



Romancing the Algorithm: Navigating Constantly, Frequently, and Silently Changing Algorithms for Digital Work

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Many romance novelists have shifted to self-publishing mediated through online technologies, such as online retailer platforms for selling novels and social media for marketing. However, engagement with such complex algorithmic systems has posed challenges, including understanding continually changing algorithms, frequently changing silently, impacting novelists' successful professionalization and monetization. We conducted surveys and interviews with romance novelists to examine how they experience, interpret, and navigate algorithms. Our findings detail interviewees' efforts to comprehend algorithms, both individually and collectively, and leverage that comprehension to navigate and manipulate algorithms. We discuss how our interviewees constructed literacy of precarious algorithms on their work platforms, suggesting implications for designing algorithmic systems supporting digital work.

CCS Concepts: • **Human-centered computing** → **Empirical studies in HCI**.

Additional Key Words and Phrases: Algorithms; Algorithmic Awareness; Algorithmic Literacy; Folk Theories; Digital Work; Future of Work; Romance Industry

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1 INTRODUCTION

The field of Computer-Supported Collaborative Work (CSCW) emerged with a focus on workers performing collaborative work mediated through digital technologies [64]. Since then, the field has broadened to include other workers (e.g., [4, 75, 85, 117]) with a more recent focus on self-employed workers, such as content creators [38, 40] and creative entrepreneurs [84], relying on contemporary online technologies, such as YouTube [10, 11, 19, 95], TikTok [126, 128], Instagram [28, 39, 41, 107], and Pinterest [84], for work. In this study, we examine an existing group of workers who adapted to a changing set of practices facilitated by the rise of online platforms: romance novelists.

Romance novelists have been largely successful in migrating from being affiliated with a publishing house to self-employment, using an ecology of platforms to publish and market their work and recruit and retain a reader base [87, 91, 100]. For example, in 2015, romance accounted for 34% of book sales in the US [116], out of which 60% of sales were of ebooks—the highest for any

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genre [100]. Despite this success, little is known about how the romance industry¹ transformed itself and the challenges of this transformation. Transitioning to digitally mediated self-publishing resulted in increased interactions with constantly changing algorithms on platforms for publishing, marketing, and selling novels [34, 99]. Our study asks (a) *what challenges romance novelists face while interacting with algorithms that are in continuous flux*, and (b) *how do romance novelists navigate such challenges?* Answering the questions would help us comprehend how digital workers, who are “only as good as their knowledge of the algorithm” [38], navigate across various algorithmic systems to perform tasks of diffused nature. This understanding could help design interventions to stabilize the precarious algorithmic systems leveraged for digital work.

CSCW and Human-Computer Interaction (HCI) work are increasingly focusing on algorithmic awareness [33, 48] and algorithmic literacy [22, 31] to understand the use of online platforms to make them more transparent. Algorithmic awareness is the knowledge that users form about how algorithms work [33, 48, 113, 114]. Algorithmic literacy is the use of that knowledge to interact with algorithms to achieve certain goals [31, 67]. Gurstein [67] defines algorithmic literacy as “the capacity and opportunity to be aware of both the presence and impact of algorithmically driven systems [and] ... to crystalize this understanding into the strategic use of these systems.” We build on Gurstein’s [67] conception of algorithmic literacy to study romance novelists’ interpretations of the inner working of social media algorithms (e.g., news feed and advertisement algorithms on Facebook) and online retail algorithms (e.g., search and recommendation algorithms on Amazon).

To analyze novelists’ algorithmic literacy and how it has been shaped, we first conducted surveys asking them about their experiences with the novel production process, including their internet use for selling novels and generating content for marketing. To gain a deeper understanding, we interviewed 15 romance novelists. Researchers have noted that users might not use the term algorithm, or they might not be aware of such terminology; however, lacking technical vocabulary does not indicate a lack of algorithmic knowledge [124, 132]. During the interviews, instead of asking romance novelists directly about their understanding of algorithms, we encouraged them to explain their attitudes and experiences with the digital platforms they use, what they like about such platforms, and how the platforms work. Using an inductive interpretive approach [98], we surfaced a range of salient themes to answer the research questions.

Interviewees’ responses centered on the role of algorithms in their understanding of the platforms. They used ‘*the algorithm*’ as a catch-all term to describe algorithms for moderation, marketing, recommendations, and overall experiences with algorithmic systems. We group our findings into three themes, demonstrating that algorithms embedded in digital platforms influence romance novelists’ ability to be successful. First, we examine how romance novelists learned about the algorithms, who they turned to for help, and the challenge posed by ongoing algorithmic change. We then describe how they share their algorithmic literacy among themselves and how that has created a second industry within the community. Finally, we discuss how novelists leverage their algorithmic literacy to work with and around algorithms to recruit new readers, maintain existing readers, and sell their novels.

Our work makes three main contributions to the algorithmic awareness [29, 48, 132] and algorithmic literacy [31, 105] scholarship in CSCW and HCI. First, it presents ways of knowledge-making observed in an understudied population with a significant stake in the digital creative marketplace. Second, it provides insights into consistent traits of (in)formal knowledge production in algorithmically-moderated work roles. Finally, it supports the validity of collective knowledge-making as a means to mitigate algorithmic precarity. These insights can be mapped to other digital workers (e.g., photographers, influencers, and podcasters), dependent on online platforms to build

¹The romance novel industry is often called the romance industry

audiences, market their work and generate sales. As we discuss these insights in detail, we propose implications for designing algorithmic systems supporting digital work.

2 RELATED WORK

In this section, we first discuss how publishing formats have changed over time for novelists, in general, and for romance novelists in particular. This information might be unfamiliar to our readers and will help them understand the context of our study. Then, to turn attention to the contributions that this paper makes, we present scholarship on algorithmic awareness and algorithmic literacy.

2.1 The Changed Landscape of the Romance Industry

Several romance authors have shifted from traditional publishing to self-publishing. In traditional publishing, a publishing house supports authors with novel production, marketing, and sales [26, 138]. When self-publishing, authors publish, market, and sell their novels themselves, in ways often mediated through digital technologies [26, 138]. Waldfogel and Reimers [139] reported that the novel industry has shifted from being driven by six major publishing houses, i.e., Hachette, HarperCollins, MacMillan, Penguin, Random House, and Simon and Schuster, to self-publishing. Online platforms, such as Amazon [16, 100, 121, 139] and Apple [100, 139] have supported this shift by providing authors with the ability to create and readers to consume books online. By allowing authors to avoid the costs of traditional publishing, online platforms lowered book prices for readers, setting the stage for increased demand and production [139]. The increase in demand has encouraged more authors to consider writing as a viable career option [65, 139].

Romance writers have embraced self-publishing [121] as is evident through their increased book sales generating billions in revenue [2, 82, 90]. While some fiction writers have seen their e-book income decline, romance novelists have become more economically secure [87]. In 2019, over 40 million romance novels were sold, generating \$336 million in revenue [62]. One potential reason for the popularity of romance e-books is the reduced stigma for the reader. Reading romance is often considered a guilty pleasure [90], but on an e-reader no one can tell what a person is reading, and thus a reader can read without the fear of being judged [51]. Self-publishing has enabled authors to take on aspects of their work previously handled by publishing houses, such as finding new readers and sustaining them as loyal customers. A few studies have identified that authors, in general, do this work leveraging social media [65, 77, 111] and others have examined the economics of digital self-publishing [96, 97, 123]. However, even with successful careers and romance making up around 23% of the overall fiction market [90], romance novelists have been overlooked by research [88], perhaps due to the connotation that writing a romance novel is “illegitimate work” [91], “schlock” [30], or “trashy” [140]. Addressing the gap, our work investigates, how self-published romance novelists leverage online platforms to perform their work.

2.2 Algorithmic Awareness & Algorithmic Literacy

Algorithms are digital infrastructures [93, 94] embedded into search engines [15], social media [33], and recommendation systems [124]. CSCW and HCI work has focused on algorithms [1, 9, 25, 37, 61, 83]. However, algorithms, largely opaque [109] and invisible [58], have remained “somewhat of a modern myth,” as Barocas et al. [6] pointed out. They observe that algorithms have great power and significance but are ill-defined to those who experience them. Algorithms are intentionally made opaque and invisible to protect competitive advantages, ensure corporate secrecy, and prevent manipulations [21, 109]. Oftentimes, algorithmic systems do not include any feedback mechanisms for users to understand the algorithms controlling their actions [29, 48]. As a result, users often remain unaware of the existence and working of algorithms on platforms, such as Facebook (see [44, 70, 113, 114]). For example, Eslami et al. [48] reported that only 37% of their study

participants were aware of Facebook's News Feed algorithm. Participants believed that all posts of their friends appeared on their feed [114]. Lacking this awareness impacted their relationships as they wrongly attributed the composition of their feeds to their friends' behavior.

