming themes, refining the specifics of each theme and the overall story they tell; 6) writing up the analysis, weaving together the narrative in a way that connects the themes to the research questions and literature. This method of thematic analysis is particularly well-suited for exploring the intricate ways in which algorithms influence the experiences, perceptions, and literacy of youth, providing deep understandings into emerging digital cultures.

4.3Participants

A total sample of 15 interviews were completed over two months, from February 2024 to April 2024. Participants were selected using purposive sampling to ensure a diverse representation of university students and recent graduates in the United Arab Emirates. The criteria for selection included:

- Age: Participants were between 18-26 years old to represent young adults who are likely to engage regularly with digital platforms and algorithms.
- Gender: Both male and female participants were included to ensure gender diversity.
- Occupation: Participants were either current university students or recent graduates across various fields to provide a range of perspectives on digital literacy and algorithmic engagement.

Participants were approached through university networks and social media platforms. Those who expressed interest were given detailed information about the study and provided informed consent before participation. The demographic and participant information is summarized in Table 1.

Table 1: List of Participants.

Name	Age	Gender	Occupation
Maryam	26	Female	Nutritionist
Mira	20	Female	Engineering student
Manar	20	Female	Marketing student
Marwan	24	Male	Software engineer
Mansoor	25	Male	Dentist
Noura	25	Female	Graphic designer
Ammar	22	Male	Business student
Sara	21	Female	Medical student
Wael	26	Male	Accountant
Yousra	21	Female	Law student
Mohamed	20	Male	Engineering student

Name	Age	Gender	Occupation
Zoheir	22	Male	English Literature student
Tala	21	Female	Art student
Farah	20	Female	Computer science student
Rima	22	Female	Social science student

5. Theoretical Framework:

5.1Definition of Algorithms

Algorithms can be defined as "structured procedures that convert input data into a specific output", acting as coded instructions that facilitate various tasks. Their role in social media platforms is undeniable (Gillespie, 2014). These algorithms, sophisticated in design, combine user data, historical browsing patterns, and collective user behaviours to curate content, ultimately shaping personalized digital experiences for users (Cohen, 2018).

In simple, an algorithm is a computerized process that takes in specific inputs and transforms them into desired outputs following a well-defined procedure (Cormen et al., 2022). Algorithms are the foundational rules and guidelines that drive computer systems (Dung et al., 2022). Arujo et al. (2020) highlighted that algorithms operate independently, making determinations without the need for human oversight. Their decision-making prowess hinges on data analytics, advanced statistical techniques, and computational might. In earlier times, approaches like regression testing were fundamental to algorithmic decisions (Mahmud et al., 2022).

5.2Technology Acceptance and Technological Determinism

This study draws on the theories of Technology Acceptance and Technological Determinism to understand how algorithms influence youth. The Technology Acceptance Model (TAM), developed by Fred Davis in 1989, helps explain how young people adopt and interact with algorithmic technology, emphasizing perceived usefulness and

ease of use as key factors (Davis, 1989). Technological Determinism, prominently discussed by scholars like Marshall McLuhan and Langdon Winner, provides insight into how technology drives social and cultural changes, affecting individual behaviors and societal structures (McLuhan, 1964; Winner, 1977). These theoretical frameworks enrich our understanding of the interplay between youth and algorithmic systems in digital environments.

5.3 Key Variables

To clarify the study's focus, the key variables identified include digital literacy skills, which refer to the ability of youth to understand and navigate digital platforms, and algorithm literacy, which pertains to the awareness and understanding of how algorithms influence content on social media. These are the independent variables. The dependent variables are content engagement, indicating how youth engage with content curated by algorithms; information verification, which involves the strategies used by youth to verify the credibility of online information; and privacy practices, which refer to the measures taken by youth to protect their privacy online.

5.4 Interview Question Design

In the design of our interview questions, methodologies and insights from Joëlle Swart's research were incorporated, which profoundly investigates how young people interact with news on social media. Swart's comprehensive analysis, primarily focusing on the tactics of news literacy including access, evaluation, and engagement with news.

This framework has been reoriented to extend beyond news literacy, embracing broader aspects of digital and algorithm literacy, as shown in Table 2. The formulation of interview questions, in a passive construct, aims to thoroughly examine users' comprehension and engagement in digital realms, drawing from the analytical perspectives and outcomes of Swart's study.

Table 2: Investigating Social Media Users' Digital Literacy and Interaction with Algorithms.

Category	Question	Objective
Understanding (Digital Literacy)	1. How do you determine the credibility of information you find online?	To assess critical thinking skills in digital content evaluation.
	2. How much do you know about how digital content is created and by whom?	To understand user awareness of digital content production.
Understanding (Algorithm Literacy)	3. How do you believe social media algorithms determine what content to show you?	To assess users' understanding of algorithms in content curation.
Awareness (Digital Literacy)	4. Which digital platforms do you use regularly and how proficient are you in using them?	To explore proficiency in using diverse digital platforms.
Awareness (Algorithm Literacy)	5. Do you think social media algorithms can be biased? If yes, in what way?	To assess awareness of bias and fairness in algorithms.
Perception (Digital Literacy)	6. What measures do you take to protect your privacy and security online?	To gauge awareness and practices regarding online privacy and security.
Perception (Algorithm Literacy)	7. Do you think social media recommendations limit or broaden your exposure to diverse viewpoints?	To explore the influence of algorithms on information diversity.
Digital Skills and Algorithm Interaction	8. How do you use digital tools for communication and collaboration?	To assess communication skills in a digital environment.
	9. How transparent do you think social media platforms are about their use of algorithms?	To understand user perspectives on algorithm control and transparency.

	10. How do you differentiate between different types of digital content (e.g., news, blogs, advertisements)?	To assess understanding of content categorization in digital platforms.
	11. How do you think your likes, shares, and comments influence what you see on social media?	To explore user interaction with algorithmic decisions.
	12. Do you use any specific tools or websites to check the reliability of online content?	To understand methods used for evaluating digital information.
	13. How do you perceive the impact of algorithms on your experience with social media or digital platforms—primarily positive, negative, or somewhere in between? Could you explain your view with examples?"	To explore/discover the algorithm skills of the participants

6. Findings and Analysis

The in-depth interviews conducted with the study participants revealed a multifaceted understanding of the role of algorithms in their digital lives. The analysis of these findings uncovered several prominent themes that shed light on the ways in which youth engage with, perceive, and navigate the algorithm-driven content ecosystems: 1) Awareness and understanding of algorithmic influence, 2) Navigating algorithm-driven content ecosystems, 3) Balancing opportunities and concerns with algorithms, 4) Perception and verification of online information, and 5) Privacy concerns and online security practices. By exploring these key themes in detail, we can gain valuable insights into the evolving landscape of algorithm literacy and its impact on individual and societal well-being in the digital age. The summarized conclusions and observations are shown in Figure 1.

