

## ABSTRACT

Title of dissertation: **SUPPORTING READER-ORIENTED NEWS  
EXPERIENCE FOR IMMIGRANTS THROUGH  
CHATBOT DESIGN**

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News reading helps individuals stay informed about societal developments. For immigrants, local news serves as a crucial information source for adapting to their host country. However, prior studies have highlighted that challenges, such as language barriers and a lack of relevant social knowledge, often hinder immigrants' ability to fully comprehend and utilize news content in their everyday lives. With the digital transformation of media, there is a growing interest in enabling readers to interact with news content based on their needs and interests. Emerging technologies such as chatbots hold promise for supporting this type of engagement through intuitive interactions. As recent advancements in large language models have further unlocked the potential of chatbots, it is important to consider what needs immigrants have when reading news with the assistance of a chatbot, and how chatbots can be designed to provide a reader-oriented news experience.

This dissertation seeks to address these gaps through a multi-study project. The first study investigates immigrants' news reading needs using a between-subjects experiment involving Chinese immigrants and U.S.-born locals, where participants read a set of news articles with the assistance of an LLM-powered chatbot. This work presents a typology of

reader-initiated questions and reveals differences in how these groups engage in analytical thinking about news content and seek practical guidance from it. The second study extends this research by including a Vietnamese immigrant group, offering a cross-validation of the findings from the first study. Study Two enriches our understanding of reading needs across different immigrant groups. My third study aims to extend both the empirical understanding and the design thinking for immigrants' news experiences by connecting their voices with those of journalists. I invited 11 immigrant readers and 7 journalists from the metropolitan area in the U.S. capital region into a co-design study. Participants joined a series of interlinked activities spanning multiple days, and they collaboratively envisioned technology design for immigrant readers by situating their design speculations within existing links between news production and consumption. The findings of this research surfaced multiple sets of (mis)alignments between immigrant readers and journalists on values that should be prioritized in news topic selection, content presentation, and information processing. Grounded in these insights, participants articulated four metaphors for future news technologies serving immigrant readers. The findings contribute meaningful insights for enhancing immigrant readers' news experiences through the appropriate alignment of roles among technology, journalists, and immigrant readers. These findings extend the first two studies by contextualizing the identified news reading needs within immigrants' lived experiences and real-world journalistic practices, and by generating design insights for technologies that better support immigrant readers.

This dissertation contributes: 1) an enhanced understanding of immigrant news readers' needs through empirical findings, such as a typology of reader-initiated questions serving different purposes; and 2) actionable insights for designing chatbots that deliver audience-oriented news experiences, grounded in collective input from stakeholders in the news ecosystem.



SUPPORTING READER-ORIENTED NEWS EXPERIENCE FOR  
IMMIGRANTS THROUGH CHATBOT DESIGN

by

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## Dedication

To all internationals who leave their homes in pursuit of their dreams and freedom.

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## Chapter 1: Introduction

News is a critical source of information for immigrants adapting to a new environment [44]. Researchers in immigration and media studies emphasize the benefits of consuming mainstream news media from the host society. For instance, mainstream news is often considered a more reliable source that provides nuanced insights into local contexts, compared to alternatives like interpersonal networks or ethnic media [80, 175]. However, immigrants often face several challenges in engaging with local news, including language barriers and limited social knowledge necessary to interpret and apply the information to their daily lives [7, 89, 175]. These obstacles prevent immigrants from fully understanding and utilizing news information [182], even though this source is widely accessible and commonly consumed by the local majority. Over time, these challenges can restrict immigrants' access to critical information in their local communities, and limit their participation in public discourse [5, 63, 175].

In today's digital era, news consumption is transitioning from a reporter-driven model to one that centers on the reader's experience [264, 296, 297]. This shift presents exciting opportunities for researchers and system designers to craft audience-oriented news experiences. To this end, scholars have introduced the concept of "news informatics," which refers to the use of interactive tools that enable readers to explore and customize their engagement with news content based on their needs and interests [262, 264]. A promising approach under this exploration is the use of chatbots for assisting with news reading. Prior research in journalism and HCI highlights the potential of chatbots to enhance reader

engagement via delivering tailored content to its audience through its conversational interfaces [125, 166, 324].

Early implementation of news chatbots, such as those developed by news agencies, are often basic prototypes and rule-based systems primarily designed to distribute news or answer simple questions for streamlining journalists' workflows [125, 284, 324]. In other words, these early chatbots do not handle open conversation with news readers and are not able to support reader-oriented news experiences. However, recent advancements in large language models (LLMs) have opened new possibilities for developing more sophisticated chatbot systems that can cater to a broader range of user needs. These technological breakthroughs provide an opportunity to rethink how news chatbots can be designed to address the challenges faced by news readers like immigrants.

Although a few studies have explored chatbot designs for news consumption through human-centered approaches, these efforts often rely on staged setups [8, 25]. For example, news reader participants were asked to imagine hypothetical chatbot interactions or use pre-scripted questions to test chatbot functionality [112]. While these studies provide valuable insights, they fall short of capturing the nuanced needs of immigrant readers in natural settings. For example, there is limited understanding of the specific types of news content that immigrants want to comprehend or how they might utilize the information within their news reading experience. These gaps are critical to designing chatbots that effectively support readers in engaging with content [204]. However, there remains a lack of empirical research capturing the informational needs of news readers during the actual process of reading and interacting with news.

Existing work also shows that designing news chatbots involves multiple stakeholders, each with distinct priorities (e.g., [29, 30, 112, 125]). For example, interviews by Hoque et al. illustrate that news readers value convenience and functionality [112], while journalists tend to restrict the scope of chatbot responses to maintain professional standards [112].

These differing perspectives highlight the complexity of designing news chatbots and the importance of engaging relevant stakeholders throughout the development process.

This dissertation addresses these gaps by examining the needs and design considerations for reader-oriented news chatbots that support immigrants during the reading process. For this work, immigrants are defined as individuals who have voluntarily relocated to a new country, such as international migrant workers [43]. The dissertation pursues two primary goals:

- to understand the information needs of immigrants during their news reading, and
- to provide a shared foundation for key stakeholders to co-design future news AI systems, generating actionable implications for reader-oriented chatbot design.

Chapter 2 reviews literature on immigrants’ news consumption practices and prior work in technology design for news reading and news chatbots. It synthesizes insights across these areas to motivate the overarching research questions and research paradigm guiding this dissertation.

Chapter 3 presents a between-subjects study with two groups: Chinese immigrants who relocated from Mainland China to Virginia, and local residents born and raised in the same region. Local readers serve as a baseline comparison because they generally possess deeper contextual knowledge of their society. This comparison helps reveal differences in reading strategies and information needs.

Chapter 4 extends this work by involving a second immigrant group—Vietnamese immigrants living in the same region—to broaden the scope and validate earlier findings. The chapter also includes an evaluation of the chatbot responses provided to participants in Chapters 3 and 4, assessing their quality and limitations.

Chapter 5 reports a co-design study conducted with immigrant readers and journalists from the same metropolitan area. Through a multi-day series of activities, participants

explored their values, expectations, and concerns about news technologies. The study facilitated discussions about how journalists' professional norms align—or conflict—with immigrants' information needs. Together, participants envisioned future technologies that build on existing relationships between news production and consumption.

This dissertation makes several contributions at the intersection of HCI, journalism, and chatbot design:

- It introduces a detailed typology of reader-initiated questions to news chatbots, organized into seven categories serving four overarching purposes, offering a foundation for future research on news engagement.
- It identifies key differences between immigrant and local readers, providing quantitative evidence of how these groups approach and interpret news, and offering guidance for designing reader-oriented chatbot systems.
- It uncovers multiple sets of alignments and misalignments between immigrant readers and journalists regarding values that shape news topic selection, content presentation, and information processing.
- Drawing on these insights, participants developed four metaphors for future news technologies serving immigrant readers: as a *data decoder*, a *connection informer*, an *empathetic friend*, and a *trajectory witness*. These metaphors highlight how technology, journalists, and readers can work together to support immigrants' news experiences.

## Chapter 2: Literature Review

Under this chapter, I review four bodies of literature. The first section examines immigrants' practices of news consumption. Previous research highlights the critical role of news as an information source for social adaptation, while also identifying challenges immigrants face in comprehending news content. Next, I explore journalism literature that underscores the growing emphasis on audience-oriented news experiences. This body of work focuses on enabling interactivity and engagement with news content, allowing readers to explore information based on their individual needs and interests. In the third section, I review studies demonstrating the potential of chatbots as tools to facilitate interactivity, and include an overview of current developments in news chatbot design. In the fourth section, I review the participatory approach as a third space and opportunity for designing for news technology. Finally, I synthesize insights from these areas to construct my overarching research questions as informed by the gaps and opportunities identified in the existing literature.

### 2.1 Immigrants News Reading

#### 2.1.1 News as an information source for immigrants adaptation

Access to accurate and timely information is crucial for immigrants navigating life in a new society [43, 209, 255]. Among various information sources, news media serves as an essential source of societal knowledge, offering insights into local policies, cultural

norms, and community events [51, 307]. Due to the established editorial standards upheld by news outlets, news media usually delivers higher-quality information compared to informal sources [175]. Despite this, studies have shown that immigrants often heavily rely on informal sources, such as personal networks, which can vary in availability and reliability [26, 44, 248, 322]. For instance, Zhang and Gao conducted interviews with 21 immigrants and their social contacts residing in the U.S. [322]. Their study found that the information provided through their social connections, which consist largely of their co-national cohorts, is often limited in scope and outdated. Researchers have raised concerns about the over-dependence on homogeneous information sources, emphasizing the importance of using various sources for a more balanced approach [47, 123, 152, 277]. In this context, news media play a crucial role by filling the gap and offering immigrants up-to-date and comprehensive information about the society.

Extensive research on immigrants' news consumption has found that they often employ a mixed approach, drawing from both ethnic media and mainstream sources of their host country [265]. This practice indicates the dual objectives that immigrants often have: integrating into the new culture while preserving their original identity [57, 163]. On one hand, immigrants consume news media to understand their new environment and stay informed about local issues and opportunities. On the other hand, they seek to maintain their cultural roots and stay updated on events and developments in their home country.

Among various types of news media, ethnic media—defined as media produced by and for a particular ethnic group—can be especially beneficial for immigrants who lack personal connections upon arrival or face language barriers [129, 181]. According to Zeigler, ethnic media supports the “process of assimilation by offering information and advice on the lifestyle in the new country [317].” It helps immigrants stay connected to their cultural roots and remain informed about developments in their home countries, while also providing essential information about the new society [308, 317]. For instance, Dalisay



analyzed large-scale survey data involving over four thousand participants across the U.S. [63], and found a positive association between the use of ethnic media and immigrants' social knowledge of the host country.

However, the information provided by ethnic media often remains limited in depth, primarily addressing practical details that are crucial for newcomers but may diminish in relevance as immigrants become more familiar with their host country [130, 131, 290]. Ethnic media can be instrumental in the early stages of adaptation, but the prolonged reliance on it may hinder deeper integration into the host society [133]. Additionally, some ethnic media content is produced by translating news stories from local mainstream media, which may lead to a lack of detail and accuracy [308]. Despite the important role of ethnic media, scholars emphasize the need for immigrants to consume a balanced mix of ethnic and local mainstream media for successful long-term adaptation [129, 175].

On the other hand, a growing body of research has explored the role of local news consumption in immigrants' social adaptation [46, 132, 137]. Exposure to host country news provides immigrants with a broader and more diverse range of cultural elements compared to ethnic media, thereby facilitating smoother adaptation [7, 311]. For instance, Alencar and Deuze conducted 12 focus groups with three immigrant groups in the Netherlands and Spain, revealing several key functions of local news media in assisting newcomers with adaptation [7]. Consuming host country news helps immigrants acquire information about events and current affairs, improve language proficiency, and facilitates their daily living and functioning in the host country. Similarly, Lee and Tse conducted surveys with 938 new immigrants and local residents in Canada, finding that increased exposure to host country media was positively associated with immigrants' social adaptation, such as knowledge of Canadian social norms [154].

Despite these benefits, several studies indicate that local news remains an underutilized information source for many immigrants [154, 175, 208]. For instance, a survey study

with Chinese immigrants conducted by Mao showed a general preference for Chinese media, with Chinese news media remaining the primary information channel for government, policy, and other everyday information [175]. This underutilization represents a missed opportunity for enhancing immigrant integration and adaptation.

To summarize, local news, as one important information source, offers a broader perspective and deeper insights that are essential for long-term integration. Despite its potential benefits, local news remains an underused resource among many immigrant populations, presenting both a challenge and an opportunity for research and intervention. In this dissertation, I aim to explore this specific facet of immigrants' news consumption by focusing on their interaction with local news media. By examining how immigrants engage with local news articles, we can gain insights into both the potential benefits and the challenges they face when utilizing this important yet underused information source. In the following section, I will review immigrants' needs when reading local news articles and the potential challenges they encounter, providing a foundation for understanding how to better support their engagement with local media and, consequently, their overall adaptation process.

### 2.1.2 Needs and challenges of reading local news for an immigrant

Extensive literature on information seeking has indicated that immigrants hold goals and priorities different from local-born residents during their news reading process and beyond [8, 43, 123, 162, 207, 208, 247, 251]. For example, Oh and Butler conducted online surveys and follow-up interviews to compare the information needed of new immigrants and domestic residents relocating to a new city in the United States. Immigrants reported a significantly greater demand for information related to their survival needs, whereas domestic people exhibited an inherent familiarity with the local socio-informational infrastructure [207]. Caidi et al. synthesized literature on immigrants' social adaptation in Canada and

elsewhere. They outlined a trajectory in which an immigrant's needs may gradually evolve from seeking settlement-related help to collecting more advanced information (e.g., tacit social knowledge for civic participation), demanding considerable support for making these transitions. In contrast, local people often require much less help in accessing information at more basic levels [43]. Many empirical studies have also indicated that, compared to locals, immigrants often need additional scaffolding in seeking domain-specific information of their interests, such as understanding health insurance policies [231, 278, 329], getting their questions about employment and job opportunities answered [171, 222, 247, 322], and interpreting online reviews of local services [3, 196, 260].

Besides holding separate goals, immigrants encounter distinct challenges in understanding and processing a piece of news. This latter point has been highlighted by a series of research on news reading [89, 175, 182]. In a recent project, for instance, Gao et al. studied how Chinese immigrants in Japan and the United States consumed covid-relevant news during the global pandemic. They found that immigrants seldom engaged with the society's mainstream media, despite having a strong willingness to understand the local covid situation [89]. During interviews in this research and a few others, immigrants shared that they often had questions about how to interpret the implications of specific news; that said, there was a lack of channels for them to discuss their questions with others and obtain answers [43]. Limited English fluency often emerged as another roadblock, further complicating immigrants' news consumption from media sources commonly used by locals [57, 80, 182, 247]. Miglietta and Tartaglia conducted surveys among immigrant communities in Italy. Their structural equation model suggested that proficiency in the local language (i.e., Italian) positively influenced local media consumption, indicating that linguistic proficiency is a key factor in understanding local information like news articles [185].

Together, previous literature collectively points to some important insights: immigrants

face unique challenges and have distinct needs when accessing news articles compared to domestic readers. However, there is a notable gap in research that elaborates on the specifics of these differences. Current understanding of how immigrants process and bridge their information gaps when comprehending news articles remains limited. One reason is the predominantly retrospective nature of previous work on immigrants news reading. These studies often rely on immigrant participants recalling their news reading practices through interviews and surveys (e.g., [7, 80, 175]), rather than examining the actual process of news reading as it occurs. While these approaches were valuable for understanding their news reading practice, they may not capture the nuanced challenges and needs of immigrants news reading. For the purpose of designing effective news reading support tools tailored to immigrants, it is essential to gain a more comprehensive understanding of their needs through a closer examination of their reading process.

## 2.2 News Reading in the Digital Era

### 2.2.1 News reading: from journalist-guided narratives to reader-oriented exploration

“News is a window on the world. Through its frame, Americans learn of themselves and others, of their institutions... The news aims to tell us what we want to know, need to know, and should know.”

— Gaye Tuchman, *Making News: A Study in the Construction of Reality*, 1978 [281].

The way news readers explore a news story is influenced by both the way journalists craft news narratives and where the audiences see their interests. This process can be described as a two-stage “martini glass” structure: the first stage involves journalists crafting

the news according to professional practices and presenting it in a linear fashion [296]. In the second stage, as news readers are initially guided step-by-step through the author's narrative, and later, they explore aspects of the news that tie to their interests and develop their own interpretations. In this subsection, I depict both components to uncover detailed insights into news reading.