Users often become aware of algorithms through "learning by doing," [32] as algorithms are "experiencing technologies" [12] understood through use [60, 112, 132], or when algorithms misbehave, producing unexpected or faulty results [18, 29, 92]. Gruber et al. [63] noted that users formed their own understandings of voice assistance algorithms based on their interactions with Amazon and Google Search. Bucher [18] noticed that Facebook users became aware of the algorithms during moments of failure, for example, when being classified as a member of a wrong social group. However, when algorithms work as intended, they blend into the background, working "behind the scenes" and thereby becoming invisible [70, 109]. Even for experts, deciphering how algorithms work becomes difficult because algorithms are linked to data, and thereby, their composition varies across contexts [83]. Developers have partial knowledge of algorithms because of their complex compositions of computational techniques and variables [21, 120, 132].

It is crucial to examine users' algorithmic knowledge, particularly in work-related contexts, as it may impact their behavior in positively [81] or negatively [33], shaping the use and evolution of the system [89, 103, 104]. For example, in 2012, users theorized that YouTube's "Up Next" recommendation algorithm promoted videos flagged as a reply made to other videos. Although the algorithms themselves were unknown, many users attempted to verify this theory. "Reply Girls," a group of female users, uploaded irrelevant, sexually suggestive videos, flagging them as replies to popular videos [19]. They earned more clicks that monetized their content, generating thousands of dollars in ad sharing revenue. YouTube had to change its algorithm to dissuade such behavior [19].

2.2.1 Folk Theories and Algorithmic Knowledge-Making. To understand users' algorithmic awareness, CSCW and HCI researchers have investigated folk theories that users formulate. These theories are often informal [101, 136, 148], intuitive [58, 80], causal [33, 58, 80], contextual [50, 80, 134], non-authoritative [31, 148], abstract [33], non-professional [58, 101, 118], and explanatory [31, 58] concepts that users construct following inductive-deductive reasoning to comprehend their environments. DeVito et al. [33] defined folk theories in the context of algorithmic systems as "intuitive, informal theories that individuals develop to explain the outcomes, effects, or consequences of technological systems, which guide reactions to and behavior towards said systems." Folk theories explain how users interpret complex platforms without any direct technical knowledge [33].

Researchers have studied folk theories that users on singular platforms, such as Instagram [28], YouTube [10], Twitter [33], Spotify [125], TikTok [79], and Facebook [8, 47, 114, 119], have created to understand how these platforms work. Beyond a specific platform, Yao et al. [146] and Dogruel [36] have studied the folk theories that users formulated to understand the broader design and workings of the internet. For example, Yao et al. [146] noted four folk models that internet users have formed about how online behavioral advertising works; for example, users thought that first-party sites such as Facebook and Amazon collaborate with each other. Dogruel [36] observed five folk theories, including users' beliefs that online platforms collect information to deliver personalized content and sell targeted ads to make a profit and that algorithms transfer information across websites [36].

The focus on folk theories is largely motivated by the need to design transparent algorithmic systems to communicate how such systems work to users [114, 143]. With DeVito et al. [31], CSCW and HCI have started focusing on users' algorithmic literacy (see also [67]). While algorithmic awareness refers to any recognition of algorithms and their underlying principles, algorithmic literacy is about using that understanding to navigate algorithmic systems. This literacy is crucial to promoting users' autonomy, especially when algorithmic knowledge gaps are exacerbated by age, education, or socioeconomic status [29]. DeVito et al. [31] analyzed the formation (algorithmic

awareness) and modification (algorithmic literacy) of folk theories caused by the rapid and subtle changes to an algorithmic system. They defined algorithmic literacy as a dynamic, ongoing educational process embedded in the larger sociotechnical context critical in the face of an ever-changing platform [31]. Extending this work on algorithmic literacy, we investigate how users comprehend constantly changing algorithms online and how they use this comprehension to perform tasks diffused across multiple platforms. Our study focuses on digital workers, romance novelists, in our case, whose success is managed by algorithms.

3 METHODS

To investigate the algorithmic literacy of romance novelists, we conducted a survey and in-depth, semi-structured interviews. In this section, we describe our data collection and analysis process.

3.1 Data Collection

In 2018, the last author attended the Romantic Times Convention, a conference where romance writers discuss the specifics of their industry. The program agenda at the conference informed this research, and a novelist we met there became our first participant. Data collection occurred from January 2021 to April 2021 after our university's Human Subjects Review Board approval. We used snowball sampling [78] to recruit participants. At the completion of each interview, we asked the participant if they would tell other romance novelists about our study. Several participants shared this information by messaging fellow novelists directly, posting on their social media profiles, and sharing the information in social media groups with romance novelists from diverse contexts.

We designed a survey to collect demographic information of participants and inventory the technologies they used and their modes of publishing. We used the survey to screen participants and tailor our interview questions to ensure we asked them about relevant technologies. We filtered survey respondents based on their experience with self-publishing; if respondents self-published at least one novel in English in the last five years, we asked for their names and contact information to schedule a follow-up interview. Interestingly, many romance authors write under pseudonyms, also referred to as pen names; they often gave us those names which can be attributed to them but are not their legal names. The names used in this paper are pseudonyms of the pen names authors provided. We received 124 responses to the survey; 47 agreed to be interviewed.

From March 2021 to April 2021, we conducted 15 interviews. We started with interviewing the early respondents who agreed to be interviewed and were situated in the United States or Canada. We ended interviewing when we reached theoretical saturation as our later interviews resulted in repeating sentiments [27]. We aim to contact the rest of the respondents who agreed to be interviewed for our future work. Through in-depth, semi-structured interviews, we investigated how authors experience and interpret algorithms that influenced their success. We asked the authors about the software or tools they use, what they liked about such tools, and how the tools worked. The first author conducted the interviews and transcribed the data collected. The first and last authors regularly discussed the data and adjusted questions to inform future interviews.

This study was conducted during the COVID-19 pandemic-imposed quarantine and physical distancing. All the interviews were held virtually through a cloud-based video-conferencing application, which we used in video mode (ten interviews) and audio mode (five interviews) depending upon the participant's preference. Virtual interviews allowed us to reach geographically distanced participants as well as to manage travel restrictions and safety concerns. With the participant's consent, we audio-recorded the interviews. Interviews were conducted in English and ranged in time from 30 to 90 minutes, with an average of 70 minutes. Interviewees ranged in age from 31 to 73. All the interviewees self-identified as women; three interviewees self-identified as women of color (two Black and one Latinx), and the rest as White. This lack of racial and gender diversity

Name	Age (years)	Location	Publishing Type	Publishing Duration	No. of Publications
Zelda	42	Ontario, Canada	Self-publishing	>5 years	>10 novels
Aileen	45	New York, USA	Self-publishing	>5 years	>10 novels
Amaria	42	Kansas, USA	Self-publishing	>5 years	>10 novels
Juliet	50	Boston, US	Traditional & Self-publishing	>8 years	70 novels
Hope	Undisclosed	New York, USA	Self-publishing	3 years	>10 novels
Lara	31	Vienna, Austria	Self-publishing	>5 years	>10 novels
Angeline	50	New York, USA	Traditional Publishing	18 years	>10 novels
Freya	53	Utah, USA	Self-publishing	>5 years	>10 novels
Suzie	36	Toronto, Canada	Self-publishing	>5 years	>10 novels
Melody	54	Philadelphia, USA	Self-publishing	1–5 years	<5 novels
Teresa	50	Utah, USA	Self-publishing	1–5 years	>10 novels
Helen	46	New York, USA	Self-publishing	<1 year	<5 novels
Elena	39	Georgia, USA	Self-publishing	>5 years	>10 novels
Serena	50	Missouri, USA	Self-publishing	>5 years	>10 novels
Sharon	73	New York, USA	Traditional & Self-publishing	>5 years	>10 novels

Table 1. Interview participants' demographics including publication types, time, and count

among our participants is not surprising, as the romance industry is overrepresented by white women [59, 129, 141]. See Table 1 for more information about interviewees' demographics.

3.2 Data Analysis

The first and the last author followed the inductive, interpretive coding approach that Merriam and Grenier [98] proposed for data analysis. We familiarized ourselves with the data, reading through the data and taking initial notes. Then we coded the data, which included going through the transcripts and highlighting everything related to participants' experiences, attitudes, and interpretations of how algorithmic systems work. For example, the codes included "self-comprehension" where participants discussed understanding algorithms themselves, "assisted comprehension" where participants sought assistance from their social networks, i.e., family members and friends, to comprehend algorithms, and "restricted comprehension" where algorithmic change restricted participants to form a much more comprehensive understanding of algorithms. Once we generated these codes, we discussed them with all the authors. Then the first, second, and last author inductively analyzed the codes to identify themes, including organizing, reorganizing, and combining the codes. Finally, the first and second authors returned to the data to ensure that the themes accurately represented the data and adjusted them. We formed three high-level themes that we present in the paper, describing what each theme means and how they are represented in the data.