6.1Awareness and Understanding of Algorithmic Influence

In exploring the theme of awareness and understanding of algorithmic influence, participants across various demographics shared insights that underscore the complexity of algorithmic interactions in their digital lives. These interactions highlight users' varying levels of awareness and their strategies to navigate this landscape.

6.1.1 Finding 1: Recognition of Personalization and Bias

Participants expressed a nuanced understanding of how algorithms tailor experiences by personalizing content based on past interactions. For instance, Mira, an engineering student, noted that social media platforms like Instagram "always try to show me and repeat for me content or a post that I had engaged with previously," illustrating a common practice of algorithms to foster user engagement through familiar content (Maryam, 26 years).

However, this personalization is also recognized to potentially foster biases. Ammar discussed how "the algorithms can be biased in a way they want the audience sometime to know about important case and issue and sometimes they intend to hide the contents on us," highlighting the manipulative potential of these systems.

6.1.2 Finding 2: Critical Engagement with Content

Participants also demonstrated critical engagement strategies in their interactions with algorithmically curated content. Yusra, a law student, for instance, used multiple methods to verify the credibility of information, such as checking the publication date and the domain's credibility, which underscores a proactive approach to combating misinformation.

Similarly, Manar's method of "cross-referencing with established news outlets or academic publications" when verifying information online shows a sophisticated strategy to ensure the accuracy of content consumed, reflecting a deep understanding of the digital information ecosystem. Maryam emphasized checking for spelling mistakes and the source's credibility as indicators of reliable information. Others

added that they compare sources and checks the publication date to ensure information reliability (Marwan, 24).

6.1.3 Finding 3: Awareness of Algorithmic Personalization and Its Effects

Participants like Zuhair and Farah demonstrated a high level of awareness regarding the personalization effects of algorithms on their social media feeds. Zuhair specifically noted that his interactions, such as likes and comments, directly influence the content he is shown, leading to a more personalized feed. This awareness extends to recognizing the potential for these algorithms to create echo chambers by continuously presenting content that aligns with previously expressed interests, thus limiting exposure to diverse viewpoints unless actively countered. For instance, Zuhair mentioned that engaging with technology-related content resulted in an increased presence of similar content in his feed, reinforcing his interests through the platform's algorithmic responses.

6.1.3.1Finding 4: Recognizing Bias and Manipulation in Algorithmic Content Curation

The understanding that algorithms can inherently possess biases due to the data they are trained on was clearly articulated by Rima. She pointed out that these biases are not just technical but can also be socio-culturally skewed, which can affect the visibility and engagement of content across different demographic groups. This recognition is crucial as it highlights an understanding of the underlying mechanics of content curation beyond just user engagement, considering the broader implications of algorithmic decision-making. As an Example, Rima discussed how social media algorithms may favor sensational or controversial content to drive engagement, potentially distorting the information landscape and amplifying more extreme viewpoints.

6.1.4 Discussion

The recognition among participants of how their interactions shape their social media experiences points to an evolved understanding of the personalization tactics employed by these platforms. As observed with Zuhair, users are becoming increasingly aware of how their

digital behaviors, such as likes and comments, directly influence the content algorithms show them. This understanding is pivotal because it reflects a broader awareness of the mechanisms behind content curation that go beyond the surface level of user engagement. It also highlights a critical self-awareness among digital natives about the role they play in sculpting their informational ecosystems, which is a significant shift towards more informed digital consumption practices (Russell et al., 2023; Yoo et al., 2023). Rima's insights into the inherent biases of social media algorithms reveal an important critique of how these platforms manage visibility and engagement. Her understanding that algorithms might propagate certain biases reflects a critical stance on the ethical considerations of algorithmic curation. This discussion is particularly relevant in the context of ongoing debates about the role of technology in perpetuating societal biases and the responsibility of tech companies to address these issues (Moura, 2023; Vlasceanu et al., 2022). Tala's proactive approach to engaging with diverse content underscores a key strategy in combating the limitations of algorithmic filtering. This strategy is vital in an era where digital bubbles and echo chambers are prevalent. By choosing to explore content outside their typical preferences, users like Tala are not only expanding their own horizons but are also actively countering the narrowing influence of personalized algorithms (Borgs et al., 2023; Dean et al., 2022).

The recognition of algorithmic bias presents both challenges and opportunities. On one hand, it demands more transparency and accountability from social media companies. On the other, , fostering a more questioning and discerning online community (Raub et al., 2018). This awareness necessitates enhanced digital literacy programs that educate users not just about the existence of algorithms but also about their long-term implications on information consumption and privacy. Encouraging users to diversify their digital interactions and to critically assess the content they consume can lead to more robust digital engagement strategies that go beyond passive consumption (Wissinger, 2017; Oeldorf et al., 2023). Additionally, users can benefit from employing strategic approaches to content exploration, such as deliberately setting out to follow accounts or engage with content that varies from their usual preferences. Such strategies can enrich users'

understanding and appreciation of different perspectives, fostering a more inclusive digital dialogue (Haupt et al., 2023).

6.2Navigating Algorithm-Driven Content Ecosystems

In the context of navigating algorithm-driven content ecosystems, participants shared their experiences and strategies, revealing how they adapt to and interact with the complex digital environments shaped by algorithms.

6.2.1 Finding 1: Adaptive Navigation Strategies

Participants actively adapt their behavior to better navigate the content recommended by algorithms. For example, Sara discussed how social media algorithms seem to pick up on spoken conversations, affecting the content displayed in her feeds. This has led her to be more mindful of her online and offline discussions, recognizing the extent to which these algorithms interpret and respond to user behavior. Manar's experience with finding an online case study through targeted search efforts illustrates a proactive approach to leveraging algorithmic systems for academic and professional development. This ability to use algorithms to one's advantage indicates a sophisticated level of understanding and engagement with digital platforms.

6.2.2 Finding 2: Challenges in Algorithmic Ecosystems

Despite the advantages, there are significant challenges that participants face, primarily related to the biases inherent in algorithmic systems. Wael, an accountant, noted that algorithms could act as a "jail," limiting exposure to diverse content and reinforcing echo chambers. This indicates a critical awareness of the limitations and potential pitfalls of algorithm-driven content curation (Wael, 26 years).