Journalists, acting as strategic “framers,” select and emphasize certain realities to construct narratives that are newsworthy and engaging, guiding readers through the news in a structured, linear manner [289]. Beyond merely disseminating information from various sources, crafting news stories is a process of portraying realities in a constructed manner [281]. Journalists consider this process—turning occurrences into engaging and objective news events—a testament to their skilled craftsmanship [19]. For instance, Ross conducted ethnographic fieldwork and interviews with students and faculty at a top U.S. journalism school. This study highlighted the emphasis journalists place on story planning during their training, such as outlining content, identifying target audiences, justifying a story's newsworthiness, and strategizing its presentation [232]. Additionally, Engesser and Brüggemann surveyed 64 climate journalists across five countries, revealing details of how journalists craft stories through a two-step process: they select certain aspects of events to cover, such as problem definitions and causes, based on trustworthiness and professional standards, and then integrate them into coherent stories [77]. According to prior media studies, the news creation process involves a complex interplay between the sources of events (authenticity of source), journalists' individual perspectives and professional skills (e.g., personal belief, knowledge), and organizational guidelines (e.g., editorial policies) [77, 245]. These elements collectively shape how journalists tell their news stories, resulting in a narrative that guides news readers to follow.

Consequently, news consumers were initially guided through the storyline crafted by journalists, after which they would explore aspects that aligned with their interests, devel-

oping their own interpretation and narratives. As Bird noted, “people do not evaluate news stories in isolation, but incorporate them into their already established worldviews [32].” This process of engagement serves multiple purposes: seeking information, understanding society, and making informed decisions. The landmark Nationwide study in media audience research demonstrated this concept by showing clips from ‘Nationwide’ to participants from various social groups. This study revealed that while media producers encode messages with specific meanings, audiences decode these messages in diverse ways, influenced by their unique sociocultural backgrounds [191].

Previous studies have documented instances, in the early days, where audiences engaged with news content, such as by writing letters to editors [289], or participating in call-in programs [16]. More commonly, people interact with news in informal ways, particularly through what is called *news talk*—an informational and often active way of communication where news stories are shared and discussed among individuals [227]. In these exchanges, meanings are constructed that may diverge from the original intent of the journalist who produced the text [32]. Due to its unidirectional nature, traditional media formats (e.g., print media, radios, etc.) typically offer limited opportunities for audiences to explore news stories further.

The digitalization of media has significantly transformed how readers engage with news. This shift to digital platforms has enabled a more selective and non-linear reading experience [165]. For example, Marshall conducted a field observation study with 22 participants of the Times News app. Their study revealed that readers often consult multiple sources to fill knowledge gaps when reading a single news story [179]. Yadamsuren and Erdelez conducted surveys of 148 online news readers and interviews with 20 participants of a local newspaper. Their survey found that readers frequently delve deeper into specific aspects of a news story, and seek varied viewpoints from different sources (e.g., online search and other media sites) to better understand issues of interest [306]. Online

news platforms enable a broader exploration of stories, contrasting with traditional media, where news is often presented through the singular lens of the journalist.

### 2.2.2 News informatics and interactivity

With the rise of the digital era, the way audiences engage with media has shifted from being author-driven to increasingly reader-oriented. In the news domain, researchers have highlighted the growing trend of enabling readers to explore news in ways that generate personalized insights and narratives tailored to their interests, a concept referred to as “news informatics” [264]. Despite the abundance of public information available online, journalists still play a crucial role as gatekeepers, selecting and curating stories for their audiences. However, this curation usually offers a limited range of narratives that may not always align with readers’ diverse interests. This raises the question of how to better support a reader-oriented news reading experience in the digital age.

Extensive research has highlighted interactivity as a key approach to enhancing a reader-oriented experience for news audiences. In earlier media research, Marie-Laure Ryan, in his work *Avatars of Story*, emphasized that interactivity is one of the most significant properties in storytelling, as it allows users to participate and influence the narrative of the story. Traditional storytelling relies on the linearity, and unidirectionality of time, logic and causality, where events follow in a set order, each leading to the next in a causal chain. Interactivity, however, disrupts this linear flow, enabling users to engage and lead to different, branching paths personalized to their own experience [233]. Furthermore, Sundar et al. developed the interactivity effects model and elaborated the interactivity from a communication perspective, breaking down interactivity into three dimensions: modality (i.e. physical interaction with a system), message interactivity (i.e. the exchange of messages), and source interactivity (i.e. the degree to which the user is allowed to serve as a “source”

of the content) [262]. They argued that enabling these three dimensions contribute to increased user engagement, meaning that users become more absorbed in and involved with the content when interactivity is well-designed. Engagement, in turn, mediates the impact of interactivity on cognitive, attitudinal, and behavioral outcomes.

The effects of interactivity in media consumption were further examined in the context of data-driven journalism. Weber et al. conducted a qualitative interview study with 60 professionals—including data journalists, designers, developers, and newsroom leaders from 26 major news organizations across six European countries [296]. Their findings revealed that interactivity is a critical component of data-driven stories, allowing readers to explore data segments actively. This interaction personalized the experience and drew readers deeper into the story, enhancing engagement and understanding. Later, Sundar tested different forms of interactivity in data-driven news stories and found that features like clicking, dragging, and hovering significantly enhanced participants' perceptual bandwidth and positively influenced their perceptions of synchronicity—how “in sync” they felt with the interface [264]. Showing interaction history in visualizations also improved their perception of contingency, or the sense that their actions had a direct impact on the content. This shift in narrative control has democratized storytelling, giving readers more agency in shaping their own experience of the news.

To summarize, the literature review highlights two main points. First, it suggests that immigrants have a strong need to read news from their host country as part of their daily information practices. However, they often face challenges in comprehending and contextualizing this content in their daily lives. This gap, between the need for information and the ability to effectively process it, presents a critical area for exploration within the field of news informatics. Second, as discussed in the second section of my review, interactivity presents a promising avenue for addressing this gap. The question, then, is how to design interactive technology that can empower immigrants to tailor their news consumption to



better fit their everyday contexts and needs.

## 2.3 Designing Chatbot for Reader-oriented News Experience

### 2.3.1 Chatbot as a tool for supporting news interactivity

Enabling conversation with news is considered as a promising approach to enhance interactivity between audiences and the media information they consume. Conversation is a fundamental, natural form of human communication, making it an intuitive method for readers to engage with news stories [45, 156]. By allowing readers to ask questions, express opinions, or explore topics further, conversational interactions can deliver a more personalized news experience. Within the field of journalism, one specific line of research, known as conversational journalism [177], promotes the idea of journalism as a dialogue rather than a monologue, contrasting it with the traditional "journalism-as-a-lecture" model [12, 146, 176]. In this approach, interactivity is seen as a key feature that fosters a stronger connection between news readers, journalists, and their work, enabling a more engaged and participatory news experience [176, 178]. However, despite the potential benefits of conversational interaction for supporting news informatics, the question of how to best offer such interaction remains open [178].

With the advent of technology, conversational agents, often in the form of chatbots, have shown great potential for enabling interactivity through natural conversations with users. This potential has been demonstrated in various contexts, such as helping research participants understand consent forms (e.g., [304]), supporting students in class learning (e.g., [60, 61, 99]), training employee skills in the workplace (e.g., [17, 225]), and assisting researchers in reading academic papers (e.g., [84, 218]). For example, Xiao et al. conducted a controlled experiment with 238 participants on Prolific, comparing a chatbot-driven consent process to a traditional form-based process. Their study found that participants using

the chatbot had better recall and comprehension of the consent form and reported a greater sense of agency compared to those using the form-based process. In these scenarios, chatbots provided informational support through Q&A-style natural conversations, engaging users and helping them better understand the material [305]. Through turn-by-turn conversation, the chatbot can adapt to individual user preferences, offering responses that are relevant to their unique concerns or interests as needed [328]. These existing studies suggest that chatbots can deliver a more interactive and personalized experience, enhancing user engagement.

### 2.3.2 Chatbot in the news space

Chatbots have gained increasing attention in the field of journalism as part of a broader shift toward automated journalism [64]. One area of development focuses on how journalists can benefit from chatbots in their own work, such as gathering information from users or streamlining news production. For instance, BuzzFeed's Buzzbot on Facebook Messenger collected photos and stories from users to support news reporting [312]. Similarly, the LA Times' Quakebot automatically monitors earthquake activity, writes reports based on the data, and emails an editor to alert them for review [188]. These "bots" were primarily designed to automate journalistic tasks and practices, focusing on efficiency rather than on leveraging conversational capabilities to enhance user interaction or news exploration.

A second line of research focuses on audience-facing chatbots, which aim to improve user interaction and engagement with news organizations. Traditionally, news chatbots have functioned primarily as recommendation tools, pushing notifications or headlines to users following an initial greeting (e.g., [85, 125, 321]). Jones and Jones conducted a case study on the BBC's experimentation with eight in-house chatbots across platforms such as Twitter, Facebook Messenger, and Telegram. Their study revealed that these chatbots were

largely focused on content distribution. While Jones and Jones emphasized that two-way interactions through chatbots have the potential to create more personalized and engaging news experiences, the reality was that these early designs were often simple and rule-based. They relied on decision-tree structures, limiting their conversational capabilities to predefined dialogues [125]. As a result, these chatbots were not equipped to handle open-ended Q&A initiated by users, despite using a conversational interface.

While there have been promising developments in both journalist-facing and audience-facing chatbots, the full potential of conversational agents to provide a truly interactive and reader-oriented news experience remains largely unrealized. To improve chatbots' ability to handle a broad range of reader-initiated questions, ongoing research in natural language processing (NLP) and information retrieval has made significant advancements in text processing. These efforts have led to various forms of conversational agents, from in-house systems trained on domain-specific news corpora (e.g., [147, 174, 235, 282] to LLM-powered Q&A chatbots for general information support. Despite this progress, important questions remain unanswered about the specific capabilities users need from a news chatbot to assist with news consumption and how to effectively design these functionalities.

A small body of recent work has explored the concept of chatbots offering Q&A assistance during readers' interaction with news articles. Much of this research does not study the news reader's actual use of chatbots; instead, it focuses on envisioning the design of conversational agents for news consumption in general [112, 120, 204]. In particular, Nordberg and Guribye conducted co-speculation workshops with individuals experienced in HCI, journalism, and other relevant fields. Participants brainstormed scenarios in which chatbots, as well as other conversational agents, might facilitate their daily news consumption. Data obtained from these workshops highlighted critical design guidelines for effective conversational agent design [204]. In a more recent project, Hoque et al. asked MTurkers to write down questions of interest after a news reading task. Their analysis in-

licated that participants tended to highlight different questions to ask, depending on their belief about who would process and respond to those questions (e.g., a Q&A chatbot or a human journalist) [112]. Several other projects in this space have invited human participants to work with functioning chatbots for news reading. These chatbots, whether commercial systems or in-house prototypes, were all developed with certain capabilities to answer reader-initiated questions. That said, for the purpose of initial testing, participants were usually instructed to engage in Q&As with the chatbot using a preset list of questions (e.g., [49, 52, 321, 324]).

## 2.4 Participatory Design as a Third Space for Technology Development

The role of users in technology design has evolved, with increasing involvement in the development process. This shift means that users are transforming from being passive informants to active participants in design [237]. As HCI has progressed to its third wave, users are becoming recognized as experts of their own experiences, actively participating in adapting, learning and reconfiguring technology to suit their needs [33]. Participatory approaches are central to this shift, involving users as co-creators and helping designers understand their everyday context and community practices. These participatory approaches are particularly valuable for marginalized groups, such as immigrants, who have often been historically overlooked in technology design [54, 56, 91, 104].

Participatory approaches are among one of the central approaches involving users as co-creators, and help designers understand their everyday context, community practice. These participatory approaches are particularly valuable for marginalized groups who have often been historically overlooked in technology design, such as immigrants [54, 56, 91, 104]. Prior research has utilized a range of participatory techniques to encourage participants to share their life experiences, needs, and workarounds. These insights have successfully

informed technology design across various settings, such as connecting low-income immigrants to local learning opportunities [56], facilitating civic participation [70], and navigating everyday information-seeking [54]. In these projects, co-design provides a common ground for diverse stakeholders, such as nonprofit staff, designers, and technology developers, to collectively shape the design process for complex real-world scenarios (e.g., [54, 74, 229].)

In this section of literature review, I firstly examine the key stakeholders involved in developing news chatbot technology: news readers (e.g., immigrants), media professionals. The literature highlights the varied perspectives each group brings to technology development. Subsequently, I discuss participatory design (PD) as my primary methodology, explaining how it allows for an inclusive exploration of chatbot design that integrates the values of all stakeholders.

#### 2.4.1 Media professionals and their perspectives in news chatbot design

Journalists, or media professionals, are one of the key stakeholders in this process. In their early exploration, they viewed chatbots as an effective tool for distributing content and engaging audiences, while recognizing challenges of chatbots that allow readers to interact directly with news content [166, 285]. Journalists see the promise of their reduced workload as chatbots provide readers convenient means to inquire about news stories [174, 284]. However, they express concerns about the potential loss of control over the editorial process. Automated responses generated by chatbots may not always reflect editorial accuracy or balance [85]. Despite recognizing readers' interest in asking subjective or opinionated questions, journalists emphasize the necessity of maintaining a "journalist-in-the-loop" to ensure the integrity of the content produced by the chatbots [125].

In one recent work, Bhuiyan et al. examined the use of transparency cues in news ar-

ticles to foster trust among readers [30]. They showed participants a prototype displaying these cues, focusing on source credibility and message characteristics. News consumers desired cues that highlighted objectivity in news selection and clear evidence supporting news content. Journalists agreed on the importance of transparency but stressed the need for cues that reflect the reporting process and potential conflicts of interest. For example, journalists were concerned that overly simple transparency (e.g., number of years of experience) might mislead consumers about the true quality of their work. This tension between the simplicity desired by readers and the nuance preferred by professionals underscores the complex challenges in news technology design.

Building on this existing research, I argue that each stakeholder group brings a unique set of perspectives and knowledge to the chatbot development ecosystem. Media professionals have noted the absence of clear success criteria for chatbots, often due to a lack of understanding of the target audience, such as historically underserved groups [125]. It is essential for news readers, along with media professionals, to be actively involved in the design process. Despite the significance, research on engaging these diverse stakeholders remains limited. This gap highlights a critical area for the ongoing exploration to inform the design of news chatbots.

#### 2.4.2 Participatory design as a third space for technology development

Participatory design, also known as cooperative design (co-design), is a methodology that engages users directly in the design activities of technological development [194]. This approach, which originated in Scandinavian countries during the 1960s and 70s, was initially a response to the changing dynamics of the workplace, where workers sought more control over their environments and tools [75]. A pivotal example of PD is the UTOPIA project in Sweden, where graphic workers and researchers collaborated to design a new,

user-friendly graphic workstation. This project challenged the prevailing trend of prioritizing system efficiency over worker control and job quality.

PD embodies a commitment to democratic values in civic, educational, and commercial settings [145], aiming to empower traditionally disempowered groups such as workers (e.g., [73, 318]), children (e.g., [34, 310]), and the elderly (e.g., [36, 258]). This empowerment is achieved through improving processes and combining diverse knowledge to enhance services and products. Over the years, PD has evolved from focusing solely on workers' rights to fostering broader collaborative efforts that enhance system functionality and user-friendliness.

A key benefit of PD is its creation of a “third space,” a concept introduced by Muller [194]. This space transcends traditional boundaries between different domains of expertise, facilitating a unique collaborative environment where stakeholders, designers, users, and researchers can co-create solutions on equal footing [192]. Within this third space, two primary principles emerge:

- User empowerment and democratization. PD fundamentally shifts the traditional dynamics between designers and users, and fosters a democratic ethos throughout the process. According to Sanders and Stappers, co-design is seen as “collective creativity as it is applied across the whole span of a design process [236].” At its core, PD challenges the conventional power dynamics between “expert” and “user” by involving users not merely as evaluators of completed systems but as equal partners from the start. Traditionally, user involvement in design has been limited to evaluating systems, and the decisions of how to interpret and lead the design was left mostly to designer and researchers, which often restrict users input to more reactions [237].

PD has proven particularly effective in empowering groups often misrepresented or marginalized in the design process, such as children, immigrants, the elderly, and

individuals from the global south. By engaging these groups directly and valuing their contributions, PD not only enhances the relevance and usability of the design outcomes but also promotes inclusivity and equity within the design process itself.

- **Mutual learning and reciprocity.** Mutual learning, as a cornerstone of PD, highlights the importance of bridging the gap between users and designers from both directions [272]. This principle fosters a hybrid space where new relationships and understandings can flourish. PD emphasizes a cooperative approach from the start, fostering a hybrid space where new relationships and understandings can emerge.

In real world scenarios, the development of systems and understanding complex human problems often require insights from multiple actors. Workshops serve as the practical setting for these interactions, often referred to as the "third space." Here, diverse parties—including stakeholders from various backgrounds—come together to communicate, align on shared goals, and develop collaborative action plans. This format allows stakeholders to benefit collectively from the mutual learning process and the resulting collective insights.