3.3 Limitations

The Romance industry is demographically overrepresented by people who as affluent, white, cisgender, heterosexual, and women [59, 129, 141]. Our participant demographics reflect these same imbalances, and thereby the findings presented in this paper may not extend to racially, ethnically, sexually, and socioeconomically diverse romance novelists. Although our survey respondents included romance novelists from different countries (e.g., India and Japan), for this study, we limited participant recruitment to the novelists predominantly from the Global North, particularly from the U.S. and Canada. We acknowledge that snowball sampling does not guarantee the representatives of the sample [108]. Our work might be subject to respondent-driven selection and thereby might not represent the diverse experiences and thoughts of all romance novelists.

4 FINDINGS

Our findings detail the efforts of romance novelists to understand the working of algorithms on online platforms they used for publishing, selling, and marketing their novels. We describe the novelists' process of formulating algorithmic folk theories, individually and collectively, including the social ecology they turned to seek help forming the theories while addressing the challenges caused by the precarity of algorithmic systems. We examine how participants shared the folk theories they formulated and their contextual experiences with each other, resulting in the formation of a collective understanding of the working of algorithms. We consider the workarounds that novelists devised, leveraging their folk theories to navigate algorithms to recruit new readers, maintain existing readers, and increase novel sales. Our findings present algorithmic literacy as an ongoing process impacted by continual algorithmic changes online.

4.1 Forming Folk Theories to Comprehend Algorithms

Romance novelists we interviewed explained how they pieced together their digital publishing and marketing experiences to comprehend algorithms by forming folk theories. Some participants had a basic understanding of the algorithms they encountered in their work. These interviewees worked as IT professionals before becoming full-time novelists or were still working in IT at the time of the study while writing novels on the side. They attempted to comprehend algorithms by passively observing the platforms or actively changing their online practices to analyze how algorithms react. Interviewees who lacked technical expertise sought assistance from family members or friends working in the IT industry to understand algorithms. While interviewees formed some fundamental folk theories, the precarious nature of algorithmic systems hindered them from developing a more comprehensive understanding of algorithms, adversely impacting their ability to be successful.

4.1.1 Self Comprehension. We examined the ways romance novelists formulated algorithmic folk theories. Some participants, who used online platforms for non-economic purposes before becoming a novelist, reported that they passively observed online platforms they used for publishing, marketing, and selling their novels in order to understand algorithms. This passive observation included noticing how platforms act when they perform daily tasks without altering their practices, such as publishing their work on online retailer platforms. Zelda told us:

“You get a sense of the algorithm [overall], even just by watching. If you are aware of an algorithm and how different online tools or apps shift the kinds of content that they prioritize, then you get an idea of what drives this algorithm.”

Other participants with prior technical expertise intentionally changed their online practices to comprehend algorithms by noticing how algorithms react. For example, Teresa described changing her practices by investing in Amazon advertisements to understand the platform's marketing algorithm. She told us that when she clicked on her book's detail page, the algorithm took her to an ad, *“and then you had to scroll back up to the detail page for something that you were actually looking to buy.”* After advertising on Amazon, which involved paying for an ad, Teresa noticed the marketing algorithm prioritized her books, opening the detail page directly. She even changed her practices to understand the profit she made through sales on Amazon. As she altered her practices, she repeatedly compared the amount spent on advertisement and the revenue generated through sales. She explained this calculation, which demonstrated her algorithmic knowledge, saying:

“We are going to do some math here because I want to make you understand [sic]. [Opened a calculator]. So 3000 pages read a day, which is what I am getting. My books are like, we will call them about 210 pages. So divided by 210. That is 14 book sales a day, times \$3.49 a book, which is my royalty per book sale. So that is like 50 bucks [dollars] a day

equivalent to reading books, which for that series, I would be really happy with. Instead, I'm making about \$25 a day. So, we are gonna average 3000 page reads a day. 14 days because they have been there two weeks. That is 42,000-page reads, divided by 210 ... I could have made \$700 for those same reads. But instead, Amazon is giving me half. So, the cost that it took me to get that revenue was more than half the revenue itself. I am not even getting 100% of my ad spend back."

We noticed technical knowledge assisted certain romance novelists in comprehending algorithms. Some participants had experience working in the IT industry before becoming full-time novelists. At the time of the interviews, a few of our participants were still working in IT while writing novels part-time. The skills they gained from their IT professions assisted them in forming algorithmic folk theories. For example, before becoming a full-time novelist, Juliet worked as an academic administrator at a university, where she did search engine optimization consultations. Her experience as a consultant helped her understand the working of algorithms. She shared her work experience which assisted her with gaining algorithmic knowledge, saying:

"I had figured out pretty early how search engine optimization worked. So that really helped me in online marketing because I understood how to put keywords into a description. I pretty quickly figured out how to do ads on Facebook because I had done AdWords campaigns on Google AdWords back in the mid-2000s. So part of why I did so well so quickly is that it was a convergence of the ability to write fiction and then the ability to sell. You don't just say: 'Please buy my book.' You had to have marketing taglines, and you had to come up with a hook and get people interested. You are appealing to their need, not your need to sell the thing."

We found that romance novelists, who worked in IT in different technical roles where they interacted with multiple technologies, reflected on their experiences and acquired knowledge to understand marketing and sales algorithms online. The accounts of our interviewees illustrated the importance of experiential learning in gaining algorithmic literacy. Our findings align with CSCW and HCI researchers' insights that algorithmic literacy involves "learning by doing" [32] as algorithms are "experiencing technologies" [12] understood through use. Users understand algorithms based on their interactions and experiences with algorithms [18].

4.1.2 Assisted Comprehension. While some romance novelists, through their experience of working in the IT industry or being avid technology users, were able to comprehend algorithms and form algorithmic folk theories, we noted that self-directed learning was not the only means of algorithmic literacy. Other novelists who lacked technical expertise sought assistance from people in their social networks, i.e., family members and friends with technical skills, to learn about algorithms. The folk theories that the novelists formulated were based on the algorithmic knowledge that the members of their social ecology translated and shared.

Some interviewees who were not technologically adept did not actively attempt to understand algorithms, arguing that they did not see the need for forming any algorithmic folk theory to understand algorithms. For example, Sharon has published over 45 novels since 1994. She shifted from traditional publishing to self-publishing. She started using Amazon in 2011 to self-publish her novels, but never made an effort to understand how the algorithms on Amazon worked. What mattered to her was the sales of her novels and not how they happened. She said:

"[Amazon] has a formula. I do not know; I guess a computer model that tells them how many pages a reader has read. And that is how you get paid. There is a formula for that, too, which I will say I do not understand and never tried to understand."

Although Sharon did not attempt to understand algorithms, she was aware of their existence. Similarly, all participants, irrespective of technical expertise, were mindful of algorithms on the platforms they used, knowing that such algorithms govern and manipulate their actions.

With the desire to understand the working of algorithms that influenced their success, interviewees lacking technical expertise turned to their family members and friends with technical skills to help understand algorithms. Many participants had spouses working in the software industry who helped them learn algorithms. Helen told us that she often sought her husband's help, who worked as a software developer to understand the specifics of algorithms, such as when she gets error messages while using online platforms. She reported:

"He'll [her husband] go through the complicated issue and say: 'Oh, they just upgraded their code and they added a filter, and now you're just getting caught in some new tighter net.' In other words, he will go: 'Oh, yeah, they upgraded the code they rented.' There have been times he's like, you need to calm down. There's just a clock cycle [used to calculate the speed and delays of a computer processor]. You just have to wait."

While the people who helped our interviewees comprehend algorithms possessed technical vocabulary, we noticed that they explained the working of algorithms to romance novelists using more colloquial language, interpreting, translating, and then transferring their algorithmic literacy. This conversion of knowledge from formal to informal vocabulary helped romance novelists formulate folk theories about algorithms. For participants who did not have direct access to the technical aspects of algorithmic systems, their friends who possessed technical expertise translated and shared their algorithmic knowledge with the novelists.

We noticed that many participants were married to IT professionals. We asked Helen about this observation, to which she replied, *"so it's kind of a running joke at novel industry conferences: how many of us have husbands or wives who are software developers, and all the hands go up."* She added, *"It is kind of a power pair, in the sense that the marketing is tech-heavy for what we do, and so if you've got a partner who can help you navigate, that helps."* More work may be required to understand the prevalence of novelist-technologist partnerships. However, as we noted, the frequency of these partnerships demonstrated that technology-adept individuals in their personal lives support self-published novelists in ways to formulate algorithmic folk theories.