6.2.3 Finding 3: Understanding of Algorithm-Driven Ecosystems

Participants like Farah express a keen understanding of how algorithms function to tailor content based on user engagement metrics. Farah acknowledges that while algorithms are designed to keep users engaged on the platform by showing content that aligns with their previous interactions, this can also result in a personalized experience that may limit exposure to a broader array of topics. This

understanding highlights the dual role of algorithms in enhancing user experience while potentially constraining the diversity of content they encounter. Farah notes that if she frequently engages with content about innovative technologies, algorithms tend to show her more of such content, which might restrict her exposure to other important areas unless she makes a conscious effort to diversify her interests.

6.2.4 Finding 4: Impact of Algorithms on Content Discovery and User Behavior

Tala's experiences illustrate how social media algorithms can influence user behavior by subtly guiding the content discovery process. She mentions that algorithms can enhance her exposure to new ideas and cultural experiences, especially when optimized to introduce content diversity. However, this is heavily dependent on the underlying algorithmic design, which can either promote a broad spectrum of content or narrow down the feed to reflect established user preferences. Tala appreciates the potential of algorithms to introduce her to new content areas, enriching her artistic inspirations and broadening her creative perspectives.

6.2.5 Discussion

These findings demonstrate that while users are becoming adept at leveraging algorithms to discover and engage with content, they are also increasingly aware of the need to maintain a critical stance towards the content they are presented with. This dual approach—both using and critically assessing algorithms—is essential for effectively navigating algorithm-driven content landscapes (Espinoza et al., 2023; Mniestri et al., 2022; Li et al., 2023). The acknowledgment by users like Farah that algorithms can limit content diversity underscores the need for digital platforms to enhance their algorithmic approaches to foster a more inclusive and varied content ecosystem. This awareness is crucial for developing digital platforms that support a balanced content strategy, mitigating the risks of over-personalization and fostering a more comprehensive user experience (Choi et al., 2023; Sclavani et al., 2023). Tala's experience illustrates the significant role of algorithms in shaping cultural and intellectual exposure, highlighting the potential of algorithms as tools for cultural education

and broadened understanding, provided they are carefully managed to avoid reinforcing existing prejudices and biases (Stinson, 2022; Gillespie, 2016). Mohamed's adaptive strategies reflect a growing trend among users to not just understand but actively manage and counteract the influences of algorithms. This proactive engagement is essential for fostering a more dynamic and interactive digital experience, where users feel empowered to shape their digital environments (Miguel et al., 2021).

The understanding of algorithm-driven ecosystems encourages discussions about the ethical responsibilities of tech companies in managing the impact of their algorithms. It also highlights the practical need for platforms to develop more sophisticated algorithms that can balance user engagement with content diversity (Martin, 2019). Policy interventions should guide the development and deployment of algorithms to enhance their role in cultural and educational enrichment. Additionally, educating users about how algorithms work and how they can be managed could empower them to better navigate and benefit from these systems (Miczka, 2022). Encouraging proactive digital citizenship can lead to richer and more diverse digital experiences, which are essential in a globally connected world (Cluver et al., 2014).

6.3Balancing Opportunities and Concerns with Algorithms

This theme examines how users balance the opportunities provided by algorithms with the concerns these systems generate, particularly in terms of privacy, bias, and information echo chambers.

6.3.1 Finding 1: Leveraging Algorithmic Opportunities

Many participants acknowledged the benefits of algorithms in enhancing their digital experiences by personalizing content to their preferences. Ammar highlighted how algorithms helped him discover communities of interest on platforms like Reddit, significantly enriching his online engagements and providing avenues for personal and professional growth. Similarly, Manar appreciated how algorithms could surface relevant academic content, aiding her studies and research efforts, showcasing the opportunities algorithms present in educational and professional contexts.

6.3.2 Finding 2: Addressing Algorithmic Concerns

Conversely, there is a strong awareness of the concerns associated with algorithmic decision-making. Wael discussed how algorithms could confine users to content bubbles, limiting exposure to diverse perspectives and potentially reinforcing existing biases. This concern is echoed by Sara, a 21-year-old medical student, who noted that algorithms could promote content that aligns with commercial interests or the developers' biases, sometimes at the expense of content diversity and accuracy.

6.3.3 Finding 3: Opportunities for Enhanced Personalization and Efficiency

Participants like Tala highlight the opportunities presented by algorithms to enhance personalization in their digital interactions. She appreciates the algorithms' ability to streamline and customize her social media feeds, which not only saves time but also enhances her experience by presenting content that is more relevant to her interests. This level of personalization is seen as a major benefit of algorithm-driven platforms, facilitating more engaging and tailored user experiences. Tala enjoys how algorithms curate her feed to include content about art and design, which directly supports her educational and professional activities as an art student.

6.3.4 Finding 4: Concerns Over Privacy and Data Manipulation

The concern about privacy and data manipulation emerges strongly in the responses from participants like Rima and Mohamed. They express apprehension about how deeply these algorithms delve into personal data to shape user experiences and the potential for misuse of this data. There is a growing unease about the transparency with which data is handled and the extent to which information is used to manipulate user behavior. Rima is wary of how algorithmic data collection can lead to privacy invasions, questioning the ethical boundaries of such practices and the adequacy of current regulations to protect user privacy.

6.3.5 Discussion

The balance between seizing algorithmic opportunities and mitigating their associated risks is delicate. Users who leverage algorithms for personal gain also recognize the need for critical engagement with these systems to avoid manipulation and misinformation. This dual approach reflects a mature understanding of the digital environment, where users must continuously negotiate their way through algorithmically curated landscapes (Metzeler et al., 2022; Fei et al., 2023; Jeong et al., 2022). The positive aspects of algorithm-driven personalization are clear in their ability to enhance user satisfaction and efficiency. However, this benefit must be balanced against potential drawbacks. It's crucial for platforms to design their algorithms to not only focus on engagement but also to incorporate features that promote informational diversity and educational content, thus supporting a well-rounded user experience (Eg et al., 2023; Soui et al., 2022). Rima and Mohamed's concerns highlight critical issues surrounding the transparency of algorithmic operations and the use of personal data. Users' apprehension about privacy invasions and data manipulation points to a significant trust gap between digital platforms and their users. Farah’s experience with echo chambers underscores the need for algorithms that do more than just reflect users' existing preferences. The challenge is designing algorithms that actively introduce users to opposing viewpoints and diverse content, thereby broadening their perspectives (Gao et al., 2023).