The effectiveness of mutual learning has been tested in several early studies lead by Kristensson, Magnusson and colleagues [143, 144, 172] show that users involved in PD can generate ideas that are more innovative and closely aligned with their needs than those developed by one party alone. Specifically, Magnusson et al. assessed the contributions of users versus professional developers in creating new SMS-based telecom services. The study involved professional service developers, ordinary users, and consulting users (who consulted with design experts) [172]. It revealed that while professional developers produced ideas with greater technical feasibility, user-generated ideas were more original and better aligned with actual user needs, highlighting the complementary strengths of each group.



### 2.4.3 Leveraging PD for news chatbot design

Emerging research studies have leveraged PD as a method for exploring chatbot design tailored to specific user groups, such as immigrants or news readers. In recent work, Chen et al. engaged immigrants and chatbot developers in co-design activities to develop chatbots for everyday information seeking in Germany [54]. Their creative use of empathy probes—illustrated cards with open-ended questions and stickers—facilitated brainstorming sessions where participants could design chatbot personalities and visual embodiments. The immigrant participants expressed a preference for human-like chatbots with friendly, efficient, reassuring, and optimistic traits to enhance emotional engagement. These chatbots need to provide direct and understandable responses in real-time to effectively support users' information-seeking challenges. In another related study, Nordberg and Guribye conducted co-speculation workshops involving media experts and HCI professionals to envision the future design of conversational interfaces (CUIs) for news applications [204]. They identified three critical dimensions for CUI development: role, conversational capabilities, and locus of control. Participants envisioned future CUIs assuming various roles, such as news anchors, personal assistants, or companions. These roles showcase the diverse needs from users on these chat interfaces.

### 2.4.4 Review of design techniques with immigrants

I conducted a comprehensive review of studies on co-design methods to inform my study plan. This review helped shape the study procedure and design techniques I employed in the study of my Chapter 5.

Fails et al. present a general model for technology design that includes five key steps [79]: defining the problem, researching the problem and gathering requirements, generating multiple solutions, evaluating those solutions, and reflecting on outcomes through an

iterative process. This model guided my overall design process. The five components of the study process are as follows:

- Define and identify the problem: This step involves identifying a user problem that needs solving, typically aiming to help users complete tasks more effectively or meet unmet needs. For example, in my current study, the focus is on designing a chatbot to support immigrants in reading local news.
- Research the problem and gather requirements: Once the problem is defined, designers aim to understand it more deeply and identify the requirements for a viable solution. Fails et al. note that this can involve passive methods like literature reviews or active engagement with users through methods such as observation. For this step, I leveraged my earlier research (Chapters 3 and 4) and conducted a literature review to delineate the problem space in immigrant news reading. This phase also highlighted the importance of involving diverse stakeholders in the design process.
- Create design solutions (brainstorming): This step focuses on ideation, encouraging a free flow of ideas to develop potential solutions. Prototypes and models are often created during this stage. My study III (Chapter 4) aligns with this and the subsequent steps, incorporating design activities that address immigrants' daily information needs and integrating stakeholder perspectives.
- Evaluate solutions: Here, the proposed solutions are assessed to guide the design process or provide final evaluations. This involves identifying strengths, weaknesses, and areas for improvement.
- Reflect on outcomes and iterate: After each stage, it is crucial to critically reflect on the outcomes to determine whether previous steps need to be revisited. This iterative reflection ensures continuous refinement of the design.

Notably, Fails et al. also emphasize the flexibility of these components [79]; they are not necessarily linear and can occur simultaneously, in varying orders, or be repeated as needed. Design researchers consistently highlight the importance of adapting design activities to the specific study population and context, rather than rigidly adhering to a single model.

Furthermore, I reviewed a collection of research papers that employed co-design methods (see Appendix), particularly those focusing on immigrants or chatbot technology. These studies provided insights into their research goals, core participant groups, and the specific activities used to engage participants and facilitate the design process. This review helped refine my approach to co-design, ensuring that it is well-suited to my research context.

Based on the reviewed literature, I developed a detailed guideline for structuring my research activities, specifically tailored to the immigrant population in my study. The proposed activities are designed with the following objectives:

- Creating an inclusive environment for immigrant participants. A central goal is to establish a ‘third space’—a safe, equitable environment that fosters open and meaningful engagement. This space should empower immigrants to participate fully in the co-design process while addressing potential barriers to their involvement. Such an environment promotes trust and mutual respect, essential for effective collaboration.
- Encourage integration of personal experiences. The co-design process should actively invite participants to share and reflect on their daily practices and lived experiences. Prior research highlights the value of using visual aids and storytelling tools to facilitate these contributions (e.g., [54, 56, 228, 299]).

In particular, studies like Cho et al. [79], Dickinson et al. [70], and Wong-Villacres et al. [299] advocate for an asset-based design approach. Unlike the traditional “needs-centered” research that frame vulnerable populations as being in deficit or requiring

help, asset-based design leverages participants' strengths and community assets. This approach empowers immigrants by highlighting the value of their existing knowledge and experiences.

- Allowing flexible organization of activities. Flexibility in structuring co-design activities is crucial for accommodating the diverse needs and preferences of participants. For example: organizing workshops in small groups can foster more intimate, focused discussion, allowing participants to share personal insights more comfortably. In contrast, the large group sessions can serve as debriefing or synthesis sessions to consolidate findings and share broader perspectives.

Additionally, the non-immigrant stakeholders should be strategically planned based on their roles. Based on previous research, their involvement often happens at different stages and aims to provide complementary insights. For instance, Duarte et al. involved local students as secondary participants in later design stages [74], enriching the process with diverse perspectives while keeping immigrants as the core contributors.

## 2.5 Research Questions

My research sits at the intersection of HCI, immigration, and journalism. The first section of the literature review highlights the need for a reader-oriented news experience tailored to immigrants. Studies examining immigrants' information-seeking practice have consistently highlighted local news as an important resource in their adaptation process. Additionally, their informational needs often differ from those of the majority population in the host country. Despite the importance of reading local news, immigrants frequently encounter obstacles in comprehending its content, primarily due to language barriers and their limited understanding of local social knowledge.

To the other end, journalism and news informatics research suggest supporting interactivity as one approach for delivering an audience-oriented news experience. Recent advancements in language technology have further unlocked the potential for interactivity by enabling open conversations that respond to readers' needs. With chatbots offering new possibilities, now is an opportune time to explore how they can support a reader-oriented news experience. However, previous studies often focus on usability testing with preset questions or explore readers' needs under mockup reading scenarios. There is still limited understanding of the specific needs of readers when interacting with a chatbot in an open-ended discussion during the news reading process, particularly among immigrant populations. Therefore, my first research question (RQ1) seeks to identify the needs of immigrant readers when engaging with news content with the assistance of chatbot:

**RQ1: What are the needs of immigrants when reading news?**

Building on the insights from RQ1, my second research question delves into the design considerations of news chatbots specifically created for immigrants. Prior research has consistently highlighted that immigrants are often marginalized in technological development processes, leaving their needs unaddressed. In a recent study, Adjagbodjou and colleagues interviewed 16 immigrant participants in the United States, revealing that existing technologies offer limited support for immigrants in navigating informal, everyday life scenarios [2]. Informed by these prior work, my second research question aims to develop design insights for chatbots that can enhance immigrants' daily news reading experience:

**RQ2: How can we design reader-oriented chatbots to support the needs of immigrants?**

## 2.6 Situating the Research

### 2.6.1 Research paradigm

“A stance or orientation toward social research and evaluation that is rooted in a pluralistic mental model and actively invites participation in dialogue—at the large table of empirical inquiry—by accommodating multiple ways of seeking, understanding, and interpreting the social world, as well as multiple standpoints on what is important, valued, and cherished.”

– Jennifer C. Greene, *Mixed Methods in Social Inquiry* [98]

In my research, I adhere to a pragmatism paradigm [68, 121, 216], which is fundamentally driven by practical questions that arise in the everyday lives of immigrants. I embrace this pragmatic view that knowledge is both socially constructed and rooted in experiential reality [124]. This dual nature acknowledges that while our understanding is shaped by social interactions and interpretations, it remains firmly anchored in the practical realities of lived experiences.

My research methodology is fundamentally question-driven, placing the research inquiry at the heart of all methodological decisions. In this context, I elaborate on my research design rationale and the meaning of “pragmatic” following the three criteria proposed by Datta [66]: practical, contextual responses, and consequential. “Practical” is based on an individual’s experiences with what is effective and what is not. “Contextual response” involves a deep understanding of the specific demands, opportunities, and constraints of the situation in which the evaluation occurs. “Consequential” suggests that the validity of a statement is judged by its practical outcomes, particularly how well the statement aligns with later experiences.

In my dissertation, I value utility and relevance within the specific context of my re-

search question (e.g., immigrant's daily life and their needs), focusing on the outcomes of actions [190]. My dissertation employs a mixed-methods approach, blending qualitative and quantitative techniques to address the complex nature of immigrant experiences in the context of news reading [98]. With a focus on practical utility, my research prioritizes practical outcomes and actionable solutions, specifically aiming to design news chatbot technologies that effectively support immigrants' news reading practices.

### 2.6.2 Research design rationale

My RQ 1 focuses on understanding immigrants' needs for chatbot-assisted news reading. To address this RQ, I employ a quantitative research methodology, specifically a controlled experimental design, following a deductive approach.

The decision to use quantitative analysis was driven by the need to generate comprehensive data about immigrants' news reading processes across a substantial sample size. Previous research has extensively explored immigrants' news consumption through qualitative studies (e.g., examining motivations and challenges) or surveys (e.g., understanding media type preferences). However, these studies are predominantly based on participants' self-reflections of their experience, and often fall short of offering in-depth measures related to their news reading processes or adequately highlighting their needs in comparison to those of locals. The research implements a between-subjects design comparing two different participant groups: immigrants (i.e., Chinese immigrants and Vietnamese immigrants) and local-born residents. I collected measurements of both behavioral and attitudinal variables to understand the needs of news readers with the assistance of a chatbot. Although controlled experimental conditions may raise concerns about ecological validity, this approach enables a more precise understanding of immigrants' reading processes. In my study, I included immigrant groups from two communities (i.e., Chinese and Viet-

name), which helps strengthen the generalizability of findings and also reveals potential differences among various immigrant samples.

For my study addressing RQ2, I focus on designing a news chatbot that delivers reader-oriented experiences for immigrants. I have chosen participatory design as my methodological approach to generate design insights for technological systems. This approach, which originated in Scandinavia, explicitly acknowledges users' values in the technology development process. Its central principle involves engaging intended users as critical participants in the system design, rather than merely as subjects of study.

The participatory design method, as compared to the conventional HCI-based user-centered approach, positions the user not just as a responder but more proactive initiators. Traditional methods (e.g., interviews, experiments, surveys) often place users in a reactive role, where researchers utilize various ways to obtain feedback on what is deemed good or bad/effective or not effective. This feedback is typically based on user reactions and the relationship between user and designer can often be asymmetric, with the designer or researcher taking the responsibility and more control to interpret and integrate user feedback into the design. Such an approach often leads to user contributions being "too little, too late" in the system design process.

Historically, participatory design has emphasized the empowerment of end users, allowing them full participation in activities leading to the development of both software and hardware products. This methodology aligns with democratic values that strengthen disempowered groups, including immigrants, by integrating diverse knowledge to enhance services and products [97, 194, 241]. This consideration is particularly relevant for immigrants, who are usually less present in the design processes or encounter participation barriers such as language barriers.

Moreover, the news chatbot design usually involves different stakeholders, such as news readers (e.g., immigrants), journalists, technology developers, and etc. The tradition of par-



ticipatory design emphasizes mutuality and reciprocity, often in a hybrid space that fosters new relationships and understandings. For example, in practice, participatory design often uses workshops that invite different stakeholders working on activities for a set of design objectives. By leveraging this method, I aim to facilitate the communication among different stakeholders involved in my research and create a shared understanding and knowledge base that aligns with the collective goals of the project.

### 2.6.3 Theoretical foundations

In my research on how immigrants engage with news content, I draw from the extensive literature on reading comprehension. Comprehension has been defined in varied ways over the decades. Early definitions describe it as simply recalling what a text is about, while more comprehensive views characterize it as the ability to use the information from the text in new contexts, recognize themes or morals, or critically evaluate the content. The study of reading comprehension has evolved significantly since the 1930s. Initial research by Bartlett treated reading as an active process where the reader's knowledge interacts with text information to create meaning [20]. This foundational work led to the development of more sophisticated models in the following decades, such as the mental representation models in the 1970s and 1980s by Kintsch and van Dijk [135], and Trabasso and van den Broek, which introduced the concept of readers creating a causal network of ideas [274]. Further advancements were made by Kintsch with the Situation Model, which posits that comprehension involves inference-making and strategic processes to integrate text with background knowledge and maintain coherence [134].

These historical developments underscore that comprehension includes a range of skills and activities rather than being a singular skill [283]. It involves a blend of multiple cognitive abilities including decoding, integrating text with prior knowledge, making infer-

ences, and evaluating content. While some of these skills, such as decoding and interpreting phrases, are foundational cognitive activities, others like integrating new information with existing mental schemas or making inferences require higher cognitive processing. This complexity is reflected in the hierarchical nature of comprehension as evidenced by the research of Basaraba et al. [21], who assessed the abilities of over 2,400 fifth-grade students across different facets of comprehension—literal, inferential, and evaluative—through multiple-choice questions. Their findings support the view that comprehension skills, while distinct, are intricately interrelated, highlighting the diverse cognitive demands reading comprehension places on individuals. This nuanced understanding of reading comprehension is crucial for exploring how immigrants interact with and understand news media, offering insights into the cognitive challenges they face and the strategies they employ.

My dissertation research extends the established literature on reading comprehension by examining the various levels at which immigrants understand news content. This study is particularly concerned with the challenges immigrants face, such as language barriers and limited familiarity with the host country’s societal context, which can hinder their ability to effectively comprehend news. I aim to identify specific needs that immigrants have when reading news and to explore how these needs relate to different levels of comprehension activities. The findings from this research will not only contribute to a deeper understanding of the information needs of immigrants for news reading but will also inform technology design of reader-oriented news chatbots. Specifically, my study aims to shed light on developing technological solutions that support immigrants’ comprehension of news reading at different levels.

## Chapter 3: Understanding Immigrants' News Reading Needs Through a Comparative Study Involving Chinese Immigrants and Locals

### 3.1 Introduction

The needs of news readers have long been a central interest for scholars in both media studies and HCI. For journalists, understanding reader needs is a critical part of the news production workflow, informing decisions on content creation and delivery [15, 189]. Similarly, HCI researchers have employed a variety of human-centered methods to explore how users interact with news systems [52, 112], offering insights into design implications that enhance reader-centered news experiences [15, 30, 103, 205].

Previous studies exploring news consumption behaviors have utilized a variety of methods, including surveys, interviews, diary studies, and analysis of web browsing data [11, 25, 165, 306]. As media content has digitized, journalists and media professionals now have enhanced access to traffic data from news websites for their news curation process [71]. These traditional approaches provide a broad perspective on consumer habits, such as the frequency of news article readership within a week and the popularity of different news genres [25, 71]. However, these prior studies lack the detail needed to understand contextualized readers, such as the types of information sought by an immigrant reader and how they use the information to make sense of the news.

To the other end, a line of research has utilized more sophisticated techniques like eye tracking to gauge deeper into readers' needs [150, 170]. Despite the insights gained,

these techniques often face practical challenges in scaling and effectively understanding the everyday user's experience. That is, while established methods have provided valuable insights, there remains a challenge in understanding the contextualized needs of news readers with a relatively lower effort.

In the current study, a chatbot is conceptualized as serving a dual role to address these challenges. First, it functions as a tool for capturing the primary needs and interests of readers, as these are revealed in the questions they pose to the chatbot during their interaction with news content. In several prior studies, the chatbot has shown great promise in collecting user feedback and their information needs in various settings [1, 31, 53]. Second, it offers a practical approach to designing a reader-oriented news experience, aligning with the broader goal of enabling users to explore news based on their individual preferences and informational goals.

This current study adopts a between-subjects design involving two distinct reader groups: Chinese immigrants who relocated to the state of Virginia in the U.S. from Mainland China, and local residents born and raised in the same region. The inclusion of local readers serves as a baseline comparison, grounded in prior information behavior research that often contrasts immigrants with locals. Local participants typically possess a more comprehensive understanding of their society, offering a meaningful point of comparison to uncover differences in news reading strategies and informational needs.

The contributions of this work to the understanding of reader-centered news experiences are threefold:

- A fine-grained typology of reader-initiated questions: This study introduces a typology of questions posed by readers, encompassing seven distinct categories that serve four high-level purposes. This typology forms a foundational knowledge base for future research on how individuals interact with news.