4.1.3 Restricted Comprehension. Although romance novelists successfully formed algorithmic folk theories, there were instances when the changing nature of algorithmic systems prevented them from establishing clearer comprehension. Algorithmic systems are dynamic. They frequently change mainly driven by platform capitalism, forcing online workers to repeatedly adapt their practices to accommodate new features and affordances [3]. For example, in 2016, Instagram changed its news feed algorithm from showing content chronologically to algorithmically prioritizing "the moments you care about" [38]. We noticed that constant algorithmic changes restricted romance novelists to form explanatory folk theories.

Participants reported that the algorithms online changed whenever they attempted to form a deeper understanding. For example, Suzie told us about her experience with changing algorithms. As a vendor on Facebook, she used to define targets for advertisements. These targets usually included famous romance novelists, such as EL James or Stephenie Meyer; there were around 100 such targets. By targeting these famous novelists, Suzie reported, *"Amazon ads will tell the readers that, 'hey, your favorite author has a new book out and we think that the book is like this famous author Stephen King.' So you [the author] are placed under Stephen King's new book. And that's a way of them [the readers] seeing your book for that set of time."* Suzie understood the targets after using them for over a year. However, she told us that in 2020, Facebook suddenly changed its advertisement algorithm, which impacted her sales. She said:

“So Facebook, all of a sudden, we woke up one day, and we could only target 15 names in all of the romance ... So all of a sudden, they [Facebook] took this enormous funnel of women who were doing Facebook ads and crammed us into 15 targets so that we can compete for each other, and like literally overnight, my 3 and 4 cents went to like 18 and 20 cents per click on an ad.”

Many interviewees mentioned similar experiences. Algorithmic changes commanded them to repeatedly adapt and alter their practices, sometimes completely transforming their modus operandi with the newest changes. The changes created barriers for our participants, many of whom lacked technical expertise, to understanding algorithms in depth.

Interviewees reported that online platforms never announced or notified them about algorithmic changes even when the changes could majorly impact their book sales. This lack of communication demonstrated that online platforms, such as Amazon and Facebook, did not recognize or care about how the changes could impact workers who may make a large portion of their living through such platforms. Aileen suffered unannounced algorithmic changes that adversely impacted her novel sales. She shared her experience of working with Amazon and Facebook, saying:

“I think a lot of us live in fear of Amazon or Facebook because they are how we make our money ... There is no good communication from either of those companies on why these things [algorithmic changes] happen because they are such big, enormous companies; they don't understand that this is how many people pay their bills. We, as the authors, are not important to their business models.”

Our findings corroborate with Duffy et al. [40] who noted the challenges content creators faced, arguing “even when a platform did announce a change to their features, communication was often unclear, leaving more questions than answers.”

Participants found it hard to stay updated about the policies of online platforms. While online platforms provided documents guiding users on what they could share, these documents were “legalese and long”, as Sharon stated. Documents containing a platform’s policies and guidelines were created for general users with insufficient guidelines for romance novelists. Most of our interviewees did not read the documents containing notoriously vague guidelines.

We noticed a “lawless” [131] content moderation impacting our study participants. When content that romance novelists posted got flagged and removed for policy violations, they often did not understand why their posts were moderated even when similar posts were shared online. Hope, who published over ten novels in the last five years, told us that Amazon did not publish one of her novels because the book cover had an image of a shirtless man. She could not understand why this book got flagged even when its cover was similar to the covers of other books that she had already published on Amazon. She said:

“Only that one book of mine was indicated as erotic. It's no worse than any of my other books, but that was the one book they picked on. I had a very innocent picture of a beach with a cover of my book that had been running for several weeks, and then it suddenly got rejected. I have a friend who every time she puts up a book, Amazon has decided it's erotic. We don't know why.”

Juliet also told us that even after publishing 70 novels, she did not understand why Facebook’s algorithms reject some advertisements. She reported, “If I have, like, a lot of romance novels have bare-chested men on the covers, and Facebook doesn't let you advertise those. However, you can advertise a fitness product with a shirtless man on it.” CSCW and HCI researchers have linked content moderation to users’ political, social, racial, and gender identities [69, 115, 147]. For example, Haimson et al. [69] noted that even when policies are followed, Black and transgender people often face content moderation while expressing their marginalized identities, replicating patterns of

over-policing these groups often face offline. We anticipate that content moderation of romance novelists might have occurred because of the widespread notion that their work is “illegitimate work” [91], “schlock” [30] and “trashy” [140]. However, more work is required to understand how one’s nature of work impacts content moderation online.

4.2 Sharing Folk Theories to Raise Algorithmic Literacy

Romance novelists formulated folk theories to make sense of the purportedly opaque and precarious algorithmic systems. As the novelists made sense of algorithms, they took it upon themselves to share their theories with the broader community. Some romance novelists shared folk theories by conducting classes, writing books, and creating blogs, while others posted on social media. Through this sharing, novelists formed a collective understanding of algorithms. However, they were aware that algorithms act differently based on each individual’s online practices and that the working of algorithms needs to be understood within a specific context.

4.2.1 Through Online Classes, Books, Articles, and Blogs. Interviewees reported that they organized virtual classes using cloud-based video-conferencing applications, such as Zoom or Skype, to share their folk theories with other novelists to help them understand algorithms. The resources to understand the working of algorithms were widely available online; however, romance novelists often found it hard to interpret such resources, including how to run advertisements or how to optimize them to make profits because of a lack of technical expertise and familiarity with the specialized vocabulary used in these resources. These resources were usually for the larger worker community, not directly relevant to romance novelists.

Many romance novelists shared their knowledge and experience of successfully navigating algorithms through conducting paid online and offline classes and writing books, articles, and blogs. For example, Aileen told us that she conducted classes to share the folk theories she formulated to help other novelists navigate complex algorithms. At the time of the interview, she was planning to conduct a class. She mentioned:

“I’m about to teach a class for newbie beginner people [novelists] on how to run a Facebook ad. But I’m not going to teach them how to set up a Facebook ads account. There are links to a YouTube video to learn how to do it. I do live videos. I just share my ads dashboard on my show and teach how to do stuff, how to manage and optimize ads. So I’m doing it in a Facebook group.”

To help fellow novelists, we found that romance novelists wrote books to explain the various strategies they followed to increase book sales online and how they leveraged algorithms for the purpose. For example, Aileen told us that she had written a book to explain to other novelists how to use social media for marketing. She said:

“It [social media] was very intimidating to so many of my author friends that they were like, just teach us how to use social media. So, I wrote a book to teach everybody how to use social media. My own personal take is to pick one and be really good at it. When you’re really good at it, then you can pick a second one, and be really good at that one. And then when you’re good at that, then you can pick the third one.”

Teaching classes or writing books takes time. Many of our interviewees were writing novels part-time while working a full-time job. While they wanted to prioritize writing novels, they also wanted to help other novelists with constructing algorithmic literacy. Motivated by their desire to help, interviewees also wrote online articles and blogs, which took relatively less time, to share their algorithmic folk theories. For example, Amaira told us that she wrote articles on how to effectively use keywords when publishing on online retail platforms to increase novel sales. She said:

“People [romance novelists] do not know how to put their keywords in properly [on Amazon]. Nobody [readers] searches for ‘romance regency,’ they search for ‘regency romance’. So, I created a Word document to help people. I uploaded it [on her website], so that people could use it to figure out their keywords.”

We noticed that the sharing of folk theories helped romance novelists. For example, when Melody struggled to understand Amazon’s advertisement algorithm, her novelist friend recommended attending an online class on advertising. Melody attended free courses by Bryan Cohen on profitable Amazon ads. She said, *“That opened up just incredibly for me, in terms of figuring out how to go and learn that platform with the low spend, before throwing a lot of money at it.”* Her advertisement clickthrough rates increased which increased her return on investments.

Unlike the free labor of knowledge sharing performed by indie game developers that Freeman et al. [53] noted, we observed that knowledge sharing among our participants led to the formation of a second industry. For example, Zelda said:

“It’s [writing books, articles, and blog posts] actually a really robust industry. Because what we do is a little bit different than what an academic does or what a business person does. So having those resources that are geared directly to us [romance novelists], with our unique job in mind is helpful.”

For romance novelists, the anticipation of algorithmic interventions did not just become a “necessary part of the job” [38], it became a job in itself. Some novelists published books on their understanding of algorithms, sharing their folk theories, and creating a secondary industry of guides to publishing romance novels. For those who wrote these guides, it also created a secondary revenue stream and further opportunities for visibility within the romance author community.