To maximize the benefits of personalization while minimizing potential harms, digital platforms need to adhere to ethical guidelines that prioritize user welfare over mere engagement metrics. This includes providing users with clear options to control how their data is used and ensuring that personalization algorithms uphold privacy standards (Gordon et al., 2022; Aromna et al., 2022). Addressing these concerns requires stringent data protection policies and greater transparency from platforms about how user data is utilized. Encouraging or mandating disclosures about data usage and allowing users more control over their data can help rebuild trust and ensure a more secure online environment (Wang et al., 2023; Fainmeser et al., 2023). Platforms should consider integrating algorithmic features that

routinely expose users to content from different cultures, ideologies, and disciplines. This would not only enrich the user's digital experience but also foster a more informed and tolerant online community (Steepnik, 2022).

6.4Perception and Verification of Online Information

This theme explores how individuals assess the credibility of the information they encounter online and the strategies they employ to verify such information, highlighting their engagement with content in an age where misinformation can easily proliferate.

6.4.1 Finding 1: Strategies for Information Verification

Participants expressed a variety of methods used to determine the credibility of online information. For instance, Noura, a graphic designer, emphasizes a methodical approach, checking the source's reliability, corroborating with established outlets, and evaluating the author's reputation and the content's timeliness before trusting the information. Similarly, Yusra uses tools like Snopes and FactCheck.org to verify controversial or unlikely claims, showcasing a proactive approach to safeguarding against misinformation by relying on recognized fact-checking resources.

6.4.2 Finding 2: Awareness of Misinformation

The participants also displayed an acute awareness of the potential for encountering misinformation online. Wael, for example, points out the tendency of social media algorithms to create echo chambers, which can limit exposure to a broader range of viewpoints and potentially facilitate the spread of misinformation. Mira's observations further highlight this concern, as she notes that algorithms often push content based on past interactions, which can skew perceptions and limit informational diversity.

6.4.3 Finding 3: Awareness of Bias in Digital Content

Participants display a high level of awareness regarding potential biases in digital content. Tala notes that understanding the creator's background and the purpose behind the content is crucial in assessing potential biases. This awareness influences how participants consume and interact with online content, guiding them towards more balanced

and informed perspectives. Tala actively looks for the presence of various viewpoints and evaluates the balance of presentation in the content she consumes, helping to mitigate the influence of any potential bias.

6.4.4 Finding 4: Reliance on Fact-Checking Tools

The use of specific tools or websites to check the reliability of online content is a common practice among participants. Mohamed, for instance, mentions using fact-checking websites like Snopes and FactCheck.org to verify the credibility of online information. Mohamed uses these tools as essential parts of his toolkit to discern truth from misinformation, which is particularly valuable in the digital age where information spreads rapidly across platforms.

6.4.5 Discussion

The insights from participants underscore the critical need for digital literacy that extends beyond basic internet use to include sophisticated strategies for discerning and verifying online information. The ability to critically evaluate the credibility of content is paramount as individuals increasingly rely on digital platforms for news, education, and personal interactions (Jones et al., 2022; Karanfiloglu et al., 2022; Tynes et al., 2021). The participants' awareness of bias in digital content underscores the need for educational tools that help users recognize and understand the biases inherent in different types of digital media. Tala's approach to critically assessing content for bias and balance offers a model for how users can maintain a critical stance towards the information they consume (Tynes et al., 2021). The reliance on fact-checking tools highlights the importance of these resources in the information verification process. As seen with Mohamed, these tools are integral in combating misinformation and ensuring that users are basing their decisions and views on accurate information (Nygren et al., 2021; Moreno et al., 2021).

Addressing these findings requires enhancing educational initiatives that focus on digital literacy, particularly in recognizing and mitigating biases and misinformation. This includes integrating fact-checking tools into everyday digital practices and promoting critical engagement with online content. Such initiatives can help build a

more informed and discerning digital citizenry, capable of navigating the complexities of the modern information ecosystem.

6.5 Privacy Concerns and Online Security Practices

This theme focuses on the privacy concerns and online security measures that individuals implement to protect their personal information in an increasingly digital world.

6.5.1 Finding 1: Implementation of Security Measures

Participants described a variety of strategies to safeguard their privacy online. For instance, Sara takes proactive measures by refusing cookies on websites to prevent tracking and hacking and being vigilant about logging out of accounts to protect her data from unauthorized access. Similarly, Wael emphasizes the importance of not sharing confidential information like photos, mobile numbers, and credit card details online, reflecting a cautious approach to personal data sharing.

6.5.2 Finding 2: Concerns over Privacy Violations

There is a significant concern among participants about how their data is handled by social media platforms and other online entities. Ammar voices concern over how algorithms can manipulate user experiences and potentially lead to privacy violations. He notes that while these platforms provide convenience and tailored content, they also have the capability to track and analyze personal data extensively, which can be invasive. Noura echoed these sentiments, pointing out the inherent biases in algorithms that not only affect content visibility but can also lead to discriminatory practices in data handling and privacy breaches.

6.5.3 Finding 3: Proactive Measures for Online Privacy and Security

Participants like Farah and Tala show that they take proactive steps to protect their online privacy and security. Farah uses a combination of strong, unique passwords, encrypted communication apps, and careful management of app permissions to safeguard her online presence. Tala similarly emphasizes the importance of using encryption tools for sensitive communications and being cautious about sharing personal information on social media. Farah also regularly updates her privacy

settings on social media and other online platforms to control what information is visible and who can see it, illustrating a deliberate approach to maintaining online privacy. Also, other participants mentioned using strong passwords, VPNs, and adjusting privacy settings as essential measures to protect his online security (Marwan, 26 years).

6.5.4 Finding 4: The Role of User Education in Enhancing Security Practices

The need for better user education on privacy and security practices is highlighted by the proactive measures participants take and their concerns about data privacy. This suggests that while users are aware of privacy issues, there is still a significant need for education on effective privacy and security practices to broaden these behaviors across a wider user base. Tala uses sophisticated security measures but also advocates for the importance of user education in helping individuals understand and implement effective security practices to protect their digital identities.

6.5.5 Discussion

The proactive steps taken by participants like Farah and Tala demonstrate an informed approach to managing online privacy and security. This behavior is crucial in today's digital environment, where data breaches and privacy violations are common. Encouraging such practices across all users can significantly enhance individual security and contribute to the overall safety of the digital ecosystem (Yousef, 2018; Susanto et al., 2021). Digital platforms need to support these user efforts by providing clear, accessible tools and options for managing privacy settings. Additionally, platforms should be more transparent about how they collect, use, and share user data, which could help alleviate some of the trust issues users like Mohamed and Rima have expressed (Wang et al., 2023; Lin et al., 2022).