- Comparative insights across reader groups: my study provided quantitative evidence that highlights critical contrasts between immigrant and local readers. The findings reveal differences in how these groups engage in analytical thinking about news content and seek practical guidance from it.
- Novel methods for studying chatbot-assisted news reading: by introducing innovative methods such as the retelling task and its associated framing analysis, this research enables a precise understanding of the takeaways readers generate and the information sources they rely on—whether content from the news article itself or responses from the chatbot.

### 3.2 Related Work

In this section, I synthesize three strands of prior research at the intersection of news informatics, HCI, and journalism. I begin by discussing literature that underscores the effectiveness of reader-initiated questions as tools for understanding the values and interests of readers concerning specific news content. Following this, I summarize research on the use of Q&A chatbots to enhance information seeking in news consumption and beyond. In the current research context, I argue that examining interactions between readers and chatbots helps us understand their needs during news reading. Additionally, I expand upon the literature related to the news reading processes of immigrants and introduce my research questions concerning their potentially unique needs compared to locals (i.e., the majority of society). I explore whether individuals from different social groups, such as immigrants and locals from the same region, would benefit equally from a news reading experience facilitated by today's Q&A chatbots. This examination leads to two research questions that further elaborate on the first research question of my dissertation.

### 3.2.1 Reader-initiated questions as indicators of information needs

Recent discussions in news informatics and journalism emphasize the importance of supporting a reader's own needs and interests as they navigate through the reported content [177, 178, 220, 240, 325]. However, given that news is often presented via a lean medium (e.g., text-based) and in a static manner (e.g., only for reading), it is not easy for reporters to predict what their readers will care about before making the news content public [220, 224]. Nor can they effectively discern how readers will perceive the informativeness or usefulness of the news content while reading it [14, 107, 266].

One possible way to pinpoint the readers' needs and interests in the reported content is to examine the questions they ask about that content. Previous research has documented various ways to collect these reader-initiated questions. In the early days, writing letters to newspaper editors [126], participating in call-in radio programs [16], and filling out call-out surveys distributed by news organizations [108, 271] were popular means for readers to "have their say" and get their values heard. Over time, as the dissemination and consumption of information both go digital, online commenting has become another dominant means for readers to voice their thoughts and questions related to a news piece [69, 215, 226].

While the above ways of question collection are proven valuable for creating a reader-oriented news experience, they share two significant constraints. One constraint is the time delay in readers receiving responses to what they have asked. As previous research pointed out, it is challenging for news producers to give immediate reactions to readers' questions, although they often refer to those questions when drafting subsequent news pieces on relevant topics [72, 153, 253]. The other constraint considers the lack of scalability. In particular, some of the traditional means, such as call-in radio programs, were not designed to collect questions from a large number of news readers. Filling out surveys or leaving

online comments potentially allows more readers to share thoughts about the reported content; however, active participants in these activities usually feature specific attributes and cover only a small sector of the entire reader population [23, 108, 287].

### 3.2.2 Information seeking through Q&As with chatbots

Chatbots have the potential to respond to user-generated questions promptly and on a large scale. Their success in assisting people with information seeking have been demonstrated in various scenarios, including the collection of neighborhood and community information by local residents [1, 101], the understanding of learning materials by students [53, 239], the explanation of medical documents for patients [31, 140], or the examination of consent forms for participants [305]. Across these scenarios, chatbots not only provide their users with the requested information. They also enable other stakeholders, such as community workers, teachers, doctors, and researchers, to recognize the information seeker's primary interests, as revealed through the questions being asked. When it comes to news reading, chatbots, in their traditional design, has primarily been implemented as recommendation tools, pushing news notifications to users following a greeting message (e.g., [85, 125, 321]). They usually do not handle open Q&A initiated by news readers, despite operating with a conversational interface.

A small body of recent work has explored the concept of chatbots offering Q&A assistance during a reader's real-time navigation through news articles. Much of this work does not study the news reader's actual use of chatbots; instead, it focuses on envisioning the design of conversational agents for news consumption in general [112, 120, 204]. In particular, Nordberg and Guribye conducted co-speculation workshops with individuals experienced in HCI, journalism, and other relevant fields. Participants brainstormed scenarios in which chatbots, as well as other conversational agents, might facilitate their

daily news consumption. Data obtained from these workshops highlighted critical design guidelines for conversational agent design [204]. In a more recent project, Hoque et al. asked Mturkers to write down interested questions after a news reading task. Their analysis indicated that participants tended to highlight different questions to ask, depending on the belief about who would process and respond to those questions (e.g., a Q&A chatbot or a human journalist) [112]. Several other projects in this space have invited human participants to work with functioning chatbots for news reading. These chatbots, whether commercial systems or in-house prototypes, were all developed with certain capabilities to answer reader-initiated questions. That said, for the purpose of initial testing, participants were usually instructed to have Q&As with the chatbot using a preset list of questions (e.g., [49, 52, 324]).

To enhance the chatbot’s capability of handling a wide range of reader-initiated questions, ongoing research in NLP and information retrieval has been making advancements in the text processing step. This endeavor has resulted in various formats of conversational agents, ranging from in-house systems trained with domain specific news corpora (e.g., [147, 174, 235, 282]) to LLM-powered Q&A chatbots for information seeking in general.

### 3.2.3 News reading by different social groups: immigrants vs. locals

News reading by different social groups: immigrants vs. locals As the potential of Q&A chatbots gets increasingly unlocked, we believe it is time to consider not only whether chatbots can promote reader-oriented news consumption, but also how they can provide suitable support for news readers from different social groups. For the interest of the current work, we pay attention to the contrast between immigrants and locals living within the same society. Previous research has evidenced differences in how these different groups attend to local news, as well as in how they generate takeaways from the news. That said, many of



these conclusions are descriptive in nature, and none have considered the emerging context of news reading that involves a chatbot assistant.

## Attending to local news

In cross-disciplinary literature on information seeking, immigrants and locals are frequently depicted as having separate goals to prioritize during daily news reading and beyond [8, 43, 123, 162, 207, 208, 247, 251]. For example, Oh and Butler conducted online surveys and follow-up interviews to compare the information needs of new immigrants and domestic residents relocating to a new city in the United States. Immigrants reported a significantly greater demand for information related to their survival needs, whereas domestic people exhibited an inherent familiarity with the local socio-informational infrastructure [208]. Caidi et al. synthesized literature on immigrants' social adaptation in Canada and elsewhere. They outlined a trajectory in which an immigrant's needs may gradually evolve from seeking settlement-related help to collecting more advanced information (e.g., tacit social knowledge for civic participation), demanding considerable support for making these transitions. In contrast, local adults often require much less help in accessing information at more basic levels [43]. Many empirical studies have also indicated that, compared to locals, immigrants often need additional scaffolding in seeking domain-specific information of their interests, such as understanding health insurance policies [231, 278, 329], getting their questions about employment and job opportunities answered [171, 222, 247, 322], and interpreting online reviews of local services [3, 196, 260].

Besides holding various reading needs, immigrants and locals can also encounter distinct challenges in processing a given piece of news information [89, 175, 182]. In a recent project, for instance, Gao et al. studied how Chinese immigrants in Japan and the United States consumed covid-relevant news during the global pandemic. They found that immi-

grants seldom engaged with society's mainstream media, despite having a strong willingness to understand the local covid situation [89]. During interviews in this research and a few others, immigrants shared that they often had questions about how to interpret the news content; adding to it, there was a lack of channels for them to discuss their questions with others and obtain answers [43]. Limited English fluency often emerged as another roadblock, further complicating immigrants' news consumption from media sources commonly used by locals [57, 80, 182, 247]. Unfortunately, most news informatics research to date has not considered tailoring the design of news reading tools for individuals from various social groups.

My current research takes Q&A chatbots as a point of departure to investigate potential differences between immigrants and locals in terms of their demand during news reading and, hence, for reader-oriented assistive tools. In this context, Q&A chatbots are positioned both as my research device and target design space to explore. Specifically, we leverage Microsoft Copilot, an LLM-powered chatbot, to assist immigrant and local participants with news reading tasks. As the chatbot responds to reader-initiated questions in real-time and throughout the task process, it compiles a dataset of questions asked by participants. This dataset will enable us to compare the primary needs and interests of news reading between the two target groups, following the rationale implied by the literature reviewed earlier. I pose the following RQ:

**RQ1: What types of questions will immigrants and locals raise, respectively, during their news reading with the assistance of a chatbot? Will they seek different assistance from the chatbot?**

## Generating takeaways from local news

Another equally noticeable contrast between immigrants and locals, if not more, lies in how people derive takeaways from their news readings. Previous research on news consumption has suggested some potential differences in this regard (e.g., [7, 63, 110, 137, 154, 159, 250, 307, 320]). For instance, Yang et al. surveyed 84 Chinese internationals living in the Midwestern United States. These participants self-reported a strong focus on using local media to learn about societal norms in the country and to acquire English vocabulary for language learning [307]. Similarly, Alencar and Deuze conducted focus groups with three immigrant groups in the Netherlands and Spain. Participants shared that they derived insights from local news to aid their adaptation to this society. However, they were not sure whether their interpretations were of comparable quality to those of the locals [7].

Notably, while the above literature offers essential knowledge about the takeaways immigrants drew from news reading, it lacks comprehensive details. Also, the contrasts between immigrant and local news readers were often inferred from studies focused on a single group, rather than from direct comparisons between groups.

My current research in this chapter contributes to the existing literature by directly comparing the takeaways generated by immigrants and locals from news reading. Inspired by prior work on the broad field of text comprehension (e.g., [102, 155, 183]), I developed a news retelling task to better document the information that a news reader includes in their takeaways. This approach enables us to better quantify the differences between news reader groups regarding their focus, as well as the information source (e.g., the news article itself, the chatbot's responses) they rely on. I address the following RQ:

**RQ2: What types of information will immigrants and locals focus on, respectively, in the takeaways they draw from news reading? Will they pull information from**

**different sources to formulate their takeaways?**

### 3.3 Method

I designed a between-subject study to understand the needs of immigrant news readers by comparing them with the vast majority of their host country (i.e. locals). I invited 96 participants living in the same region of the United States to work on a remote news reading task. Participants used their own computers to perform the task and stay connected with the researcher via the screen-sharing mode of Zoom.

Participants were tasked with reading a shared set of news articles about local housing in that region, a topic frequently highlighted as being relevant and important to everyone's daily life [94, 175, 207, 252]. Each participant had one hour to read through the entire set of news. An LLM-powered chatbot, Microsoft Copilot, was provided to assist participants in their news reading process, offering the information they requested in a Q&A format. After that, participants filled out a questionnaire to report their overall news reading experiences and then worked on a news retelling task. Below, we elaborate on each aspect of our research design in further detail.

#### 3.3.1 Participants

A total of 96 individuals from two social groups participated in our study: one group of immigrants and one group of locals. All participants were residing in Virginia, United States. We recruited immigrant participants by sharing social media posts and distributing paper flyers within the immigrant communities of Virginia. All immigrant participants rated themselves as having limited working proficiency in speaking English, the majority language of their host country.

The immigrant group consisted of individuals originally from China (N = 48). Among

them, 31 participants self-identified as female, while 17 self-identified as male. Their average age was 26.94 years (S.D. = 5.00). Their average length of residence in the United States was 5.34 years (S.D. = 3.94), and they all spoke Mandarin as their native language.

The local group included individuals who were raised in Virginia and had lived there for most of their lives ( $N = 48$ ). Among them, 19 self-identified as female, and 29 self-identified as male. Their average age was 35.33 years (S.D. = 10.13). All local participants were native speakers with full proficiency in English.

### 3.3.2 Task procedure

All participants received task instructions in their native language and completed the study with the help of a researcher fluent in that language. Each participant was allocated a one-hour session, a duration determined to be sufficient from our pilot testing, which accounted for varying reading speeds and English proficiency levels. I started my data collection in early October, 2023 and finished it in mid December, 2023. The participation involved four successive phases:

- Preparation phase: To ensure all participants had the same understanding of how Microsoft Copilot functions, we conducted a tutorial which covered the chatbot's basic functionalities, such as searching for information within and beyond a webpage, text processing through summarizing and paraphrasing, translating text across languages, and synthesizing information as requested by the user. The tutorial content was identical for both local and immigrant groups. After the tutorial, participants set up Microsoft Copilot on their computer's browser and completed a practice news reading trial with the chatbot's assistance, allowing the researcher to identify and resolve any usability issues.
- News reading phase: Participants were given four news articles prepared by the re-

search team to read. The order of reading these articles was fully counterbalanced between individual sessions, resulting in 24 possible combinations. Within each social group, two individuals were assigned to each combination. Participants had the autonomy to formulate and ask questions in their preferred language (e.g., English or Mandarin) as they read through the articles, without any obligation to interact with the chatbot.

- Survey phase: After completing each news reading task, participants answered a series of survey questions. Details of these survey questions will be discussed in a later section on measurements.
- Reflection phase: Immediately following the reading of each article, participants were asked to answer questions about their overall experience. After completing the survey, they were directed to a writing page where they were tasked with retelling the news story they had just read, aimed at informing someone with a similar background to themselves. To ensure originality in their retelling, access to both the article page and the chatbot page was restricted. There were no limits on the retelling length or the language used.

Upon completing all phases, participants were thanked for their contributions to the research and received compensation.

### 3.3.3 News materials

There was an identical set of 4 news articles for all participants to read. These articles were selected from a larger news collection based on the following criteria:

- Topic: the selected pieces should discuss housing information that can be applied to individuals living in the state of Virginia, aligning with the general interest of our

participants from this specific region.

- Length: the selected pieces should be of reasonable and comparable length.
- Style: the selected pieces should not be opinion-based articles.
- Complexity: the selected pieces should not be too complex for general readers to follow.

The 4 news articles used in our final task met all the above criteria, as confirmed by evaluations from Prolific workers across these four aspects. It was also confirmed by all participants that the 4 news articles were recent, and they had not consumed these articles prior to attending our study.

### 3.3.4 Interfaces

Figure 3.1 demonstrates the task interface for news reading. We hosted the 4 news articles via a website set up by our research team. The interface mimicked the common design of news webpages, and ensured the consistency of the overall layout as participants proceeded across articles. Certain visual elements, such as pictures and advertisement blocks, were excluded from our web page design, which enabled us to avoid potential confounding factors affecting the participants' news reading experience and our data analysis.

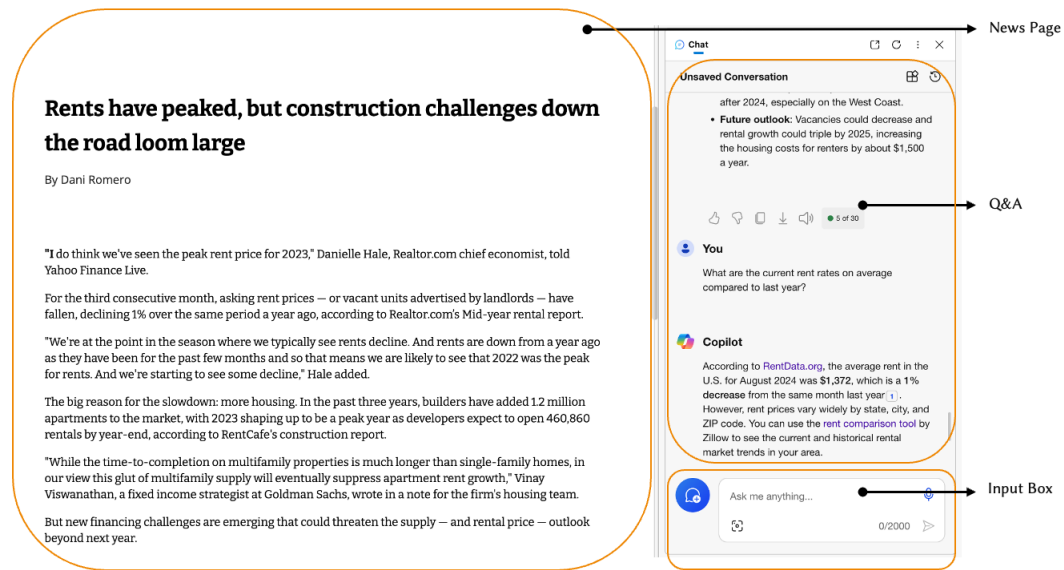


Figure 3.1: An illustration of the task interface

### 3.3.5 Measurements

I obtained data on the following aspects to answer my RQs:

- **Personal Background.** Before participants attended the study session, I asked each of them to report their self-identified Attachment to the Topic of Housing (1 = not at all, 7 = very much) and Prior Experience with Chatbots in daily work and life (1 = not at all, 7 = very much) in addition to other demographic information (i.e., Age, Gender). I considered these measures as control variables in later data analysis, as suggested by prior literature [58, 184].
- **Reader-initiated questions.** During their news reading process, I obtained the text log of each participant's Q&As with the chatbot. This data provided us with a lens to understand people's needs and interests, as reflected in the informational requests they sent to the chatbot in real-time during news reading. A total of 1,288 questions



were identified from the log data, consisting of 699 questions asked by Chinese immigrants (with 316 questions asked in Mandarin), and 589 questions asked by locals.