4.2.2 Through Social Media. We found that romance novelists actively leveraged social media to troubleshoot the problems they face when working with platforms online. Whenever they faced an issue, interviewees usually posted about it on private social media groups, exclusive to romance novelists, to seek assistance from other, more experienced novelists. For example, Juliet said:

“In [social media] authors groups, someone might post and say, ‘Amazon put my book down and says that I broke some rule.’ A bunch of people might immediately reply and say, ‘it’s happening to hundreds of people; it’s a software glitch.’ Then at least you know that it’s not just me or people might come in and say, in a group, I’m releasing my first book in French, what are some good keywords for a small-town romance? In other words, it’s like the collective hive mind; how can we all help each other to do better.”

There existed social media groups where novelists could seek each other’s guidance. Some of these groups were relatively small, with a few hundred members. However, others were large groups with thousands of members. For example, 20booksTo50K was a private Facebook group with around 50 thousand users. The group was first created to help novelists write their first few books (up to 20) until they made 50 thousand a year. Successful novelists, such as those on the best-selling list, often discussed their writing, publishing, and marketing practices in the group. Due to its increasing popularity and growing membership, the group organizers started a yearly conference for self-publishing authors to help them become successful. Honey, who attended some of these conferences, told us about the posts shared on the group:

“They [20booksTo50K group] cover a lot of information regarding publishing, a majority probably around Amazon. They have a lot of documents that are saved on there as far as different places and different conversations you can look at to get additional information.”

Melody, who wanted to use TikTok to market her novels, started following the conversations in the 20booksTo50K group about the platform. She told us that *“There are people killing it on TikTok*

right now; I'm not one of them. But I'm watching the people [on 20booksTo50K group] who are using the platform to market their novels." Such groups helped romance novelists ask questions and learn how the algorithms they interacted with work.

In addition to posting in groups, participants reported that they directly contacted other novelists through social media who they thought could help address their issues. Suzie, a 36-year-old romance novelist who when started self-publishing, faced challenges. She usually posted questions in social media groups exclusive to romance novelists. She said:

"I'm in a couple of groups with authors where if you have a problem, you can post. Then I have a couple of authors that I have a very good relationship with. I would go to them directly and ask a question in the group."

We noticed that social media provided a space for novelists to seek help from other novelists to resolve the problems they faced as they worked with algorithms.

4.2.3 Forming a Collective Understanding. As romance authors sought each other's help to understand algorithms, their understanding was socially shaped, creating a collective comprehension of how algorithms work. Simpson et al. [127] have noticed that TikTok users relied on their peers who were established on the platform to understand how the algorithms worked.

We noticed that sharing algorithmic folk theories through classes, books, articles, blog posts, and social media has resulted in the formation of the collective knowledge of the working of algorithms among romance novelists. This collective understanding was evident through the perspectives and attitudes many interviewees have developed toward using Twitter for marketing. A majority of interviewees told us that they did not use Twitter for novel marketing. Due to the embedded political ambiance on Twitter, many novelists had been targeted for writing romance which was deemed a "derogatory genre" by some users, making it unsafe for the novelists to use the platform for marketing, as Suzie said:

"There was a lot of trolling on Twitter. Particularly being a woman that writes about books with sex in them, you can become a bit of a target of people who are not happy about that. I found that there were always a lot of people ready to criticize the genre or the fact that we were writing books with explicit content, or using that as like an invitation to send me inappropriate things that I just didn't feel very safe or comfortable in there."

Suzie told us that she stopped using Twitter to market her novels, and shared her experience with other novelists. Consequently, her novelist friends stopped using Twitter for marketing purposes, afraid that they would get attacked by trolls which could impact their professionalization. The formation of collective algorithmic literacy reveals that romance novelists attempted to understand the algorithms by sharing their knowledge with each other.

While romance novelists created folk theories describing the working of algorithms, we found that they were aware that algorithms act differently for different users based on a user's activities. Interviewees knew that they could not directly apply the theories from the classes, books, or blogs shared by other novelists towards their novel production process online. However, they can learn from others and regulate the learning as applicable to their context. For example, Honey said:

"Somebody could say, okay, you do this, and you do this; but your results could be completely different from somebody else's results. So there are a lot of aid classes that people offer to authors about advertising. But even with something like that, they're walking you through the process of how to set it up, what to look for, but it's still gonna be trial and error"

Romance novelists shared their algorithmic folk theories through classes, books, articles, blog posts, and social media, forming collective attitudes of, for example, the features and moderation on

Twitter while adapting their practices to accommodate knowing that algorithms behaved differently across contexts depending on users' activities.

4.3 Leveraging Folk Theories to Work *With* and *Around* Algorithms

Romance novelists attempted to discern which behavioral modifications would allow their work to continue without algorithmic intervention, employing strategies platforms may not have intended to encourage. We noticed romance novelists used the folk theories formulated both individually and collectively to work with and around algorithms, leveraging some algorithms and manipulating others to gain new readers, maintain a sustained connection with existing readers, and calculate sales generated through advertising on social media. In this section, we discuss the different folk theories they devised which demonstrated their algorithmic literacy.

4.3.1 Gaining New Readership. To gain new readers, interviewees requested their existing readers to like and comment on the marketing content (e.g., blurbs or covers of their novels) they posted on social media. Participants told us that the marketing algorithm on social media favors and further promotes the content that has been liked and commented on by others. They also asked the readers to share the content on their social media profiles to reach potential readers; when existing readers share the content, it reaches the users they are connected with, getting attention and thereby increasing the marketing efforts of romance novelists. For example, Amaira said:

“When a reader likes and shares it, all of her friends see that book. When they see that book, and maybe they are a reader, they might go and buy it, thinking this is a really good book. One of the things about having readers and interacting with them on Facebook is again you want their friends to see it, and that’s a way of getting your book in front of people. You’ve got one reader, and hopefully, you’re getting another reader through that reader you want. The hope is that for every other reader you get, they bring you five more readers and five more readers like that.”

While posting their marketing content on social media, interviewees used hashtags that readers followed. Each social media platform had its own list of famous hashtags. For example, “*romanceauthoroftiktok*”, “*romancereaderoftiktok*”, and “*booktalk*” were famous among romance readers on TikTok. Participants were aware of these hashtags and they actively used them while sharing marketing content online. Posting their content with hashtags allowed romance novelists to market their novels and thereby reach new readers.

Interviewees reported their folk theories of “*a loss leader*” or “*a lead magnet*.” To gain more readers, they usually made their novels available for free on online retail platforms (e.g., Amazon). A loss leader is usually the first book in a series, while a lead magnet can be any book that a novelist makes freely available to attract more readers. For example, Stephenie Meyer may advertise *Twilight* as a loss leader to gain readers to read the rest of the books in the series. Nicholas Sparks may promote *Safe Haven* (not his first book in a series) as the lead magnet based on his discretion about which book he thinks would attract readers to read his other novels. Romance novelists we interviewed told us about the use of these free books to gain readers, arguing that once a reader reads their free book, they might want to read the other books. New readers are more inclined to read a free novel by an author that is new to them instead of purchasing the novel. Readers who enjoy the free novel usually read (and pay) for other novels. Consequently, a novelist ends up making sales on the rest of their novels through loss leaders or lead magnets. For example, Hope made her first novel freely available (a loss leader). She advertised the novel through social media to attract readers. She said:

“A loss-leader is like the really cheap rotisserie chicken at Costco. If somebody goes in there to buy that, and Costco knows, they’re not going to make money on it, but they assume

that while somebody is in there, they're gonna buy a lot of other stuff. Similarly, if you write a series of books, and you advertise the first book, and your writing is good, and people like what you write, then they will likely go on and read the rest of them. So you can spend more money on advertising on the first book and still make a profit ... If I give away a book for free, but then I make the rest of the books in the series for \$3.99 each, and there are 10 of them, I mean, not that I get the whole \$3.99, I could make a pretty good, it could work out really well for me."

When gaining more readers, our interviewees took care to avoid overdoing their efforts to prevent what they called "*the social media jail*," demonstrating that romance novelists did not just form folk theories on how to increase sales but also on how to avoid algorithmic moderation. They told us that social media platforms, such as Facebook and Instagram, impose limits on posting and tagging others. If a user crossed the boundary, their profile was likely to get flagged or, worse, suspended. This restriction could negatively impact the novelists as they primarily market through social media. Melody witnessed a novelist friend who financially incentivized her readers to increase interactions on her posts, thereby ending up in a social media jail. Melody said:

"Don't pay for followers. You really do need to do things that are organic because if the reaches are not organic, then I do believe that the algorithms will start to kill your following, and then you truly aren't reaching the people that you need to reach. That's really the biggest challenge with all of this is you're playing this game with social media."