The data shows a strong awareness and proactive management of online privacy concerns among users. However, there remains a gap between the desire for privacy and the actual practices that can fully protect users from potential breaches. This gap suggests the need for more robust and user-friendly tools to manage privacy settings, as

well as clearer information from platforms about how user data is used and protected (Ashger et al., 2022; Ingole et al., 2023; Tao et al., 2023). The importance of user education in enhancing online security practices cannot be overstated. As participants demonstrate, even those who are relatively well-informed can benefit from continued education on the best practices for online security and privacy (Asker et al., 2023; Rahman et al., 2020).

Organizations, educators, and digital platforms should work together to develop and disseminate educational materials that cover the latest in online security practices and the importance of maintaining privacy. This could include workshops, online courses, and integrated tips within platforms that guide users on how to manage their digital footprints effectively (Kumar et al., 2023; Bhagavatula et al., 2022).

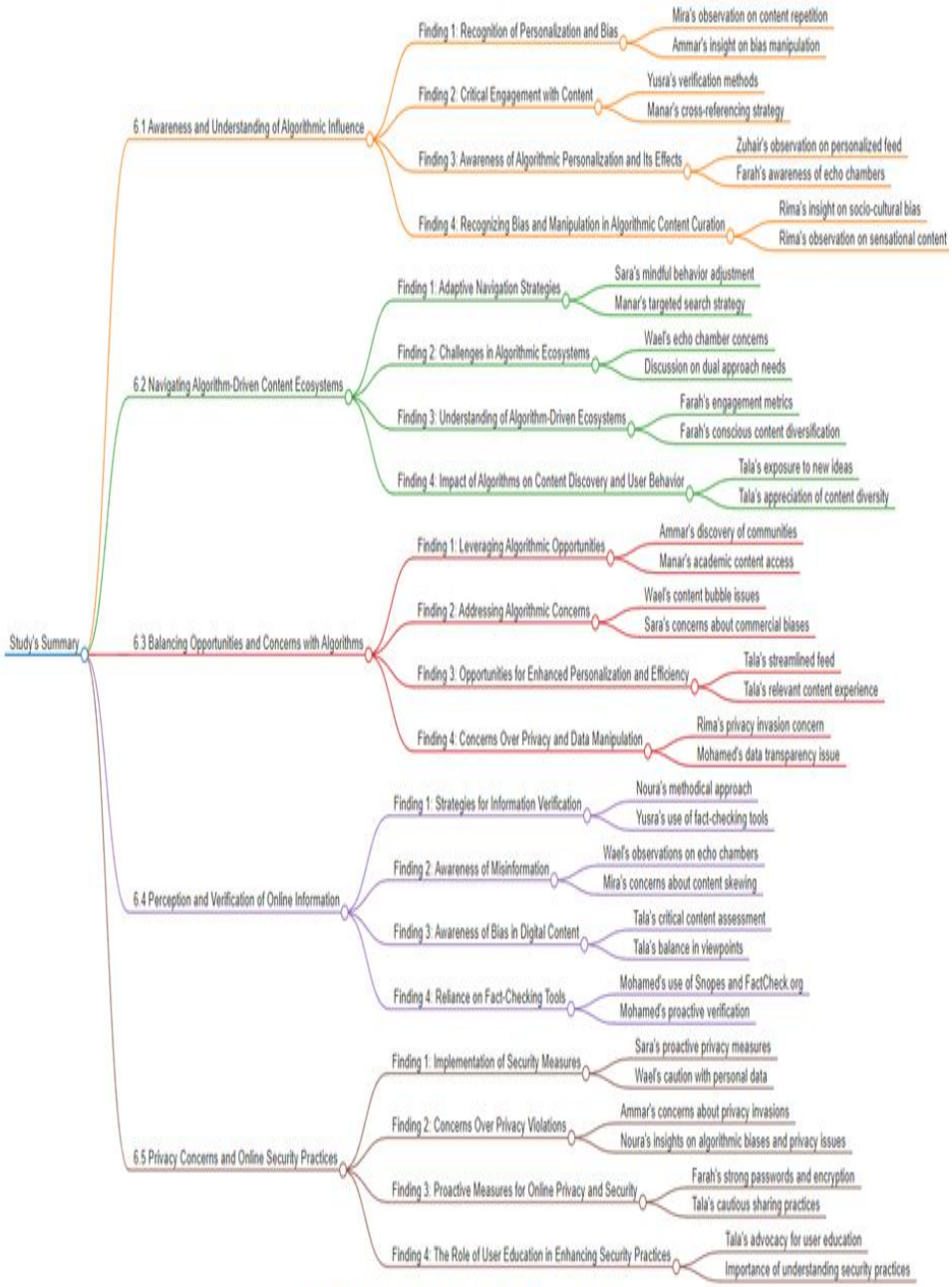

Figure 1: Study's summary and conclusions

7. Conclusions and final remarks

This research explored five critical themes regarding the interaction between users and algorithmic systems in digital environments: awareness and understanding of algorithmic influence, navigating algorithm-driven content ecosystems, balancing opportunities and concerns with algorithms, perception and verification of online information, and privacy concerns and online security practices. These themes highlight the complexities of digital engagements, and the strategies users employ to navigate, leverage, and counteract algorithmic influences.

7.1Observations and Recommendations

- Users showed a strong awareness of how algorithms shape their digital experiences and employed strategies to benefit from these systems while mitigating risks. Enhancing digital literacy programs can help users better navigate these landscapes.
- Users employed various methods to verify the credibility of digital content, such as cross-referencing information and using fact-checking websites. Platforms can support this by integrating robust fact-checking tools and clearer indicators of content source and type.
- Privacy concerns are paramount, with users adopting multiple security measures to protect their personal information. There is a need for better security tools and practices. Platforms should prioritize transparency and user control over data to build trust and provide a safer online environment.
- Users recognize the ethical implications of algorithms. Developers and platforms should ensure these systems promote fairness, accuracy, and diversity while avoiding biases. Transparency and fairness in algorithmic processes are crucial to avoid reinforcing biases.
- A collaborative approach involving users, developers, platforms, and regulators is needed to establish standards ensuring algorithms operate transparently and ethically. Policy interventions and enhanced transparency from platforms can help address privacy concerns and build user trust.