- **Reader-generated takeaways.** After they read a news article, I collected the text content generated in each participant's news retelling. This data enabled us to grasp the concrete takeaways people had derived from their news reading. Our implementation of the retelling task was inspired by prior work on text comprehension, where participants were asked to write down what they remembered from reading a document [102, 155, 183]. By shifting the main focus of this task from individual memory and cognition to information sharing with an external audience, I made the task more suitable for capturing people's takeaways from news reading. These takeaways, as the literature on news consumption and journalism has suggested [32, 122, 197], typically involve people generating their interpretations of the news article rather than merely memorizing its content. Our participants generated a total of 384 retelling pieces: one piece per news article, and 4 pieces per person. Among them, 165 pieces were formulated in Mandarin.
- **Overall News Reading Experiences.** We used survey questions to gain insights into each participant's overall news reading experience, even though they did not directly address our RQs. Part of these questions asked about the Value of news reading perceived by each person, derived from prior research on societal adaptation [7, 298] (e.g., "Reading this news enriched my knowledge about essential local services and affairs on the relevant topic," 1 = strongly disagree, 7 = strongly agree; Cronbach's  $\alpha = .87$ ). The rest of the questions asked about each person's Workload during news reading, adapted from the NASA-TLX scale [106] (e.g., "How much mental and perceptual activity was required in this news reading process?" 1 = not at all, 7 = very much; Cronbach's  $\alpha = .74$ ).

### 3.4 Data Analysis and Results

We performed three subsections of analyses to pinpoint the differences, as well as similarities, between immigrants and locals in their news reading assisted by a chatbot. These analyses focused on comparing their self-initiated questions during news reading (RQ1), self-generated takeaways after news reading (RQ2), and survey reports on the overall news reading experience.

In each subsection of the result, we first introduce the results of my descriptive analysis. We then detail comparisons between the Chinese immigrants and the locals, followed by corresponding comparisons between the Vietnamese immigrants and the locals. All comparisons used locals as the reference group.

#### 3.4.1 Reader-initiated questions asked by immigrants vs. local participants

**Typologies and distribution.** We began the analysis of reader-initiated questions by identifying the types of questions exchanged between news readers and the chatbot. This step set the foundation for more detailed comparisons between immigrant and local news readers under RQ1.

Specifically, I worked with a Chinese-English bilingual to manually code the entire set of 1,288 questions obtained from all participants. We independently reviewed all the Q&A logs. Each person worked on a subset of the data, identifying mutually exclusive categories that could best describe the nature of the questions initiated by my participants. Subsequently, we cross-checked the questions and categories generated by each other.

The above steps were repeated until the two researchers had examined all subsets of the data and, accordingly, revised the categories being generated. These categories and

their definitions were then provided to a third person, blind to all previous steps, for another round of independent categorizing of all the reader-initiated questions. We obtained a high inter-coder reliability score at this step (Cohen's Kappa = .94), indicating satisfactory robustness of the converged rules. After that, the two researchers and this third person attended group coding sessions together, resolving remaining inconsistencies and finalizing the categorization of all questions.

Table 1 details the seven question categories identified through our manual coding process<sup>1</sup>. These categories are grouped under four high-level themes. Three of these themes—Literal Comprehension, Analytical Thinking, and Practical Guidance—reflect participants' informational needs and interests during news reading. The fourth one—Conversational Repair—captures their coordination with the chatbot when the Q&A did not go smoothly.

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<sup>1</sup>Instances where participants acknowledged successful receipt of a message from the chatbot (e.g., "Thank you.") were excluded from the table and further analysis. These acknowledgements were rare (8 cases in total) and less relevant to my RQs.

Table 1: Questions asked by local and immigrant participants across 7 categories

| Theme/Category        |                     | Definition                                                                                                                       | Sample question of locals                                                                                                                                                      | Sample question of immigrants                                                                                                                                             |
|-----------------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Literal Comprehension | Word Explanation    | Lexical explanations of words and phrases that appear in the given news                                                          | What is the meaning of glut?                                                                                                                                                   | Slump 是什么意思? [English translation: What does slump mean?]                                                                                                                 |
|                       | Text Summary        | A concise representation of the selected text from the given news                                                                | Can you briefly summarize this news?                                                                                                                                           | 请简单复述一下这篇新闻的内容。 [English translation: Please briefly summarize the content of this news.]                                                                                 |
| Analytical Thinking   | Viewpoint Synthesis | An integration of insights and perspectives for explanations on a reader-specified issue conveyed in the news                    | Why is housing growth slow? [Context: The news article discusses various issues associated with this slow growth.]                                                             | 为什么文章里说邻近的田纳西和北卡罗来纳州比弗吉尼亚便宜? [English translation: Why does this news article say that (the housing expenses in) Tennessee and North Carolina are cheaper than Virginia?] |
|                       | Referential Fact    | Factual information related to content mentioned in the news but requiring external sources for further details                  | What is the year-to-year rent in Arlington, VA? [Context: The news mentions yearly rent in Arlington but does not specify rates across years.]                                 | 美国有哪些城市实行了租金管制? [English translation: Which cities in the United States have implemented rent control?]                                                                   |
|                       | Broader Impact      | Societal effects or consequences related to the issues reported in the news but go beyond its explicit content                   | How does Joe Biden's Renters Bill of Rights affect non-subsidized housing? [Context: The news mentions the Renters Bill of Rights, but does not discuss unsubsidized markets.] | 该文章对于中国新移民有什么样的影响? [English translation: What impact does this news have on Chinese new immigrants?]                                                                      |
| Practical Guidance    |                     | Recommendations or advice that encourage specific behaviors of the news reader but go beyond what this news explicitly discusses | I am a renter in VA, what should I be paying attention to and what advice can you give?                                                                                        | 你能给我一些找到便宜公寓的建议吗? [English translation: Can you give me advice on finding an affordable apartment?]                                                                       |
| Conversational Repair |                     | The chatbot's notice of the need to rework its immediate previous response to the news reader                                    | That's not quite relevant to my question. Can you answer my question by referring to the news I am currently reading?                                                          | 我问的不是存款的利率而是房屋贷款利率。 [English translation: I asked about mortgage interest rates, not deposit interest rates.]                                                             |

Based on this categorization, I counted the raw number as well as the percentage of questions under each category. Figure 3.2 illustrates the distribution of these counts across the two participant groups. I observed potential differences between immigrants and locals in terms of the question categories they prioritized. In particular, compared to participants in the local group, individuals in both immigrant groups appeared to ask the chatbot more

for assistance with Literal Comprehension and Practical Guidance, but less for Analytical Thinking. Next, I applied more rigorous analyses to verify the observed contrasts.

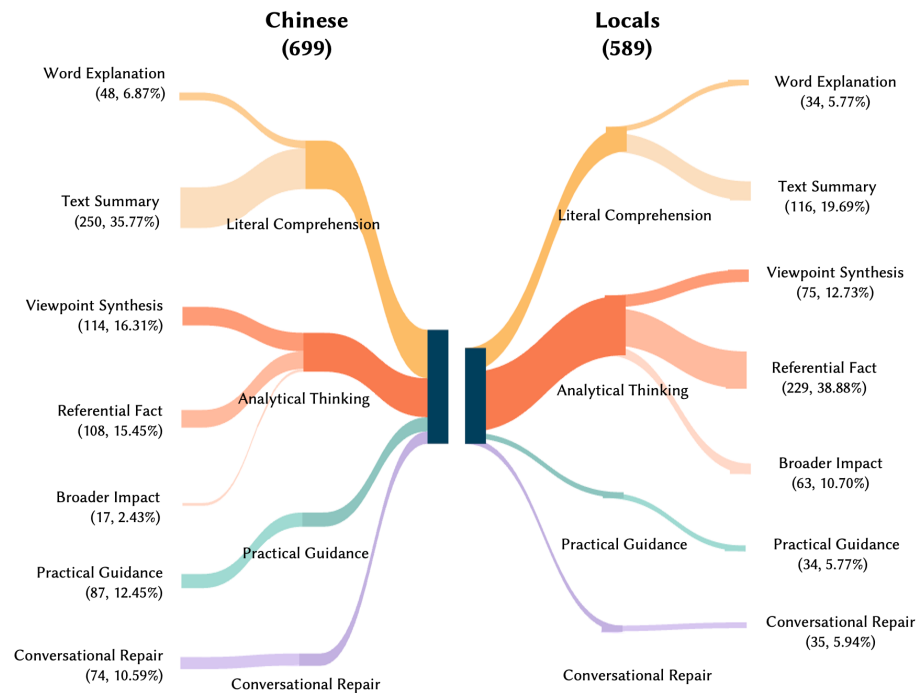


Figure 3.2: Distribution of questions among Chinese immigrant and local participants.

Comparisons between participants in the Chinese immigrant group and the local group. I performed a set of negative binomial regression analyses to assess the comparison between Chinese immigrants and locals in terms of their likelihood of asking the chatbot questions from each category. This analysis is particularly useful when the dependent variable consists of discrete counts and exhibits overdispersion, as is the case with my current data on the counts of reader-initiated questions.

I built one negative binomial regression model for each question category. In the model, the number of questions asked by a participant was used as the dependent variable. The main predictor was the participant group (i.e., Chinese immigrant or local). I included

the following control variables across all models: the participant's Age (i.e., number of years), Gender (i.e., female or not), Attachment to the topic of housing (i.e., rating on a 7-point scale), Prior Experience with chatbots (i.e., rating on a 7-point scale), and the Total Number of Questions the person asked. Table 2 specifies the effect of the participant group in predicting people's likelihood of asking the chatbot questions from each of the 7 categories, as well as indices of the overall model fit.

Table 2: Effect of participant group (i.e., Chinese immigrants vs. locals) on the questions asked per category.

| Category               | Chinese Immigrant vs Locals |         |    |     |        |              | Overall Model Fit |        |        |              |                      |
|------------------------|-----------------------------|---------|----|-----|--------|--------------|-------------------|--------|--------|--------------|----------------------|
|                        | B                           | S.E.(B) | df | p   | Exp(B) | 95%CI        | Log-likelihood    | AIC    | BIC    | Deviance /df | Pearson $\chi^2$ /df |
| Word Explanation       | 0.08                        | 0.47    | 1  | .87 | 1.08   | [0.43, 2.72] | -117.35           | 250.7  | 271.21 | 0.88         | 1.09                 |
| *Text Summary          | 0.71                        | 0.15    | 1  | .00 | 2.03   | [1.52, 2.71] | -204.8            | 425.6  | 446.11 | 1.5          | 1.2                  |
| Viewpoint Synthesis    | 0.27                        | 0.22    | 1  | .23 | 1.31   | [0.85, 2.04] | -157.82           | 331.64 | 352.16 | 1.18         | 1.06                 |
| *Referential Fact      | -0.92                       | 0.18    | 1  | .00 | 0.4    | [0.28, 0.57] | -195.47           | 406.93 | 427.44 | 1.29         | 1.16                 |
| *Broader Impact        | -1.41                       | 0.38    | 1  | .00 | 0.25   | [0.12, 0.51] | -100.86           | 217.73 | 238.24 | 0.97         | 1.16                 |
| *Practical Guidance    | 0.66                        | 0.27    | 1  | .01 | 1.93   | [1.15, 3.24] | -122.91           | 261.82 | 282.34 | 1.26         | 1.29                 |
| *Conversational Repair | 0.81                        | 0.32    | 1  | .01 | 2.26   | [1.21, 4.22] | -131.85           | 279.7  | 300.22 | 1.14         | 1.06                 |

Note: \* indicates statistical significance ( $p < .05$ )

In short, my results suggested that, with all control variables held constant, the expected counts of questions exchanged between Chinese immigrants and the chatbot were significantly fewer than those exchanged between locals and the chatbot in the categories of Referential Fact (decreased by 60%) and Broader Impact (decreased by 75%). Conversely, Chinese immigrants tended to exchange more questions in the categories of Text Summary (increased by 103%), Practical Guidance (increased by 93%), and Conversational Repair (increased by 126%). There was no significant difference between the two groups in other categories.

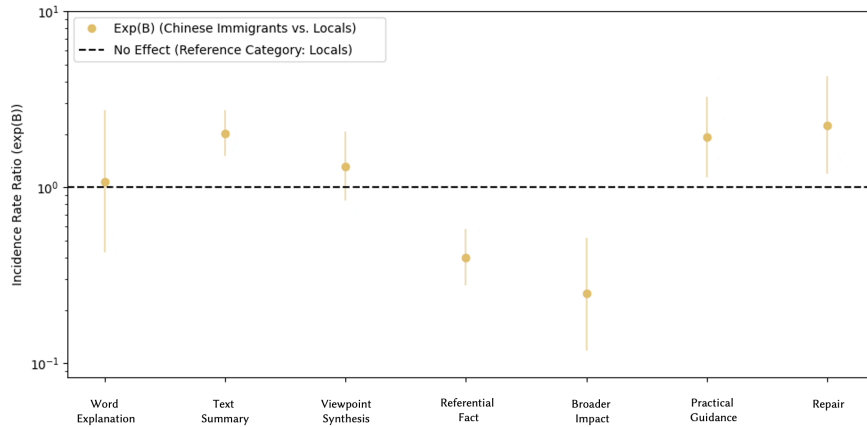


Figure 3.3: Exponentiated coefficients ( $\exp(B)$ ) from all 7 negative binomial regression analyses that examine the effect of the participant group (i.e., Chinese Immigrants vs. locals) on the questions asked per category.

### 3.4.2 Takeaways generated by immigrants vs. local participants

#### Framing elements and distributions

I followed Entman’s framing theory to examine all retelling pieces obtained from the data collection, considering the retelling content as a reflection of the takeaways generated by news readers [78]. This theory has been widely referenced in prior research on news media and journalism (e.g., [67, 243]), usually for analyzing the reporter’s narrative about a news event. I adopted it to analyze how my participants framed their takeaway from news reading, allowing for more structured comparisons between immigrant and local news readers under RQ2.

In his framing theory, Entman identified four primary elements of a narrative: descriptive statement, causal attribution, moral evaluation, and treatment recommendation.

I worked with the research assistant and applied these four concepts to understand the framing of all 384 retelling pieces in our data. My review of this retelling data followed a similar workflow to my categorization of the Q&A data. That is, we began by translating all the retelling pieces into English. After that, we iterated between independent coding and group discussions. By the end of this process, we reached a high level of consensus regarding how Entman's concepts could be used to understand the content of my participants' retelling pieces. I asked two independent coders, blind to all previous steps, to identify the primary elements of each retelling piece with the instructions I provided. They reached high inter-coder reliability (Cohen's Kappa = .95), and then resolved the remaining inconsistencies through further discussions.

Table 3 demonstrates the three primary elements confirmed and applied to my data analysis, within the context of one retelling piece generated by the participant. Specifically, I adopted Entman's original concepts of Descriptive Statement and Causal Attribution, as the same two elements of content also frequently appeared in my retelling data. I proposed a new concept termed Action Suggestion, as my participants often provide "suggestions to others" when retelling the news. However, my participants, as news readers, rarely made explicit moral evaluations or treatment recommendations in their retelling, which differs from how news reporters would do in their narratives.

By breaking down the content of each retelling piece according to the three primary elements, I was able to trace the source of the segment under each element. Specifically, I compared every segment of a retelling piece against two bodies of text: the text from the news article that participants had read, or the text from the chatbot's responses that participants had received during news reading. This comparison resulted in three possible sources for every segment of a retelling piece:

- Article: the content in this segment overlaps exclusively with information provided



Table 3: Retelling example and its identified segment under each framing element

| Example of One Retelling Piece                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                               |                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>“Hey, how’s it going? We recently talked about the housing market in Virginia, and I just read something interesting that explains the rental side of things. Apparently, rent prices have been going down for a few months. Now might be a good time to lock in a lease. Rent rates vary across the country, depending on the metro area. The recent drop in prices is linked to the number of apartments being built. Recently, millions of units have been constructed across the country, driving down overall rent prices.”</p> |                                                                                                                                               |                                                                                                                                                                                                                                                     |
| Framing Element                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Definition                                                                                                                                    | Identified Segment                                                                                                                                                                                                                                  |
| Descriptive Statement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Description of the situation, condition, or context presented in the news                                                                     | <ul style="list-style-type: none"> <li>- Rent prices have been going down for a few months.</li> <li>- Rent rates vary across the country, depending on the metro area.</li> <li>- Millions of apartment units have been built recently.</li> </ul> |
| Causal Attribution                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Identification and explanation of the causes or reasons behind an issue or event, answering the questions of what leads to what and why       | The recent drop in prices is due to the large number of apartments being built recently.                                                                                                                                                            |
| Action Suggestion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Recommendations, proposed solutions, or suggested actions in response to the issues presented in the news or relevant to readers’ daily lives | Now is a good time to try to lock up a lease.                                                                                                                                                                                                       |

in the news article;

- Chatbot: the content in this segment overlaps with information provided by the chatbot;
- External Insight: neither the article nor the chatbot has provided information that overlaps with the content in this segment.