Interviewees were aware of the limit imposed by the marketing algorithms. They perform their marketing activities within limits to avoid getting noticed by the algorithm that could impact their success. These algorithms acted as "technical arbiters" [40] punishing those who violated platforms' guidelines. However, the guidelines were unclear and uncertain to the novelists, making many novelists question if "social media jail" was a platform feature or a practice to be followed to not get noticed by algorithms, with different opinions shrouding the understanding.

We noticed that romance novelists posted non-novel-related content on social media to find new readers. The content varied from sharing information about their personal life and conducting polls to asking the audience about their favorite trope. Such posts helped novelists connect with their readers as they join the reader base on a more personal level which could help with building a relationship; to show readers that novelists are just like them, facing similar challenges and living similar lives. Helen said that having such "extra" content was important because "*If you always talk about your books, it's hard to engage readers. So having a little bit of a personality in there definitely helps. That's what I try to do, a little bit of a version of myself, in addition to talking about books.*" Melody had been conducting "Car Talk Tuesday" for the last two years. As a part of this series, she posted a video every Tuesday while driving to work, talking about everyday things, including current news, her personal thoughts, or her daily challenges. Such non-novel-related content resulted in an increase in her readers' engagement with her posts. Melody said, "*Sometimes you want to post things just to get interaction in general, from people whether they read your books or not, to boost you in the algorithms. This also makes the readers feel that they are connected to us.*" These examples show that romance novelists formed different folk theories to leverage algorithms and find new readers online.

4.3.2 Sustaining Existing Readership. Romance novelists formulated different folk theories on ways to sustain existing readership. Interviewees reported that they created a broader social media presence along with having personal websites and e-newsletters. Suzie told us about an incident where novelists in Australia were removed from Facebook. She said "*there was an issue recently with the Australian Government and Facebook about news media, and what can be shared on Facebook and*

what can't. As a result, a lot of authors were unfairly labeled as a media entity, and their pages were deleted." She added, *"If you would spend all this time building up a page with 10,000 readers, and then all of a sudden, one day it's gone, that's terrible. You've lost your platform."* Such uncertainty caused by the lack of ownership of their social media motivated romance novelists to create their presence on multiple social media platforms, and even beyond through personal websites and e-newsletters, in order to have a sustain connection with their readers; in case novelists are not able to access a platform, they can connect with readers via another.

Interviewees underlined the need to claim their presence on social media platforms. Different platforms catered to readers of different ages. For example, Juliet mentioned that TikTok was usually for reaching younger readers, Instagram for readers between the age of 18 to 35, and Facebook for much older readers. Having a presence on these platforms, interviewees emphasized, helped them to attract and engage with readers from different age groups. Melody told us why she maintained a presence on different social media platforms:

"So that you can just hit some different pockets of readers, readers that maybe are potential readers but don't realize that they are. There are a lot of people on Instagram who don't necessarily go to Facebook. So you can't neglect Instagram. You never leave money on the table. So you have to figure out where your readership is."

Other interviewees told us that though they primarily used Facebook, they had created profiles on other social media platforms for future use. Participants emphasized the importance of having a presence on multiple platforms, in case readers migrated to different platforms for these reasons. Aileen said, *"I go claim my digital landscape everywhere, like I own my name on all of the different platforms, whether I use them or not because you never know when readers are gonna flock over there."*

Romance novelists established these wider digital presences in response to the ever-changing nature of algorithmic systems online that could make or tank their careers. While some platforms (e.g., TikTok and Clubhouse) have evolved and become popular, many other platforms (e.g., Vine) have disappeared from the market; some platforms (e.g., Myspace, LiveJournal) have vanished overnight [49]. Nobody knows which platform will join the sprawling graveyard next. Interviewees reported that sometimes platforms disappear without any notice, and thus having a cross-platform presence would help them communicate and stay connected with their readers. As they used MySpace, its sudden disappearance prompted them to simultaneously maintain a digital presence on other platforms. Serena asserted:

"Myspace disappeared almost overnight. Within 48 hours, it was gone. There's no reason to think that at some point, Zuckerberg or someone may just make Facebook go away for whatever reason. Even if Facebook goes away, Instagram might not end. So I already have a presence on Instagram, I don't have to start from scratch on Instagram. So I think that's why you find a lot of authors being fairly broad in their social media because if one of them leaves, at least I've still got this one as well, like TikTok, or Pinterest or whatever."

The changing nature of algorithmic systems led romance novelists to proactively create their presence on different media platforms in case they have to migrate to other platforms for numerous reasons. CSCW and HCI work has documented reasons users migrate to different platforms, which varies from forced to voluntary migration prompted by the closing of a platform [110], unsatisfied needs [145], trouble learning norms [86], changed relationships [142], and disinterest in a platform's features [130]. Fiesler and Dym [49] noted three platform-based reasons for migration: feature and design changes, value and policy changes, and protection of content on a platform.

On social media platforms, romance novelists are entirely dependent on changing algorithms that support or constrain their work and success. CSCW and HCI researchers have reported the fickle nature of online algorithmic systems prompting online workers to create their digital presence. For

example, Ohlheiser [106] noted the temporality of TikTok, arguing that algorithmic changes on the platform significantly impact content creators' careers, making creators realize that they are dependent on platforms that could drastically change without warning. Interviewees emphasized the need for having a personal website to have "virtual real estate" they could own and control. Having a personal website also bolstered their marketing efforts by acting as a repository where readers could see their novels without the intrusion of competing information curated by algorithms on, for example, retail platforms online. Zelda said:

"So like the website is, well, it's real estate that I own. I can control the content on it. There's never any competing information. Even on the book pages, so if you go to one of my book pages on Amazon or on Kobo, my book is not the only thing available for sale on that page. There are other books on that page. There are lots of adverts and stuff like that. Whereas my website, if I drive people there, the only thing they are seeing is exactly what I choose to present to them. And then you can go there and see: 'Oh, look, she's got 20 odd books, not just this one that I read.' So really, it's sort of like a signpost in the yard."

Interviewees told us that having personal websites makes it easier for readers to find them as it helps with search engine optimization. It is hard for readers to find authors on online retailers or social media if they do not know the authors' details, such as names. However, with a few identifiable keywords, for example, 'a small-town Canadian romance,' a reader can easily find an author through a quick search online if the author has a personal website. Juliet observed that search engines pulled data from her website to show the result, making it easier to find her:

"The other kind of data-oriented reason for having a decent website or a fleshed-out website is that Google Search has been pulling, I've been noticing from I don't know if it's from my website. When you do a search on Google, you'll see pieces of like a little bio about me. I'm not sure how much the website makes a difference or not, but I suspect it might."

Interviewees reported that e-newsletters provided a channel to send updates to their readers. They could directly market their novels to readers without being affected by algorithms that mediated and controlled their communication on social media. For example, Serena said:

"I send out newsletters, that means that I'm talking directly to them [the readers], almost in a way I can't on Facebook, because Facebook's algorithms limit who sees my posts, and I don't know how it works. It's Zuckerberg's evil magic. So, I might post in a reader group that people deliberately joined, and they may not ever see my posts on their newsfeed. I don't know why there's nothing I can do to change that. It's out of my control. But the nice thing about a newsletter is I owe the list. I show up in their inbox every time I send."

Interviewees considered creating a wider digital media presence by having a personal website and an e-newsletter as backups. This wider media presence was motivated by their fear of not having control over their social media profiles because of the precarity of such platforms. They created a wider presence so that in case they could not use their social media platforms to connect with their readers, they can use their personal website and newsletter to communicate with and update the readers. Melody told us that two of her novelist friends' Facebook profiles were suspended because someone else stole their identity to "run contests off of author pages where they're telling people that they've won a contest and then they're asking for credit card information." Fortunately, they had their website and e-newsletters to communicate to their readers and explain the situation. Therefore, having an online presence across multiple social media platforms, personal websites, and e-newsletters assisted romance novelists in maintaining a sustained connection with readers.

4.3.3 Workarounds Connecting Advertisement to Sales. We noted that romance novelists sought workarounds to calculate their novel sales. Due to the lack of cross-platform advertisement tracking,

there was no way for romance novelists to know the sales they made through advertising on social media. For example, when a novelist advertised on Amazon, they got a report detailing the number of clicks on the advertisement and the sales generated. However, they could not track the sales if they advertised on another platform, such as social media. Hope told us about this problem, saying:

“Facebook will tell how many clicks you received, even how many unique clicks, but you have no way of knowing whether they [the reader] then proceeded to buy or read the book [on Amazon].”