7.2Final Remarks

The interaction between users and algorithms is dynamic and reflects broader societal shifts toward a digital world. Ongoing research, user education, platform accountability, and regulatory foresight are essential to shaping a beneficial, fair, and inclusive digital landscape. These efforts will help harness the potential of digital technologies while safeguarding against risks, fostering an informed, secure, and empowered digital society.

These conclusions emphasize the importance of equipping users with the skills and knowledge to navigate algorithmic systems effectively. As digital platforms become more integral to daily life, creating an environment of transparency, ethical design, and robust user education is crucial for ensuring a balanced and fair digital future.

8. References:

[1] Araujo, T., Helberger, N., Kruikemeier, S., & De Vreese, C. H. (2020). In AI we trust? Perceptions about automated decision-making by artificial intelligence. AI & society, 35, 611-623.

[2] Armano, E., Briziarelli, M., & Risi, E. (2022). Digital platforms and algorithmic subjectivities (p. 268). University of Westminster Press.

[3] Asgher, S., Latif, F., & Tahir, N. (2022). Online Behavioral Advertising: Do Awareness and Privacy Concerns Protect the Users. Journal of Development and Social Sciences, 3(4), 165-174.

[4] DataReportal. (2024). "Digital 2024: The United Arab Emirates." Retrieved from https://datareportal.com/reports/digital-2024-united-arab-emirates in 10-07-2024.

[5] Regaz, A., & Bouamama, A. (2022). The Public Opinion Shaping Between The Virtual Groups Dictatorship And Algorithms Dictatorship: A Critical Reading In Facebook Working Mechanisms From Perspective Spiral Of Silence. Rawafid Journal of Studies and Scientific Research in Social and Human Sciences, 6(3), 879-903. (in Arabic)

[6] Elsayed, F. Z. M. A. (2020). Algorithms and the Engineering of Social Media Users' Preferences. Al Jazeera Centre for Studies. Retrieved from http://studies.aljazeera.net (in Arabic)

[7] Hasan, W. M. A. (2024). Audience Perceptions of the Impact of Algorithmic Systems on the Distribution of News Content on Facebook and Its Relationship With Their Interactive Behavior. Journal of Mass Communication Research, 70(1), 304-312. (in Arabic)

[8] Asker, H., & Tamtam, A. (2023). Knowledge of Information Security Awareness and Practices for Home Users: Case Study in Libya. ESI Preprints, 14, 22-22.

[9] Arafah, B., & Hasyim, M. (2022). Social Media as a Gateway to Information: Digital Literacy on Current Issues in Social Media. Webology, 19(1), 2491-2503.

[10] Bakke, A. (2020). Everyday Googling: Results of an observational study and applications for teaching algorithmic literacy. Computers and Composition, 57, 102577.

[11] Barnhart, B. (2021). Everything you need to know about social media algorithms. SproutSocial.

[12] Bawden, D. (2008). Origins and concepts of digital literacy. Digital literacies: Concepts, policies and practices, 30(2008), 17-32

[13] Borgs, C., Chayes, J., Ikeokwu, C., & Vitercik, E. (2023). Disincentivizing Polarization in Social Networks. arXiv preprint arXiv:2305.14537.

[14] Bhagavatula, S., Bauer, L., & Kapadia, A. (2022). " Adulthood is trying each of the same six passwords that you use for everything": The Scarcity

and Ambiguity of Security Advice on Social Media. Proceedings of the ACM on Human-Computer Interaction, 6(CSCW2), 1-27.

[15] Boyd, D. (2014). It's complicated: The social lives of networked teens. Yale University Press.

[16] Cohen, J. N. (2018). Exploring echo-systems: how algorithms shape immersive media environments. Journal of Media Literacy Education, 10(2), 139-151.

[17] Cormen, T. H., Leiserson, C. E., Rivest, R. L., & Stein, C. (2022). Introduction to algorithms. MIT press.

[18] Choi, Y., Kang, E. J., Lee, M. K., & Kim, J. (2023, April). Creator-friendly Algorithms: Behaviors, Challenges, and Design Opportunities in Algorithmic Platforms. In Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems (pp. 1-22).

[19] Culver, S. H., & Kerr, P. (2014). Global citizenship in a digital world. International Clearinghouse on Children, Youth and Media; Nordicom.

[20] Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). Technology acceptance model. J Manag Sci, 35(8), 982-1003.

[21] Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319-340.

[22] McLuhan, M. (1964). Understanding Media: The Extensions of Man. McGraw-Hill.

[23] Winner, L. (1977). Autonomous Technology: Technics-out-of-Control as a Theme in Political Thought. MIT Press.

[24] DeVito, M. A. (2021). Adaptive folk theorization as a path to algorithmic literacy on changing platforms. Proceedings of the ACM on Human-Computer Interaction, 5(CSCW2), 1-38.

[25] DeVito, M. A., Gergle, D., & Birnholtz, J. (2017, May). " Algorithms ruin everything" # RIPTwitter, Folk Theories, and Resistance to Algorithmic Change in Social Media. In Proceedings of the 2017 CHI conference on human factors in computing systems (pp. 3163-3174).

[26] Dean, S., & Morgenstern, J. (2022, July). Preference dynamics under personalized recommendations. In Proceedings of the 23rd ACM Conference on Economics and Computation (pp. 795-816).

[27] Diepeveen, S., & Pinet, M. (2022). User perspectives on digital literacy as a response to misinformation. Development Policy Review, 40, e12671.

[28] Dogruel, L., Masur, P., & Joeckel, S. (2022). Development and validation of an algorithm literacy scale for internet users. Communication Methods and Measures, 16(2), 115-133.

[29] Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., ... & Williams, M. D. (2021). Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and

agenda for research, practice and policy. International Journal of Information Management, 57, 101994.

[30] Espinoza-Rojas, J., Siles, I., & Castelain, T. (2023). How using various platforms shapes awareness of algorithms. Behaviour & Information Technology, 42(9), 1422-1433.

[31] Eg, R., Tønnesen, Ö. D., & Tennfjord, M. K. (2023). A scoping review of personalized user experiences on social media: The interplay between algorithms and human factors. Computers in Human Behavior Reports, 9, 100253.

[32] Eshet, Y. (2004). Digital literacy: A conceptual framework for survival skills in the digital era. Journal of educational multimedia and hypermedia, 13(1), 93-106.

[33] Fei, Y., & Xuan, L. (2023). Information Security in the Age of Algorithms. Journal of Asia Social Science, 10(1), 41-54.

[34] Fainmesser, I. P., Galeotti, A., & Momot, R. (2023). Digital privacy. Management Science, 69(6), 3157-3173.