Figure 3.4 illustrates the distribution of participants who had leveraged each possible source to formulate their retelling content under each element. Overall, these counts indi-

cate the trend that local participants cited a larger amount of Article sources in segments of Descriptive Statement and Causal Attribution than immigrants did. In contrast, immigrants cited a relatively greater amount of Chatbot responses as sources in their segments under Action Suggestion. Next, I applied more rigorous analyses to detail the contrasts in retelling between immigrants and locals.

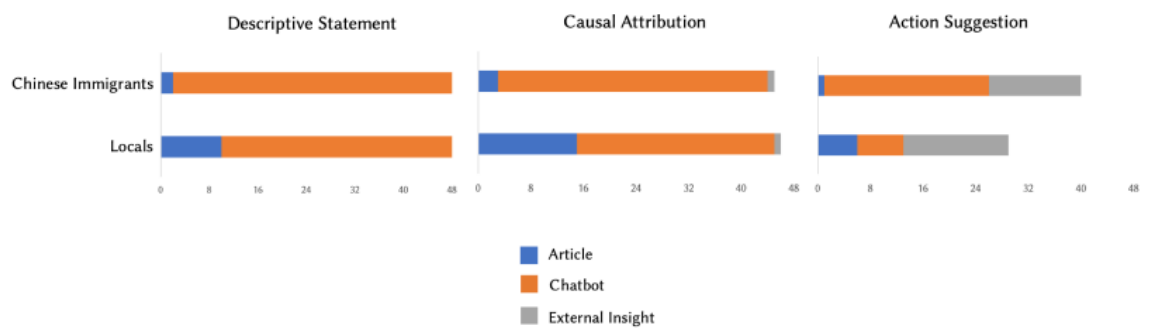


Figure 3.4: Distribution of the use of information sources by participant groups (i.e., Chinese immigrants or locals).

I conducted a set of binary logistic regression analyses to compare Chinese immigrants and locals in terms of their likelihood of including each of the three framing elements in their retelling pieces. The dependent variable of each regression model considered whether a framing element was included in this person’s retelling (i.e., absent or present). The primary predictor was the participant group (i.e., Chinese immigrant or local)<sup>2</sup>. I also included the same control variables as those used in models in the previous section. My

<sup>2</sup>For all analyses, we used each participant as the unit of analysis, rather than each retelling piece written by the participant or each framing element within the retelling. In my dataset, specifically, although each participant created one retelling piece for every news article they read, the four retelling pieces by the same individual included an identical set of framing elements in my dataset. Similarly, the same individual appeared to rely on the same set of sources when generating descriptive statements, causal attributions, and action suggestions in their retellings. These data patterns indicated a high degree of intrapersonal consistency in both people’s framing of the retelling and their source use for the retelling, reflecting each person’s individual style.

results showed that, compared to participants in the local group, those in the Chinese immigrant group were significantly more likely to include Action Suggestions in their retelling (increased by 259%). This was the only framing element that demonstrated a significant difference between them.

Table 4: Likelihood of source occurrences across framing elements by Chinese immigrants vs. locals

| Category              | B     | S.E. | Wald $\chi^2$ | p   | Exp(B) | 95%CI          | $\chi^2$ | Nagelkerke $R^2$ | N  |
|-----------------------|-------|------|---------------|-----|--------|----------------|----------|------------------|----|
| <b>Article</b>        |       |      |               |     |        |                |          |                  |    |
| Descriptive Statement | -1.5  | 0.97 | 2.39          | .12 | 0.22   | [0.03, 1.49]   | 24.15    | 0.42             | 96 |
| Causal Attribution    | -3.02 | 0.94 | 10.25         | .00 | 0.05   | [0.01, 0.31]   | 31.34    | 0.46             | 91 |
| Action Suggestion     | -2.28 | 1.39 | 2.69          | .10 | 0.1    | [0.01, 1.56]   | 14.45    | 0.39             | 69 |
| <b>Chatbot</b>        |       |      |               |     |        |                |          |                  |    |
| Descriptive Statement | 1.5   | 0.97 | 2.39          | .12 | 4.46   | [0.67, 29.65]  | 24.15    | 0.42             | 96 |
| Causal Attribution    | 3.16  | 0.95 | 11.08         | .00 | 23.6   | [3.67, 151.80] | 36.52    | 0.51             | 91 |
| Action Suggestion     | 2.23  | 0.74 | 9.11          | .00 | 9.34   | [2.19, 39.87]  | 14.04    | 0.25             | 69 |

I then proceeded to the comparison of sources. Specifically, among participants who included segments of Descriptive Statement in their retelling pieces, I set up three binary logistic regression models to predict whether those segments had used Article (i.e., no or yes), Chatbot (i.e., no or yes), or External Insight (i.e., no or yes) as its information source, respectively. The same steps were then repeated for the segments of Causal Attribution, and then for Action Suggestions. All these models included the participant group (i.e., Chinese immigrant or local) as the main predictor, along with the same set of control variables used previously. Table 4 specifies the effect of the participant group in predicting the source of each element of people's retelling content, as well as indices of the overall model fit.

My results suggested that, compared to locals, Chinese immigrants were more likely to rely on Chatbot's responses as the source to generate Causal Attribution (increased by

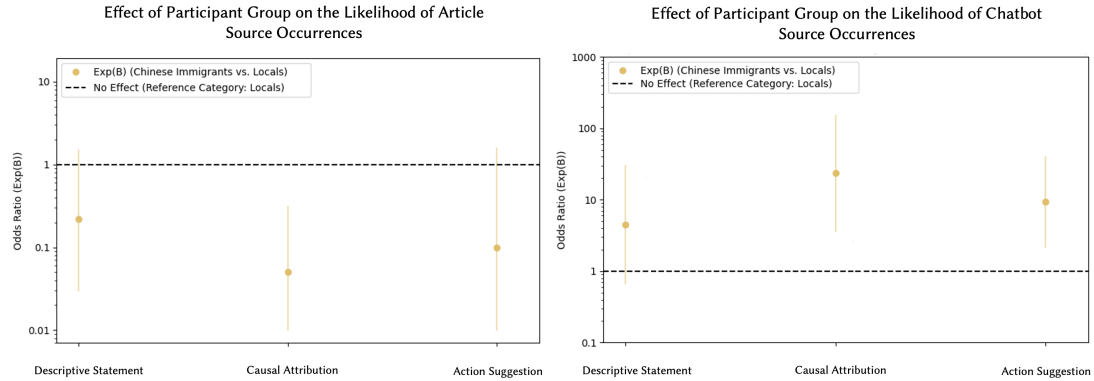


Figure 3.5: Exponentiated coefficients (Exp(B)) from binary logistic regression analyses examining the effect of participant group (i.e., Chinese Immigrants, or locals) on the likelihood of Article (left) and Chatbot (right) source occurrences across Descriptive Statement, Causal Attribution, and Action Suggestion.

2,260%) and Action Suggestion (increased by 834%) relevant takeaways in their news retelling. They were less likely to rely on news Articles as the source to generate Causal Attribution relevant takeaways (decreased by 95%). Other aspects of the retelling within the scope of the above analyses did not reveal significant differences between Chinese immigrants and locals.

### 3.4.3 Overall news reading experience perceived by Chinese immigrants vs. local participants

I conducted two ANOVAs to compare the overall Value perceived from the chatbot-assisted news reading and the overall Workload experienced across two participant groups. While these analyses were not directly related to my RQ1 and RQ2, they provided insights

that contextualize my other findings.

In both ANOVA models, the participant group (i.e., Chinese immigrants or locals) was the main independent variable. I included a consistent set of control variables across my analyses, which comprised a person's Age, Gender, Attachment to the topic of housing, Prior Experience with chatbots, and the Total Number of Questions they had exchanged with the chatbot. The dependent variable was participants' self-rated experience of news reading, collected via Likert scales and treated as continuous measures.

My results revealed a significant main effect of the participant group on their perceived Value of news reading:  $F(1, 89) = 8.72, p < .05$ . Chinese immigrants ( $M = 5.31, S.D. = 0.66$ ) perceived a greater Value of the news reading than the locals ( $M = 4.86, S.D. = 0.92$ ). There was no significant difference in the Workload perceived by the Chinese immigrants ( $M = 3.43, S.D. = 0.90$ ) and the locals ( $M = 3.31, S.D. = 0.83$ ):  $F(1, 89) = 1.27, p = .26$ . Figure 3.6 illustrates the comparisons of news reading experiences between the participant groups regarding their perceived Value and Workload.

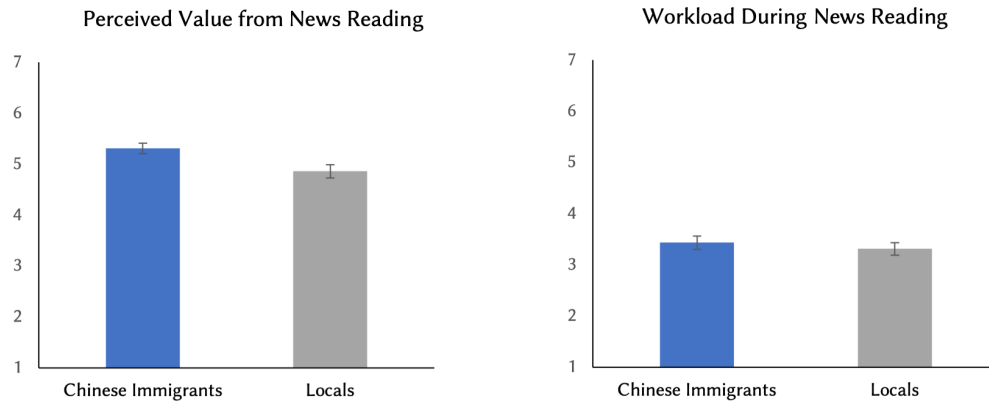


Figure 3.6: Comparisons of news reading experiences between Chinese immigrants and Locals

#### 3.4.4 Discussion

To conclude, I conducted a between-subject study to compare chatbot-facilitated news reading between two news reader groups: Chinese immigrants and locals living in the same region. My findings highlighted several statistically significant and conceptually meaningful differences between the immigrant group and the local group. In the rest of this section, I reflect on three key aspects of my work: the reader-chatbot interaction as a novel approach for understanding news readers' needs, the varying depth of sensemaking between immigrant and local news readers, and the chatbot's role in influencing immigrants' takeaways from news reading.

## Reader-chatbot interaction as a new way for understanding news readers' need

To the best of my knowledge, the current research is among the first behavioral studies that leverage reader-chatbot interaction to pinpoint news readers' needs. This approach complements prior work in important ways. In particular, research in journalism and social media has long been interested in referring to news readers' needs to enhance tailored news production and delivery [15, 69, 273, 295]. Participants in those studies typically made self-reports via surveys and interviews outside of their news reading process (e.g., [28, 30, 82, 86, 167, 256, 309]). More recent work, including many by HCI scholars, has utilized eye-tracking and other computer-based techniques to capture an individual's interests as they process the news content (e.g., [40, 170, 261]). While these behavioral tracking techniques provide valuable information on how readers distribute visual attention across a news article, they often come with challenges in interpretation. In the context of my current research, exchanges with the chatbot can externalize a news reader's interests during their news reading process and be contextualized within their written questions. Such an approach helps uncover the nuanced needs of news readers with relatively low effort. More importantly, as my results demonstrate, the reader- chatbot interaction will be particularly valuable in helping immigrant news readers voice their needs and questions in addition to supporting local news readers. The former group has often been placed on the periphery of decision-making regarding what to feature in a given society's mainstream news, whose perspectives to include in the news, and where to gather reader feedback for the next iteration of news production and delivery.

## Varying depth of sensemaking between immigrants and local news readers

My analyses on the reader-initiated questions provide the typologies and benchmarks for follow-up work that aims at creating reader-oriented news experiences. The question categories identified in the current work reflect three layers of needs and interests from the perspective of news readers: the literal layer (i.e., Word Explanation and Text Summary), the analytical layer (i.e., Viewpoint Synthesis, Referential Fact, and Broader Impact), and the practical layer (i.e., Practical Guidance). They formulate a “ladder of sensemaking,” priming individuals to comprehend the news at varying levels of depths.

With the landscape of questions appearing consistent across the two news reader groups, I identified clear contrasts between immigrants and locals regarding their likelihood of asking questions in each specific category. The raw counts and percentages signal an overall trend where immigrants were more likely to leverage the Q&A chatbot for Literal Comprehension of the given news, and locals tended to utilize the same chatbot more for Analytical Thinking of the news content. This difference was further unpacked in detail through my regression analyses. Specifically, participants of the local group prioritized the collection of Referential Fact that can supplement or, sometimes, verify information already described in the given news. They also made strategic use of the chatbot to learn about Broader Impact of the reported content, exploring connections between various societal issues beyond the scope of the given news article. These behaviors enable the individual to not only understand but also form critical reflections or judgments on the information being presented [219].

In contrast, the immigrant news readers were more likely to seek information regarding Text Summary and Practical Guidance. They also tended to experience more difficulties in having their questions understood by the chatbot, as evidenced by their requests for Conversational Repair. Some of these results, such as the demand for summaries and repairs,



were not entirely surprising, given the language profile of the immigrant individuals in my sample. Especially for immigrants who speak a minority language of the society, achieving a satisfactory level of literal comprehension of the news can often be challenging [2].

The issue warranting attention is, in my current study, the abrupt transition of immigrant readers from achieving Literal Comprehension of the news to seeking Practical Guidance from it. The entire sector of Analytical Thinking questions appeared much less significant in the Q&A data of these participants compared to locals. Such a contrast might suggest that the news content, if unverified or misleading, would expose immigrants to higher risks. Immigrants are likely to remain unaware of this risk, given that they perceived the value of their news reading to be high. This lack of depth in immigrants' news reading highlights a "cold start" problem [164], where individuals may have insufficient background knowledge to guide them in performing further steps.

Future chatbot design should consider having the chatbot provide proactive support to news readers, rather than only passively reacting to reader-initiated questions. This support is best provided after a news reader has initiated some self-exploration with the news content, thereby preventing the loss of human agency [263]. One possible approach is to have the chatbot synthesize questions typically asked by local readers, such as those considering Referential Facts and Broader Implications, and use them to scaffold and prompt immigrant readers' news sensemaking at the analytical level. Moreover, there can be extra value in extending such support to local news readers as well: ensuring a diverse range of questions flowing in both directions, from locals to immigrants and vice versa. This reciprocal exchange of perspectives could enrich the sensemaking experience for all news readers. The question categories and corpus obtained from my research, along with the analyses, provide essential materials for design explorations along this direction.

## Chatbot’s role in influencing immigrants’ takeaways from news reading

In this work, I employed novel methods (i.e., the retelling news) to investigate the takeaways people derived from news reading and to compare these takeaways across reader groups. Compared to the local group, the immigrant group relied more on the chatbot’s responses when formulating takeaways, particularly in terms of Action Suggestions shared with others. They also generated Causal Attributions relevant to interpreting the news events they read; however, their interpretations were less likely to be drawn directly from the content of the news article. I concluded from these results that, especially for immigrant news readers, the chatbot functioned as an important “proxy” connecting the news with its audiences.

The results align with recent research on human-AI interaction. It has been found that individuals with insufficient knowledge in a task domain tend to rely heavily on AI’s outputs for task completion in that domain, especially when they hold a strong belief in the AI’s capability to process large-scale data [113, 138, 238, 292]. In my research context, immigrant news readers possess less societal knowledge compared to local readers, which may lead to their greater reliance on chatbot responses when forming their news takeaways.

In envisioning future chatbot designs for reader-oriented news experiences, my work points to a dilemma that deserves attention, particularly for immigrant news readers. On the one hand, chatbots hold the potential to direct news readers to information they were likely to miss otherwise; on the other hand, readers could become dependent on the chatbot’s responses, potentially diverting their focus away from the original news content. This could shift their attention from one set of information to another without enriching their understanding of the news. To mitigate this issue, the suggestion is not to prioritize the news article’s content over the chatbot’s responses, or vice versa. These sources may each have their inherent strengths and biases, and their influence can vary depending on the

reader group’s characteristics and situational demands. Future news reading tools and interfaces should explicitly encourage news readers to consider diverse sources, especially when drawing takeaways to inform their actions.