Understanding sales through advertisement gets complicated further if a reader bookmarks a book and makes a purchase later instead of buying the book immediately. Interviewees explained that this is due to the lack of communication between the two platforms used for advertising and selling. For example, Facebook has no way of reporting if an advertisement led to Amazon sales as no algorithm connects and communicates across the platforms. This lack of cohesion between the platforms that novelists used to conduct their work posed challenges. Aileen commented:

“There’s no good reporting for any of it. I wish that there was that. Something where I could say, here’s all the money I made today, here’s all the money I spent today. Did I make money today? There’s not a good reporting system for that.”

Interviewees found workarounds to track the sales made through advertisements on social media. Aileen said that she checked the Amazon and Facebook dashboards weekly to calculate the sales of her novels. She kept a spreadsheet comparing sales for about each Amazon book to the money she spent on advertising each book, using the difference to analyze if she made a profit. Other novelists created affiliate accounts to track their sales through advertisements. Juliet used an affiliate account on Amazon to generate coded links to use on Facebook advertisements. She then used a link tracker to investigate how many readers clicked on the Facebook ads using the coded links to buy her novels and determine whether her advertisement generated any sales. Juliet said:

“So let’s say I spend \$1,000 on an app, and I use my affiliate coded link in the ad, and I determine that I’m going to make \$3 every time somebody buys a book, and I sell 500 books. So I’ve made 1500, I spent 100. I’ll never know if every single one of those sales was 100% because of the ad, but I certainly know for every \$1000 that I spent, I made 1500, and 3 days ago, I spent zero, and I was making \$98 off that book. I compare the baseline to the ad spend to the sale.”

These different strategies to gain new readers, maintain a sustained connection with existing readers, and calculate sales made through advertising demonstrated that interviewees formed various folk theories to navigate online platforms. They understood what aspects of algorithms impeded their sales and how to work around and fill the gaps that existed when using platforms with no cross-platform functionality.

5 IMPLICATIONS FOR DESIGNING ALGORITHMIC SYSTEMS FOR DIGITAL WORK

Algorithms are deeply embedded in digital workspaces. Consequently, it becomes crucial to understand workers’ understanding of algorithmic systems that could heavily impact their ability to be successful. Our study demonstrates the need for continued scholarly attention to workers’ experiences and perspectives about continuously changing algorithmic systems. Romance novelists’ efforts to comprehend algorithms individually and collectively in order to navigate algorithmic systems provide insights into how digital workers construct algorithmic literacy of precarious systems online. These insights can be mapped to other self-employed digital workers, such as content creators (e.g., photographers, influencers, and podcasters), dependent on online platforms to build audiences, market their work, and generate sales. In this section, we discuss the findings,

situating them in CSCW and HCI scholarship to reflect on the demands of digital work [42] and propose implications for design technologies that support workers' algorithmic literacy.

5.1 Designing for Precarity

Our study demonstrates that continual algorithmic changes restricted romance novelists from forming a more profound understanding of algorithms. Online platforms provided no service to notify the novelists about algorithmic changes, let alone assist them in comprehending algorithms. This lack of assistance amplified widespread precariousness among the novelists about the working of such platforms. Romance novelists understood that while they used online platforms, they were not in charge of platform curation. Our findings align with Simpson et al.'s [126] observation that LGBTQ+ content creators on TikTok felt they lack control of the platform which constructed their digital selves, making it hard to 'domesticate' for personal use [126]. Creators from other marginalized communities have experienced a lack of control over their digital selves, especially when their content is misclassified and policed by algorithmic moderation [11, 68, 69, 128].

We note studying algorithms in relation to their organizational boundaries, focusing on the policies that influence the execution of algorithms and impact those tasked with navigating them. Online platforms are profoundly volatile, with fluctuations in wider socioeconomic, cultural, and political realms [38, 75]. Conway's Law states, "the structure of the system mirrors the structure of the organization that designed it" [71]. Extending this law to technical systems, Herbsleb and Grinter [72] argued that the structure of the code mirrors the structure of the organization and its culture. Romance novelists repeatedly mentioned how the algorithms changed online. They created a digital presence across different platforms in case a platform disappears. The frequent and sudden changes of algorithms online mirrored the precarious nature of technical firms driven by repeated disruption and siren calls to "move fast and break things" [40] rooted in wider and deeply flawed manifestations of platform capitalism [39]. Blevis et al. [13] argue that "[to] serve its own interests, our economic system produces incessant moments of disorder and disruption rather than graceful performative luxury, and tells us this is a good thing" (see also [122]). This continual disruption caused by algorithms restricted the novelists from forming thorough algorithmic literacy. When designing for algorithmic literacy, designers might attend to ways organizational practices and cultures are embedded in algorithms. Designing for more stabilized systems with a scaled-back approach to algorithmic changes may provide opportunities to prepare users for impending changes, minimize disruptions in the platform economy and support users in forming algorithmic literacy.

The uncertainty associated with changing algorithms and unclear policies prompted romance novelists to use platforms offering more control, stability, safety, and sustainability. While the novelists built an online presence on various platforms, they made efforts to establish a sustained connection with readers via personal websites and e-newsletters. These mediums provided them with more control over their work practices and platform stability in their outreach. Design for digital work has largely steered towards the refinement of modern online platforms and more sophisticated algorithms, with researchers documenting the scope of algorithms users struggle to understand [29, 33, 102, 109]. However, worker groups may default to older forms of technology-mediated communication and connection in times of uncertainty, which provide them with features that they value, for example, control, safety, sustainability, and stability [35, 66]. As more workers migrate to digital platforms, they might benefit from tools integrating older but more stable forms of technologies with newer but constantly changing ones. Designers can assist digital workers by designing systems that help workers manage these different generations of technologies simultaneously, either by integrating them or by creating a channel to assist cross-platform content sharing. For example, a dashboard for digital workers to manage different social media platforms simultaneously may be of value to a broad spectrum of content creators. However, care should

be taken in cross-platform design [49] as managing multiple platforms can become arduous and confusing, especially if favored alternative platforms are unknown to workers.

Research has shown the stresses digital workers incurred by attempting to appease both audiences and algorithms [17, 43, 144]. Workers operate in “anticipatory compliance” [17], i.e., by demonstrating preemptive behavior modifications to comply with the algorithm. We notice this compliance in our participants, a symptom of situations in which they lacked clarity in how and what algorithms moderate their work. As algorithmic transparency becomes an increasingly important concern for online workers, there may be value in creating tools that provide workers with timely, plain language summaries of policy and governance strategies, as well as condensed algorithmic education for factors that directly impact their key metrics and labor costs.

Platforms that romance novelists used for work, including social media, come and go and readers migrate. When MySpace lost popularity, all that romance novelists had learned to leverage the platform for marketing their novels was rendered obsolete. Based on this experience, novelists were cautious about using new platforms, such as TikTok, which looked appealing to them, but they feared that such platforms might be subjected to the same fate as some of their predecessors. Thus, the decision to use a platform for work goes beyond its changing algorithms. It also includes considering the broader media ecology in flux. As this ecology continues to evolve with some platforms retiring and new ones getting added, forming algorithmic literacy will always be an ongoing challenge. Workers will always need to engage in the additional labor of understanding new platforms, their features, including figuring out how to adhere to the changing platforms’ policies, how algorithms on these new platforms might enforce the policies, and adapting their strategies when the algorithms inadvertently change rules that they were familiarizing themselves with. When designing algorithmic systems for work, we could consider studying the skillsets needed across varying roles to cope with this evolving media ecology and the influence this evolution has on the stability of online work.

5.2 Designing for Underlying Goals and Values

While many participants attempted to understand algorithms, some intentionally refrained from doing so, as constructing algorithmic literacy comes at the expense of time and effort which is better spent writing novels. All participants were, however, aware of algorithms. This observation contrast with those reported by Rader and Gray [114], Eslami et al. [48], and Duggan and Smith [44] where a majority of their participants were unaware of the existence of algorithms. A key difference between our findings and others may lie in the usage of these online platforms for economic or non-economic purposes. Users may become aware of algorithms because they care about how their content is being distributed online. If they do not have such needs then they might not care about the working of algorithms or not even notice unless algorithms produce unexpected or faulty results [18, 29, 33]. For example, Lustig et al. [92] reported that Facebook users cared about the working of algorithms when the recommender system did not emotionally respond in the way they expected their close friend or therapist to respond, leaving them with “complicated, messy, and often contradictory” timelines. For digital workers, including romance novelists, the need to understand algorithms is a heightened sense of urgency as their work depends on successfully navigating online platforms [38]. Klawitter and Hargittai [84] argue that content creators, for example, “may be more incentivized than most in understanding how [algorithmically curated] feeds decide what to display to users ... [because] their livelihood directly depends on such exposure ... [and thereby are] likely exert more time and effort on getting to know these systems than average users.” Algorithms directly impacted romance novelists’ professionalization and monetization. Their algorithmic awareness was driven by a greater necessity of making sales and generating revenue. This incentive does not exist when users use platforms for regular non-economic purposes, though the impacts of

platform monetization and content promotion may contribute to their own algorithmic awareness as boundaries between work and social contexts are blurred. The design of algorithmic systems for digital work could consider workers' purposes behind using the systems. This understanding could help us create systems with proper feedback mechanisms [29, 48, 92], such as to specify why a post shared was flagged or removed or why a certain post was recommended, to assist digital workers in nurturing their algorithmic literacy.