[35] Garingan, D., & Pickard, A. J. (2021). Artificial intelligence in legal practice: Exploring theoretical frameworks for algorithmic literacy in the legal information profession. Legal Information Management, 21(2), 97-117.

[36] Gillespie, T. (2014). The relevance of algorithms. Media technologies: Essays on communication, materiality, and society, 167(2014), 167.

[37] Gillespie, T. (2016). # trendingistrending: When algorithms become culture. In Algorithmic cultures (pp. 64-87). Routledge.

[38] Gurstein, M. (2003). Effective use: A community informatics strategy beyond the digital divide. First Monday.

[39] Gordon-Tapiero, A., Wood, A., & Ligett, K. (2022, November). The case for establishing a collective perspective to address the harms of platform personalization. In Proceedings of the 2022 Symposium on Computer Science and Law (pp. 119-130).

[40] Gao, Y., Liu, F., & Gao, L. (2023). Echo chamber effects on short video platforms. Scientific Reports, 13(1), 6282.

[41] Haupt, A., Hadfield-Menell, D., & Podimata, C. (2023). Recommending to strategic users. arXiv preprint arXiv:2302.06559.

[42] Hargittai, E. (2005). Survey measures of web-oriented digital literacy. Social science computer review, 23(3), 371-379.

[43] Hargittai, E. (2010). Digital na (t) ives? Variation in internet skills and uses among members of the "net generation". Sociological inquiry, 80(1), 92-113.

[44] Ingole, C. U., Bandela, M., Tanna, D., Solanki, S. K., Dhotre, P., & Patil, R. (2023). Privacy Awareness and Online Behavior of Indian Users: An Analytical Study.

[45] Jeong, H. S., Oh, Y. J., & Kim, A. (2022). Critical algorithm literacy education in the age of digital platforms: Teaching children to understand YouTube recommendation algorithms. In Learning to Live with Datafication (pp. 153-168). Routledge.

[46] Jones, R. H. (2022). Commentary: Critical digital literacies as action, affinity, and affect. TESOL Quarterly, 56(3), 1074-1080.

[47] Just, N., & Latzer, M. (2017). Governance by algorithms: reality construction by algorithmic selection on the Internet. Media, culture & society, 39(2), 238-258.

[48] Jenkins, H. (2009). Confronting the challenges of participatory culture: Media education for the 21st century (p. 145). The MIT press.

[49] Karanfiloğlu, M., & Sağlam, M. (2022). Media literacy, fact-checking and cyberbullying. Organized by, 37.

[50] Kitchin, R. (2017). Thinking critically about and researching algorithms. Information, communication & society, 20(1), 14-29.

[51] Klinger, U., & Svensson, J. (2018). The end of media logics? On algorithms and agency. New media & society, 20(12), 4653-4670.

[52] Koenig, A. (2020). The algorithms know me and i know them: using student journals to uncover algorithmic literacy awareness. Computers and Composition, 58, 102611.

[53] Kumar, G., Pandey, S. K., Varshney, N., Kumar, A., Kumar, M., & Singh, K. U. (2023, April). Cybersecurity Education: Understanding the knowledge gaps based on cyber security policy, challenge, and knowledge. In 2023 IEEE 12th International Conference on Communication Systems and Network Technologies (CSNT) (pp. 735-741). IEEE.

[54] Kusuma, C. S. D., & Ramadhan, A. N. (2022, December). Youth Empowerment Through Digital Literacy Education. In 9th International Conference on Education Research, and Innovation (ICERI 2021) (pp. 285-293). Atlantis Press.

[55] Le, D., Chung, K., Quach, S., & Thaichon, P. (2022). Introduction to artificial intelligence (AI). Artificial Intelligence for Marketing Management.

[56] Li, R., Kingsley, S., Fan, C., Sinha, P., Wai, N., Lee, J., ... & Hong, J. (2023, April). Participation and Division of Labor in User-Driven Algorithm Audits: How Do Everyday Users Work together to Surface Algorithmic Harms?. In Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems (pp. 1-19).

[57] Lv, X., Chen, Y., & Guo, W. (2022). Adolescents' Algorithmic Resistance to Short Video APP's Recommendation: The Dual Mediating Role of Resistance Willingness and Resistance Intention. Frontiers in psychology, 13, 859597.

[58] Lin, Y. J. (2022). An exploration into trust and privacy management in a digital age. International Journal for Applied Information Management, 2(1), 34-43.

[59] Chicago Livingstone, S. (2008). Taking risky opportunities in youthful content creation: teenagers' use of social networking sites for intimacy, privacy and self-expression. New media & society, 10(3), 393-411.

[60] Mahmud, H., Islam, A. N., Ahmed, S. I., & Smolander, K. (2022). What influences algorithmic decision-making? A systematic literature review on algorithm aversion. Technological Forecasting and Social Change, 175, 121390.

[61] Martin, K. (2019). Ethical implications and accountability of algorithms. Journal of business ethics, 160(4), 835-850.

[62] Metzler, H., & Garcia, D. (2022). Social drivers and algorithmic mechanisms on digital media. Perspectives on Psychological Science, 17456916231185057.

[63] Mniestri, A., & Randerath, S. (2022). ALGORITHMIC JUSTICE FROM BELOW. AoIR Selected Papers of Internet Research.

[64] Moylan, R., & Code, J. (2023). Algorithmic Futures: An analysis of teacher professional digital competence frameworks through an algorithm literacy lens.

[65] Moura, I. (2023). Encoding normative ethics: On algorithmic bias and disability. First Monday.

[66] Moreno Gil, V., Ramon Vegas, X., & Rodríguez Martínez, R. (2021). Fact-checking interventions as counteroffensives to disinformation growth: Standards, values, and practices in Latin America and Spain. Media and communication. 2021; 9 (1): 251-63.

[67] Miguel-Revilla, D., Calle-Carracedo, M., & Sánchez-Agustí, M. (2021). Fostering engagement and historical understanding with a digital learning environment in secondary education. E-Learning and Digital Media, 18(4), 344-360.

[68] Napoli, P. M. (2013). The algorithm as institution: Toward a theoretical framework for automated media production and consumption. Fordham University Schools of Business Research Paper.

[69] Narayanan, A. (2023). Understanding Social Media Recommendation Algorithms.

[70] Nygren, T., Guath, M., Axelsson, C. A. W., & Frau-Meigs, D. (2021). Combatting visual fake news with a professional fact-checking tool in education in France, Romania, Spain, and Sweden. Information, 12(5), 201.