### 3.5 Limitation

This study has several limitations. All participants were recruited from Virginia, U.S., which restricts the geographic representativeness of the sample. Immigrant news readers in this sample only included one specific population, which may undermine the generalizability of my results. Also, it is important to acknowledge that, by conducting a controlled experiment and adopting the quantitative approach, I missed the opportunities to examine more natural news reading behaviors for ecological validity. Future studies should continue the investigation of chatbot-assisted news reading with a wider range of participant groups, scenarios and methods. It is also important to conduct future research that involves other key stakeholders, such as professional journalists and news media policy makers, to explore the promises and challenges of new reading in today’s AI-powered era. The research materials and results generated from my current study pave the way for this exciting area of exploration.

### 3.6 Conclusion

In this experimental study, I explored the differences in information needs between immigrant and local news readers during chatbot-assisted news reading and the takeaways they generated from this interaction. Our participants consisted of 96 news readers, distributed between two groups: Chinese immigrants and local residents living in the same region. I analyzed Q&A logs from each participant’s interaction with the chatbot during the news reading process and collected the takeaways through a retelling task. Our

analysis of the Q&A logs revealed seven distinct categories of questions. I observed that compared to the local group, the immigrant group exerted more effort in understanding the literal meaning and practical implications of the news content but engaged less in analytical thinking to assess the given content. Additionally, the immigrant group relied more heavily on information provided by the chatbot's responses when formulating their takeaways regarding actions to take in life. I discussed our findings in the context of chatbot design for a reader-oriented news experience. I argue that chatbots should be designed to support immigrant news readers in diversifying their sensemaking perspectives, while also being cautious about relying too heavily on any single information source. This approach would help ensure that chatbots enhance rather than limit the news reading experience, fostering a more comprehensive understanding and engagement with news content.

## Chapter 4: Cross-validation Study by Examining Vietnamese Immigrants' News Reading Behaviors

### 4.1 Introduction

Previous studies indicate that immigrants often share common information needs during their adaptation process [44]. However, scholars warn against oversimplifying the subtle differences among various immigrant groups [4]. Much existing research focuses on single ethnic groups or does not consider group differences in data analysis [80, 175, 265]. Furthermore, the effectiveness of language technology in assisting immigrants can vary significantly, depending on the availability of language resources for that technology [242].

Recognizing these limitations, I aimed to address these issues and broaden the scope of my study by including a second group of immigrants—Vietnamese immigrants—who reside in the same region as the initial group studied. Building on Chapter 3, my current work aims to provide a more comprehensive understanding of immigrants' needs with the assistance of chatbot for news reading.

### 4.2 Related Work

The related work for this study is organized into two sections. The first section highlights the importance of acknowledging the heterogeneity within immigrant communities when understanding their information needs. Although immigrants often share similar in-

formation needs in their host countries, there are differences within and between groups in how they seek information and consume news. Research on immigrants should account for potential variations to avoid oversimplifying or generalizing across diverse populations. The second section suggests that while technological advancements bring promise, they may perform differently across language communities. These prior works informed the decision to recruit Vietnamese immigrants as my study sample in study two.

#### 4.2.1 Avoid overgeneralization while centering on immigrants' needs

While the information needs of immigrants have remained relatively similar, generalizing across diverse groups risks oversimplifying their distinct information needs, experiences, and patterns of multicultural media use [4, 5]. A small body of work conducting comparative studies of various immigrant groups suggests these variations across groups, despite the general theme of news media being important to them [130]. For instance, Ahmed and Veronis [5] conducted a comparative study with four immigrant and ethnocultural communities in Ottawa, examining their ethnic and mainstream media consumption. While confirming the role of mainstream media in satisfying immigrants' informational needs across all groups, their study also revealed differences in media usage. Notably, the Chinese community maintained prevalent use of diasporic media even among long-term residents, contrasting with other groups' general trend of increased mainstream media use over time.

Additionally, Nguyen et al. conducted interviews and focus groups with four communities to understand misinformation spread within Asian communities in the U.S. [201]. Their study revealed that factors such as historical trauma and nationalism also affect how immigrants interpret the quality of consumed media content. While these studies do not directly answer how similar or different the needs of these immigrant groups are, they

underline the need to explore these potential nuances while allowing for generalizable insights. The literature review in Chapter 2 has collectively shown the value of local media to immigrant groups, and also highlighted their challenges in assimilating knowledge from media content due to language barriers and lack of relevant background knowledge [63, 129, 175, 182]. However, it’s notable that prior research on immigrants largely either focuses on one specific ethnic group (e.g., [80, 175, 265]) or does not consider immigrants’ communal backgrounds as a variable in their analysis (e.g., [63, 182]).

#### 4.2.2 Disparities in language technology support for low-resource languages

Users’ experience with language technology depends on s based on the performance of the underlying language models. on the performance of underlying language models. In NLP, disparities arise when languages or domains are classified as low-resource, meaning they have limited data, research, computational resources, or linguistic study available. Margueresse et al. describe low-resource languages (LRLs) as “less studied, resource-scarce, less computerized, less privileged, less commonly taught, or low-density [173].” Research in NLP and machine translation (MT) has highlighted a significant performance gap between LRLs and high-resource languages such as English [145, 242]. For instance, Sel et al. observed a noticeable drop in BLEU scores—a measure of translation accuracy—when comparing the Kazakh-English language pair (low-resource) to the Polish-English pair (high-resource). Recent work on large language models reveals similar performance disparities [6, 145]. While models perform relatively well in widely digitally available languages like French, Spanish, and Japanese, they fall short in accuracy for LRLs such as Bengali, Hindi, and Swahili [6]. Additionally, users in LRLs also experience higher time costs. For example, researchers found that the number of tokens for a given text in Armenian and

Burmese languages is about nine times as many as in English [145].

Based on the literature review above, I chose to include a sample from another immigrant community in this study to examine potential disparities among different immigrant communities and local residents. According to 2020 state fact sheets, Vietnamese immigrants represent one of the largest immigrant communities in Virginia, with more than 42,000 Vietnamese-born residents [186]. Besides, Vietnamese-English is considered a low-resource language pair in NLP tasks like machine translation [59]. Including this sample enhances the generalizability of findings from Study I and can help provide a more nuanced understanding of diverse needs across immigrant populations. Considering the demographics of immigrant communities in the local region [286] and the language resources available to them [148, 160], I selected Vietnamese immigrants from the same region as in Study II for this research.

### 4.3 Method

For this study, I worked with a Vietnamese-speaking research assistant and recruited 48 Vietnamese immigrants residing in Virginia. Recruitment was conducted through social media posts and paper flyers distributed within Virginia's immigrant communities. All participants reported limited working proficiency in English, the predominant language in the United States, providing a sample comparable to the other immigrant group in my study.

The sample included 48 participants from Vietnam, with equal representation of self-identified female ( $N = 24$ ) and male ( $N = 24$ ) participants. The average age was 26.81 years ( $SD = 4.21$ ), and participants had lived in the United States for an average of 6.31 years ( $SD = 4.23$ ). All participants identified Vietnamese as their native language.



### 4.3.1 Task procedure and news materials

Participants followed the same task procedure and read the same set of news as those in Study I. They received instructions and materials in Vietnamese from the Vietnamese-speaking research assistant. To ensure that the news materials remained recent, data collection for this cross-validation study was conducted within one month after Study 1's data collection.

### 4.3.2 Measurements

I obtained a dataset of Vietnamese participants following the same procedures of Study I. Specifically, our research team collected a total of 1,146 questions asked by Vietnamese participants, with 316 questions asked in Vietnamese. In the news retelling tasks, participants produced a total of 288 retelling pieces, 184 of which were written in Vietnamese.

## 4.4 Data analysis and results

I started my analysis by focusing on the reader-initiated questions from Vietnamese immigrants. First, I worked with three bilingual human translators fluent in both Vietnamese and English to translate all non-English Q&A logs into English. I then began by examining a random subset of these Q&A logs, comparing them to the codebook from Study I to confirm its applicability to this dataset. After this validation, I collaborated with another research assistant, who was trained to be familiar with the coding process, to analyze all subsets of the data thoroughly.

I discussed and resolved any discrepancies with the research assistant, completing the categorization of all reader-initiated questions from Vietnamese immigrants. This collaborative process yielded a high inter-coder reliability score (Cohen's Kappa = .89), demon-

strating the robustness and reliability of the finalized coding framework.

#### 4.4.1 Distribution of reader-initiated questions of Vietnamese immigrants and Local participants

Based on the categorization of the questions, I calculated both the raw numbers and percentages for each category to clearly demonstrate the differences between Vietnamese immigrants and local participants. See Table 5 and Figure 7. The trends observed in Study I persisted in this study. Compared to local participants, individuals in both immigrant groups tended to ask the chatbot more questions about Literal Comprehension and Practical Guidance, but fewer about Analytical Thinking. I then applied the same analytical methods as in Study I to verify the observed contrasts between Vietnamese immigrants and locals.

Table 5: Questions asked by Vietnamese immigrant and local participants across 7 categories

| Theme/Category        |                     | Definition                                                                                                                       | Sample question of locals                                                                                                                                                      | Sample question of immigrants                                                                                                            |
|-----------------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Literal Comprehension | Word Explanation    | Lexical explanations of words and phrases that appear in the given news                                                          | What is the meaning of glut?                                                                                                                                                   | Deter nghĩa là gì? [English translation: What does deter mean?]                                                                          |
|                       | Text Summary        | A concise representation of the selected text from the given news                                                                | Can you briefly summarize this news?                                                                                                                                           | Neu y chính của bài báo này. [English translation: Present the main idea of this article.]                                               |
| Analytical Thinking   | Viewpoint Synthesis | An integration of insights and perspectives for explanations on a reader-specified issue conveyed in the news                    | Why is housing growth slow? [Context: The news article discusses various issues associated with this slow growth.]                                                             | Từ bài báo, tại sao giá thuê nhà lại tăng? [English translation: From the news article, why has rent increased?]                         |
|                       | Referential Fact    | Factual information related to content mentioned in the news but requiring external sources for further details                  | What is the year-to-year rent in Arlington, VA? [Context: The news mentions yearly rent in Arlington but does not specify rates across years.]                                 | Có chương trình của chính phủ để hỗ trợ việc thuê nhà không? [English translation: Are there government programs for rental assistance?] |
|                       | Broader Impact      | Societal effects or consequences related to the issues reported in the news but go beyond its explicit content                   | How does Joe Biden's Renters Bill of Rights affect non-subsidized housing? [Context: The news mentions the Renters Bill of Rights, but does not discuss unsubsidized markets.] | Luật mới này có lợi cho chủ nhà hay người mượn nhà? [English translation: Is this new law more beneficial for homeowners or renters?]    |
| Practical Guidance    |                     | Recommendations or advice that encourage specific behaviors of the news reader but go beyond what this news explicitly discusses | I am a renter in VA, what should I be paying attention to and what advice can you give?                                                                                        | Có thể làm sao để tiết kiệm được tiền thuê nhà? [English translation: What to do in order to save money on rent? ]                       |
| Conversational Repair |                     | The chatbot's notice of the need to rework its immediate previous response to the news reader                                    | That's not quite relevant to my question. Can you answer my question by referring to the news I am currently reading?                                                          | Ý tôi là Hoa Kỳ chứ không phải Mỹ Đình. [English translation: I mean Hoa Kỳ (United States), not Mỹ Đình (a place in Vietnam).]          |

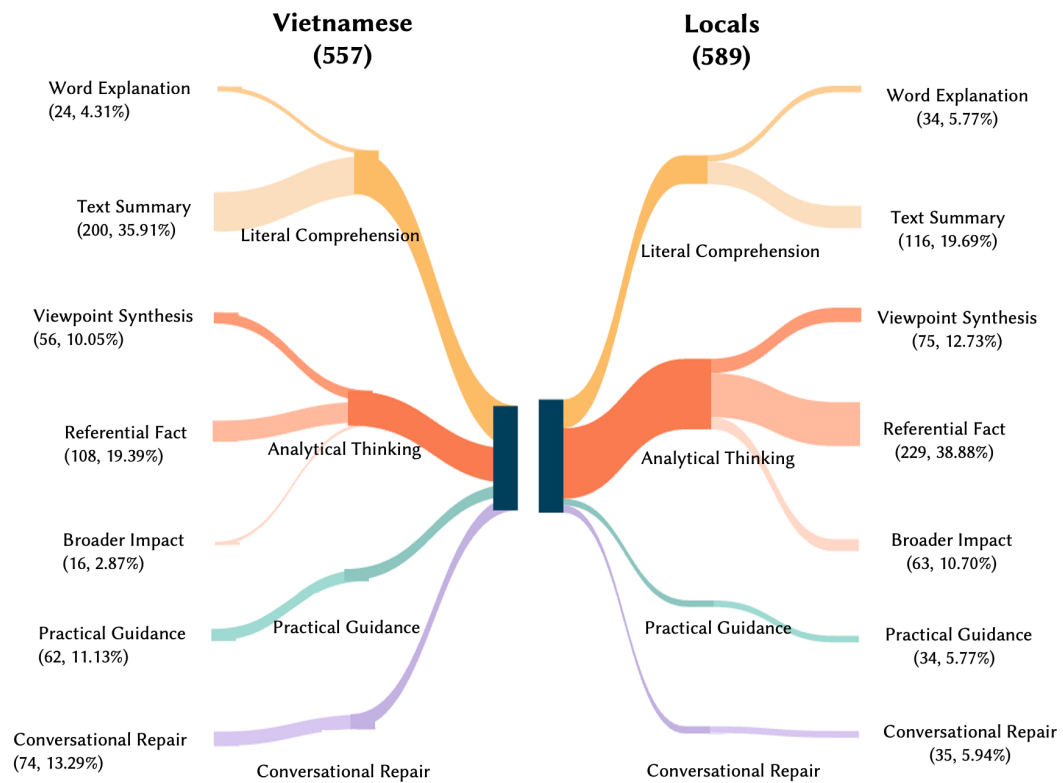


Figure 4.1: Distribution of questions among Vietnamese immigrant and local participants

I conducted a series of negative binomial regression analyses to compare the likelihood of Vietnamese immigrants and local participants asking the chatbot questions in various categories. The model choice and variable settings were identical to those used previously. Table 6 details the impact of the participant group on the likelihood of posing questions to the chatbot across the seven categories, along with the overall model fit.

Table 6: Effect of participant group (i.e., Vietnamese immigrants vs. locals) on the questions asked per category.

| Category               | Chinese Immigrant vs Locals |         |    |     |        |              | Overall Model Fit |        |        |              |                     |
|------------------------|-----------------------------|---------|----|-----|--------|--------------|-------------------|--------|--------|--------------|---------------------|
|                        | B                           | S.E.(B) | df | p   | Exp(B) | 95%CI        | Log-likelihood    | AIC    | BIC    | Deviance /df | Pearson $\chi^2/df$ |
| Word Explanation       | -0.66                       | 0.44    | 1  | .13 | 0.52   | [0.22, 1.23] | -94.73            | 205.45 | 225.97 | 0.86         | 0.95                |
| *Text Summary          | 0.49                        | 0.15    | 1  | .00 | 1.63   | [1.21, 2.19] | -198.32           | 412.64 | 433.16 | 1.6          | 1.23                |
| *Viewpoint Synthesis   | -0.45                       | 0.22    | 1  | .04 | 0.64   | [0.41, 0.98] | -130.33           | 276.66 | 297.17 | 1.27         | 1.36                |
| *Referential Fact      | -0.69                       | 0.19    | 1  | .00 | 0.5    | [0.35, 0.74] | -192.12           | 400.23 | 420.75 | 1.25         | 1.06                |
| *Broader Impact        | -1.62                       | 0.37    | 1  | .00 | 0.2    | [0.10, 0.41] | -92.52            | 201.04 | 221.55 | 1.05         | 1.53                |
| *Practical Guidance    | 0.9                         | 0.28    | 1  | .00 | 2.45   | [1.42, 4.25] | -117.5            | 251    | 271.52 | 1.4          | 1.57                |
| *Conversational Repair | 0.56                        | 0.27    | 1  | .04 | 1.76   | [1.04, 2.98] | -125.17           | 266.33 | 286.85 | 1.47         | 1.52                |

Note: \* indicates statistical significance ( $p < .05$ )

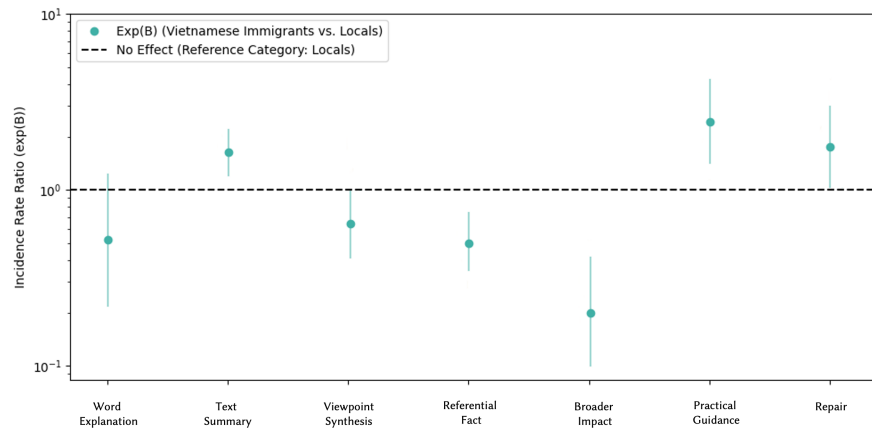


Figure 4.2: Exponentiated coefficients (exp(B)) from all 7 negative binomial regression analyses that examine the effect of the participant group (i.e., Vietnamese Immigrants vs. locals) on the questions asked per category.