When designing systems for digital work, we could determine the values that digital workers prioritize while conducting their tasks, and the platforms that support such values; for example, romance novelists prioritized values, such as community building, solidarity, and mutual support. To do so, we could take a value-sensitive design-based approach [14, 55, 56, 135]. We can determine the platforms that digital workers use for their work, their rationale for choosing them, how they link such platforms to create a sociotechnical ecology to work successfully, and the corresponding ways their algorithmic literacy is shaped by such platforms and their algorithms. Doing so could provide insight to design platforms to prioritize the values of workers when creating resources, such as best practices or explanations of platform policy. However, users might have diverse and conflicting values. While we could consider such values in design from an ethical standpoint, this is not to say that one value is more important than or overrides other values [46, 57, 76]. In systems that might be used for numerous purposes, such as social media, we could seek to balance different values to avoid standardization that could restrict such systems' wider use. Algorithmic systems might present new challenges for the users as the values they enable might not be considered by designers. A more careful conceptualization of values is needed to design systems to build on the values of digital workers to support their work. As we design systems, we could become more conscious of our own values that might play out in the systems, in alignment (or not) with users, thereby compromising the values of users; however, not just of designers but values of others involved, such as those who collect and annotate data, train and tweak models, and commercial third parties that shape the behavior of large algorithmic systems (e.g., big data systems) for work.

5.3 Designing for Collective Knowledge-Making

Romance novelists formulated folk theories to circumvent algorithms to domesticate the platforms. They shared folk theories with each other to raise collective algorithmic literacy. CSCW and HCI researchers have noted the social construction of algorithmic literacy [38, 53, 126], reporting how digital workers leverage their professional networks for collective algorithmic knowledge-making. For example, in their examination of the social ecology of indie game developers, Freeman et al. [54] described the process of socially constructing algorithmic literacy, which included collaborative information seeking, sharing and reproducing, community support, and navigation of outside policy and politics. Novelists leveraged their professional networks to understand algorithms. Those who understood how online platforms and their algorithms work shared their understanding with others through classes, books, blogs, and social media. Novelists gave back to their community, and learned from each other, thereby forming a collective algorithmic literacy. This "*hive mind*," as a participant described it, developed in response to the new knowledge base required to succeed independently, made this social construction of algorithmic literacy a valuable professional competency. Such social constructions offer opportunities to understand how collective algorithmic literacy supports digitally mediated professions. This understanding could help us to design sociotechnical systems assisting digitally mediated collective knowing-making and transfer. For example, we could design systems that act as a dashboard or repository of information shared on various mediums among workers to help conduct digital work successfully.

Beyond their professional networks, romance novelists sought help from networks of family members and friends working in the IT industry or having the technical expertise to comprehend

algorithms. These intermediaries interpreted the working of algorithms, translated, and shared their interpretations with the novelists. Designing technologies for digital work could analyze how intermediaries interpret, translate, and transfer their algorithmic knowledge to the workers lacking technical expertise, including the (non)technical vocabulary they use. This understanding may provide context for examining how knowledge transfer builds the capabilities of workers to comprehend algorithms online. CSCW and HCI researchers have emphasized identifying niches of “invisible” groups [20] who often reside “out there” [133] around users, assisting their use of digital technologies. Designing algorithmic systems to support algorithmic literacy could incorporate intermediaries as secondary users who might be performing the work of comprehension, translation, and transferring algorithmic knowledge for the actual users of a system.

We can take a broader ecological perspective [5], understanding different ways in which secondary users are involved in algorithmic systems. We could assess how the intermediaries’ perceptions and interpretations of algorithms are used to raise the algorithmic literacy of workers to harness online platforms for their economic success, and how such perceptions and interpretations might be incorporated into designing more transparent algorithmic systems. Platform designers should take into account the entire ecology of users. Such an approach may yield valuable insights into alternative ways of framing complex algorithms in plain language terms that convey the most relevant information to workers. Designing to support connections between workers and their intermediaries can help form skills currently essential to the labor force.

The social construction of algorithmic literacy may span oral and written digital or non-digital formats. Romance novelists shared their algorithmic knowledge by publishing books, conducting online classes, writing blog posts, and posting on social media. Designing resources to promote algorithmic literacy may draw from different mediums through which (in)formal literacy is being shaped, ranging from online communication channels to non-technical mediums.

5.4 Designing for Online Seams

Romance novelists used workarounds to weave together disconnected platforms for their work. Their experiences navigating online platforms without cross-platform functionality shed light on how workers bridge gaps between online platforms, demonstrating their algorithmic literacy. CSCW and HCI researchers have discussed the existence of seams when a user using digital technologies moves across physical spaces [23, 24, 74, 137]; seams are the points of ambiguity where technologies are rendered visible [137]. We note the existence of *online seams* encountered when moving across online platforms. As the novelists navigated online platforms, ranging from social media for marketing novels to online retail sites for publishing, they experienced seams that hindered their work. For example, the novelists had no way of determining if the advertisements on social media resulted in sales through online retail platforms. Platforms such as Facebook and Amazon did not provide cross-platform functionality, allowing users to transfer details from one to another. To address the problem, the novelists formulated workarounds, such as maintaining a spreadsheet comparing advertisement costs and revenue generated to creating affiliate accounts.

Such workarounds were not a stable set of techniques as they were produced through “fleeting moments of alignment situated to particular tasks with materials ready-to-hand” [137]. However, the workarounds demonstrate romance novelists’ understanding of the online seams and ideas to fill those seams. These ideas illuminate an opportunity to design systems that could support cross-platform communication and integration. We may design an application to help digital workers track the money they spent on advertising across social media platforms and the profits their sales generated on online retail platforms. We could design a web-tool to measure the impact of Facebook ad campaigns on how consumers discover, research, and buy their products on Amazon.

6 FUTURE WORK

The precarity of digital platforms placed burden on romance novelists to understand algorithms, demanding their time and effort. They had to perform labor to gain new readers, sustain connections with existing readers, and maintain relationships with their peers. This labor, involving communication, affect, and care work, is often ignored and dismissed as “embodied, natural, immaterial” [7, 52]. Future work may expand on the different forms of labor that romance novelists perform and the ecology of workers assisting the novelists in performing such labor. Given its necessity in digital work, by studying the additional labor, we might gain richer insights into the working patterns of self-employed workers leveraging online platforms for professionalization and monetization.

Algorithms acting as “technical arbiters” [40] punishing users demands further attention. Traditionally marginalized novelists from racial or ethnic minorities, with disabilities, and from the LGBTQ+ community might be disproportionately impacted by the vicissitudes of algorithmic systems [79]. For example, research has demonstrated that queer content is often asymmetrically policed and systematically silenced on online platforms [11, 45, 68, 73, 128]; Tumblr’s ban on adult content inadvertently silenced individuals relying on the site to explore their gender and sexual identity [68]. Future work can investigate the experiences of romance novelists from marginalized groups with algorithmic systems, specifically studying (a) how the dynamics of their identities and the connotation of performing “illegitimate work” [91] may map themselves onto algorithmic systems, (b) how algorithms suppress or oppress their identities, and (c) what are the self-organized practices that romance novelists follow to navigate through such suppression or oppression.

7 CONCLUSION

The nature of their work makes self-published romance novelists a particularly unique research subject, considering their success, primarily calculated through online book sales, often requires an understanding of underlying algorithms moderating their work. We conducted surveys and interviews to understand how romance novelists interpret changing algorithms on online platforms they use for work. We noticed that the novelists sought assistance from their social networks of family and friends to interpret algorithms. They shared their algorithmic knowledge with each other via online classes, books, blogs, and social media posts, making the construction of algorithmic literacy a collective and professional activity. They devised workarounds to navigate diverse algorithmic systems with no cross-platform functionality while manipulating certain algorithms, which demonstrated their algorithmic literacy. Based on our findings, we presented four implications to design algorithmic systems supporting digital work: designing for precarity, underlying goals and values, collective literacy-making, and online seams.

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