[71] Oeldorf-Hirsch, A., & Neubaum, G. (2021). What do we know about algorithmic literacy? The status quo and a research agenda for a growing field.

[72] Oeldorf-Hirsch, A., & Neubaum, G. (2021). What do we know about algorithmic literacy? The status quo and a research agenda for a growing field.

[73] Oeldorf-Hirsch, A., & Neubaum, G. (2023). What do we know about algorithmic literacy? The status quo and a research agenda for a growing field. New Media & Society, 14614448231182662.

[74] Perez Vallejos, E., Dowthwaite, L., Creswich, H., Portillo, V., Koene, A., Jirotka, M., ... & McAuley, D. (2021). The impact of algorithmic decision-making processes on young people's well-being. Health Informatics Journal, 27(1), 1460458220972750.

[75] Perrin, A. (2015). Social media usage. Pew research center, 125, 52-68.

[76] Reed, L., & Boyd, D. (2016). » Who Controls the Public Sphere in an Era of Algorithms?«. Questions and Assumptions, 1, 13.

[77] Ridley, M., & Pawlick-Potts, D. (2021). Algorithmic literacy and the role for libraries. Information technology and libraries, 40(2).

[78] Ribble, M. & Bailey, G., (2007). Digital Citizenship In School. Washington DC: International Society for Teehnology in Education

[79] Russell, A. M., Bergman, B. G., Colditz, J. B., & Massey, P. M. (2023). Algorithmic accountability on social media platforms in the context of alcohol-related health behavior change. Addiction (Abingdon, England), 118(1), 189.

[80] Rahman, N. A. A., Sairi, I. H., Zizi, N. A. M., & Khalid, F. (2020). The importance of cybersecurity education in school. International Journal of Information and Education Technology, 10(5), 378-382.

[81] Raub, M. (2018). Bots, bias and big data: artificial intelligence, algorithmic bias and disparate impact liability in hiring practices. Ark. L. Rev., 71, 529.

[82] Schroeder, J. E. (2021). Reinscribing gender: social media, algorithms, bias. Journal of marketing management, 37(3-4), 376-378.

[83] Schwartz, R., Naaman, M., & Teodoro, R. (2015). Editorial algorithms: Using social media to discover and report local news. In Proceedings of the International AAAI Conference on Web and Social Media (Vol. 9, No. 1, pp. 407-415).

[84] Shin, D. (2022). How do people judge the credibility of algorithmic sources?. Ai & Society, 1-16.

[85] Shin, D., & Kee, K. F. (2023). Editorial note for special issue on Al and fake news, mis (dis) information, and algorithmic bias. Journal of Broadcasting & Electronic Media, 67(3), 241-245.

[86] Shin, D., Kee, K. F., & Shin, E. Y. (2022). Algorithm awareness: Why user awareness is critical for personal privacy in the adoption of algorithmic platforms? International Journal of Information Management, 65, 102494.

[87] Swart, J. (2021). Experiencing algorithms: How young people understand, feel about, and engage with algorithmic news selection on social media. Social media+ society, 7(2), 20563051211008828.

[88] Scalvini, M. (2023). Making Sense of Responsibility: A Semio-Ethic Perspective on TikTok's Algorithmic Pluralism. Social Media+ Society, 9(2), 20563051231180625.

[89] Stinson, C. (2022). Algorithms are not neutral: Bias in collaborative filtering. AI and Ethics, 2(4), 763-770.

[90] Soui, M., Srinivasan, K., & Albesher, A. (2022). Intelligent Personalized E-Learning Platform using Machine Learning Algorithms. Machine Learning Methods for Engineering Application Development, 110.

[91] Stepnik, A. J. (2022). ACTIVE CURATION FOR CULTURAL COMMENTARY: YOUNG ADULTS, ALGORITHMS, AND NEWS CONTENT ON SOCIAL MEDIA. AoIR Selected Papers of Internet Research.

[92] Susanto, H., Yie, L. F., Setiana, D., Asih, Y., Yoganingrum, A., Riyanto, S., & Saputra, F. A. (2021). Digital ecosystem security issues for organizations and governments: Digital ethics and privacy. In Web 2.0 and cloud technologies for implementing connected government (pp. 204-228). IGI Global.

[93] Saputra, M., & Al Siddiq, I. H. (2020). Social media and digital citizenship: The urgency of digital literacy in the middle of a disrupted society Era. International Journal of Emerging Technologies in Learning (Online), 15(7), 156

[94] Tao, Y., & Wang, W. H. (2023). Fair privacy: how college students perceive fair privacy protection in online datasets. Information, Communication & Society, 26(5), 974-989.

[95] Tynes, B. M., Stewart, A., Hamilton, M., & Willis, H. A. (2021). From Google Searches to Russian Disinformation: Adolescent Critical Race Digital Literacy Needs and Skills. International Journal of Multicultural Education, 23(1), 110-130.

[96] Tinmaz, H., Lee, Y. T., Fanea-Ivanovici, M., & Baber, H. (2022). A systematic review on digital literacy. Smart Learning Environments, 9(1), 21.

[97] Vlasceanu, M., & Amodio, D. M. (2022). Propagation of societal gender inequality by internet search algorithms. Proceedings of the National Academy of Sciences, 119(29), e2204529119.

[98] Wei, S., & Yan, P. (2023, March). Measuring Users' Awareness of Content Recommendation Algorithm: A Survey on Douyin Users in Rural China. In International Conference on Information (pp. 197-220). Cham: Springer Nature Switzerland.

[99] Wissinger, C. L. (2017). Privacy literacy: From theory to practice. Communications in Information Literacy, 11(2), 378-389.

[100] Wang, Z., Yuan, C., & Li, X. (2023). Evolutionary analysis of the regulation of data abuse in digital platforms. Systems, 11(4), 188.

[101] Yoo, J., Li, X., Choi, S., Ding, Y., Kang, E., Park, Y., & Hwang, H. (2023, February). Consumer Perception Study on the Search Algorithm: Analysis of YouTube Using Text Mining. In Future of Information and Communication Conference (pp. 325-339). Cham: Springer Nature Switzerland.

[102] Yousef, Y. S. (2018). Identifying the causes and effects of poor privacy practices by online social network users: the potential of advisory monitoring software in changing user behaviour (Doctoral dissertation, Anglia Ruskin University).

[103] Yustika, G. P., & Iswati, S. (2020). Digital literacy in formal online education: A short review. Dinamika Pendidikan, 15(1), 66-76.