With all control variables held constant, our results showed that the expected counts of questions exchanged between Vietnamese immigrants and the chatbot were significantly fewer than those exchanged between locals and the chatbot in the categories of Viewpoint Synthesis (decreased by 36%), Referential Fact (decreased by 50%), and Broader Impact (decreased by 80%). That said, Vietnamese immigrants tended to exchange more questions with the chatbot in the categories of Text Summary (increased by 63%), Practical Guidance (increased by 145%), and Conversational Repair (increased by 76%). There was no significant difference between groups in other categories.

#### 4.4.2 Takeaways generated by Vietnamese immigrants and local participants

Following Entman's framing theory, I examined all retelling pieces, employing the same coding process of Study I to identify the primary elements of each retelling piece generated by Vietnamese participants. This process achieved high inter-coder reliability (Cohen's Kappa = .93). I then compared each segment of a retelling piece against two sources: the text from the news article participants had read, or the text from the chatbot responses received during news reading. This comparison yielded three potential sources for each segment: Article, Chatbot, and External Insight.

I calculated the distribution of sources used by immigrants to formulate their retelling content for each element. Figure 9 illustrates the distribution among all participants across three groups. Overall, Vietnamese immigrant - Local participant comparison showed a similar pattern to what was observed with Chinese immigrants. The data indicates that local participants cited a larger amount of Article sources in segments of Descriptive Statement and Causal Attribution than both Chinese and Vietnamese immigrants. Conversely, immigrants cited a relatively greater amount of Chatbot responses as sources in their segments

under Action Suggestion. Additionally, one notable difference between Chinese and Vietnamese immigrants was Vietnamese immigrants' inclusion of fewer Action Suggestions in their retellings. Next, I applied a more rigorous analysis to detail the contrasts in retelling between immigrants and locals.

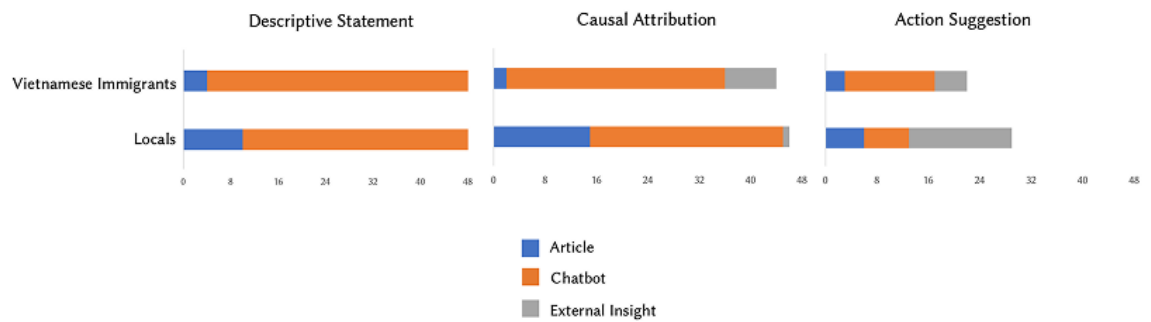


Figure 4.3: Distribution of the use of information sources by participant groups (i.e., Vietnamese immigrants or locals).

I conducted a series of binary logistic regression analyses to compare Vietnamese immigrants and local participants, using the same model choice and variable settings as in Study I. The primary difference was the redefinition of the participant group as our main predictor, distinguishing between Vietnamese immigrants and locals. The analyses revealed no significant differences between these two groups in terms of their likelihood to include any of the three framing elements in their retelling pieces. However, the two groups did differ in how they leveraged sources. Table 7 details the impact of the participant group on the source of each element in the retelling content, as well as the indices of overall model fit.

Table 7. Likelihood of source occurrences across framing elements by Chinese immigrants vs. locals

| Category              | B     | S.E. | Wald $\chi^2$ | p   | Exp(B) | 95%CI          | $\chi^2$ | Nagelkerke $R^2$ | N  |
|-----------------------|-------|------|---------------|-----|--------|----------------|----------|------------------|----|
| <b>Article</b>        |       |      |               |     |        |                |          |                  |    |
| Descriptive Statement | -1.37 | 0.84 | 2.67          | .10 | 0.25   | [0.05, 1.32]   | 19.28    | 0.32             | 96 |
| Causal Attribution    | -2.95 | 0.95 | 9.66          | .00 | 0.05   | [0.01, 0.34]   | 25.01    | 0.39             | 90 |
| Action Suggestion     | -0.06 | 1.35 | 0             | .96 | 0.94   | [0.07, 13.33]  | 11.45    | 0.33             | 51 |
| <b>Chatbot</b>        |       |      |               |     |        |                |          |                  |    |
| Descriptive Statement | 1.37  | 0.84 | 2.67          | .10 | 3.93   | [0.76, 20.32]  | 19.28    | 0.32             | 96 |
| Causal Attribution    | 1     | 0.62 | 2.64          | .11 | 2.72   | [0.81, 9.08]   | 10.86    | 0.16             | 90 |
| Action Suggestion     | 3.93  | 1.26 | 9.74          | .00 | 50.69  | [4.31, 596.85] | 21.49    | 0.46             | 51 |

Compared to locals, Vietnamese immigrants were more likely to rely on Chatbot's responses as the source to generate Action Suggestion (increased by 4,969 %) relevant takeaways in their news retelling. They were less likely to rely on the news Article as the source to generate Causal Attribution relevant takeaways (decreased by 95%). Other aspects of the retelling within the scope of the above analyses did not reveal significant differences between Vietnamese immigrants and locals. Also, they were less likely to have External Insights that overlap with neither the article content nor the chatbot's responses to formulate Action Suggestion relevant takeaways (decreased by 94%). Other aspects of the retelling within the scope of this part of our analyses did not reveal significant differences between Vietnamese immigrants and locals.



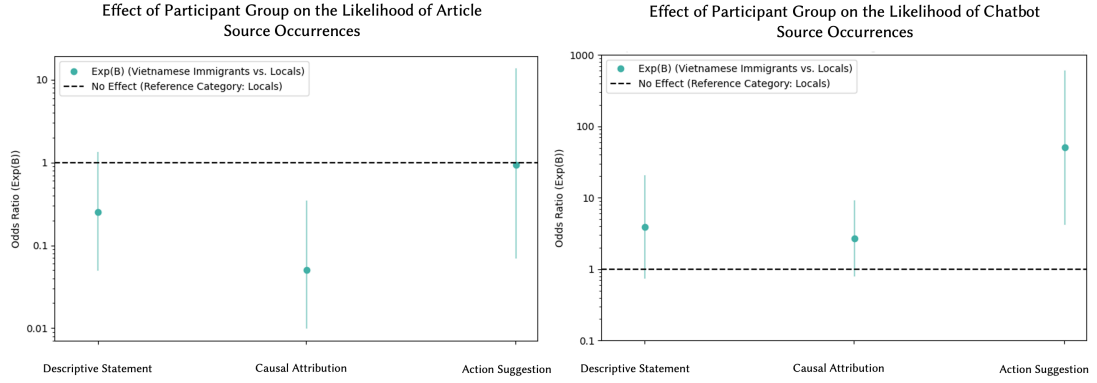


Figure 4.4: An illustration of the task interface

#### 4.4.3 Overall news reading experience perceived by Vietnamese immigrants and local participants

I conducted two ANOVA tests to compare the perceived value from chatbot-assisted news reading and the experienced workload among participants in three groups. In both ANOVA models, the main independent variable was the participant group (Vietnamese immigrants vs. locals). I included the same set of control variables as in other analyses, which consisted of a person's age, gender, attachment to the topic of housing, prior experience with chatbots, and the total number of questions exchanged with the chatbot.

The results demonstrated a significant main effect of the Vietnamese immigrant participant group on their perceived value of news reading:  $F(1, 89) = 4.89, p < .05$ . Specifically, Vietnamese immigrants reported a higher value from the news reading experience ( $M = 5.28, S.D. = 0.99$ ) compared to the locals ( $M = 4.86, Standard Deviation = 0.92$ ).

Conversely, there was no significant difference in the workload perceived by Vietnamese immigrants ( $M = 3.26$ ,  $S.D. = 1.01$ ) and locals ( $M = 3.31$ ,  $S.D. = 0.83$ ), with ( $F(1, 89) = 0.14$ ,  $p = .71$ ). Figure 11 illustrates the comparative analysis of news reading experiences between the participant groups regarding their perceived value and workload.



Figure 4.5: An illustration of the task interface

## 4.5 Evaluation of Chatbot Responses

To better understand how participants interacted with the AI chatbot in our study, I conducted a follow-up evaluation to assess the factual quality of the chatbot's responses. Each response was compared against the original news article and general world knowledge.

Traditional evaluation approaches—such as checking entity-relationship triples extracted from text—are limited because they depend heavily on extraction accuracy and perform poorly in open-ended conversational settings. Overlap-based measures such as BLEU and ROUGE capture textual similarity rather than factual correctness, making them less suitable for detecting hallucinations. They are further insensitive to conversational intent. In

our study, participants asked diverse, open-ended questions, and these metrics cannot assess whether the chatbot appropriately addressed the user’s intent or remained consistent with the article.

Given these limitations, I used a LLM as a judge [157], following approaches and taxonomy proposed by scholars such as Luo et al. [169], Huang et al. [117], and Chiang et al. [55]. I employed a recent LLM (i.e. GPT 5.1) with chain-of-thought prompting to assess each chatbot response for factual accuracy and faithfulness. The model produced categorical judgments (hallucination: yes/no) and elaboration of reasons. This method allowed me to (1) quantify the factual quality of responses, (2) compare hallucination patterns across participant groups, and (3) triangulate engagement and trust measures with objective indicators of response accuracy. The evaluation followed a structured procedure. Full prompt specifications appear in the Appendix.

- Identify all factual statements in the chatbot’s response.
- Assess each statement as supported, contradicted, or unverifiable based on the article or general world knowledge.
- Determine whether the response contains hallucinations. Provide reasons in one or two sentences in the output.

#### 4.5.1 Results

Across groups, most chatbot responses did not contain factual hallucinations. Accuracy rates (i.e., proportion of responses found *not* to contain hallucinations) were:

- Chinese Immigrant group:  $516/697 = 74.0\%$
- Vietnamese Immigrant group:  $389/555 = 70.1\%$

- Local group:  $486/595 = 81.7\%$

To validate the LLM judgments, I manually reviewed 150 randomly selected responses from each group. Agreement between human review and the LLM judge was high:

- Chinese Immigrant group:  $122/150 = 81.3\%$
- Vietnamese Immigrant group:  $116/150 = 77.3\%$
- Local group:  $128/150 = 85.3\%$

These rates suggest that the LLM judge provides reasonably reliable assessments, though not at a level that would eliminate the need for human review.

#### 4.5.2 Error analysis: when the LLM judge failed

During manual validation, I identified several recurring patterns in which the LLM's judgment was inaccurate.

#### Interpretation of policy implications

In one example, a participant asked about potential pros and cons for renters and landlords under a new housing policy. The chatbot produced several reasonable but speculative interpretations (e.g., changes in flexibility or screening practices) that extended beyond what the article explicitly stated. The LLM labeled these as hallucinations because they were not verifiable in the article. However, interpretive reasoning is often expected in policy questions, and not all reasonable inferences can or should be tied to explicit textual evidence. In these cases, the model failed to distinguish legitimate inference from factual error.

## Verification against time-dependent knowledge

Another example involved suggestions for Virginia workers seeking rental options. The chatbot mentioned the Virginia Rent Relief Program and referenced Zeus Living as an available provider of temporary housing. The LLM flagged the response because Zeus Living had shut down in 2023. However, at the time of our experiment, the company was still operating. Without access to the temporal context of the conversation, the LLM incorrectly evaluated historically accurate statements as false.

## Missing context from the news-reading task

In another case, a user asked about the phrase term “vacancy rates” *in Chinese*. The chatbot interpreted this as a question about vacancy rates in China. The LLM accepted the answer as factually valid. However, within the study context, the user was expected to ask questions related to the U.S. housing market described in the article. Without task-specific context, the LLM misjudged the appropriateness of the chatbot’s response.

### 4.5.3 Additional observations and considerations

Based on this evaluation, several broader insights emerged from this subsection of analysis. First, LLM judges need explicit grounding in prompts. Their performance depends on how well the prompt provides context (e.g., article content, task description, expected answer domain). Without this, they often misclassify contextually inappropriate answers as correct. Second, LLM judges struggle with reasonable inferences or lack of contexts. When a response is interpretive rather than purely factual or critical context is missing, the model tends to err on the side of labeling it hallucinated, even if the inference is reasonable for the question type. Last, our agreement rates (about 77–85%) align with findings from

prior work showing that LLM judges approximate human ratings but still miss subtle contextual and temporal cues. These findings indicate that LLMs can serve as effective tools for large-scale, automatic evaluation of chatbot responses, particularly for detecting clear factual errors. However, their limitations aforementioned mean that they should not fully replace human evaluation. Instead, LLM-based assessments should be used cautiously, supported by explicit contextual prompts, and complemented with human review for accuracy and validity.

## 4.6 Discussion

### 4.6.1 Comparisons between Chinese immigrants and Vietnamese immigrants on reading needs

In summary, Study II aligns with and extends the findings from the previous chapter. Interestingly, my results also highlight noteworthy differences between the two immigrant groups in terms of the sources relied upon for drawing takeaways. Specifically, unlike their Chinese counterparts, Vietnamese immigrant participants were less likely to incorporate External Insights when framing Action Suggestions in their takeaways. This distinction was not observed in the comparison between Chinese immigrants and locals. I built my discussion based on these differences observed in the current study.

While it is difficult to provide a definitive explanation, I suspect that some variations in communal practices between Vietnamese and Chinese immigrants, as well-documented in social science literature, have partially contributed to our results. For instance, Chinese immigrants living in the same society are frequently described as maintaining strong intragroup connections to preserve their shared identity [50, 187]. In contrast, studies with Vietnamese immigrant groups in the United States have revealed greater subgroup differ-

ences rooted in mixed historical and religious identities, which hinder the formation of a cohesive community [158, 244, 276]. In Park et al.'s recent survey study, for example, participants in Vietnamese groups reported significantly lower levels of ingroup cohesion and civic engagement compared to other ethnic groups living in the United States [211]. This cultural attribute may lead Vietnamese immigrants to be more reticent about sharing certain information, such as their own insights and views on the news event, when retelling the news to others of a similar background. The current comparison underscores the complexity of how different social groups utilize technology for information seeking and media consumption, and it emphasizes the need for a nuanced understanding of the diverse backgrounds, experiences, and knowledge bases when designing technology to support these activities.

#### 4.7 Summary of Chapter 4 and 5

Before moving further, I have summarized the findings from my first two studies, focusing on the comparisons between the immigrant groups (Chinese and Vietnamese immigrants) and the local group.

Distribution of reader-initiated questions. In the distribution of reader-initiated questions asked by immigrant versus local participants, we observed potential differences in the categories they prioritized. Specifically, compared to local participants, participants in both immigrant groups tended to ask the chatbot more for assistance with Literal Comprehension and Practical Guidance, but less for Analytical Thinking. We conducted more rigorous analyses to confirm these observed contrasts.

Reader-initiated questions. Our regression analysis showed that both immigrant and local news readers asked questions across a similar range of categories. However, significant differences emerged in which categories were more frequently addressed by each group.

Immigrants were less likely to engage in questions that require Analytical Thinking and more likely to seek help in areas of Literal Comprehension and Practical Guidance, compared to locals. Figure 3 illustrates these contrasts, setting locals as the reference group across all categories.

Generation of takeaways. In terms of generating takeaways from news reading, our analyses highlighted distinct tendencies between immigrant and local news readers in their reliance on different sources. Compared to locals, individuals in both immigrant groups more frequently referenced Chatbot responses when formulating Action Suggestions. Conversely, they were less likely to draw on the news Article for Causal Attribution. While there were several differences between the Chinese and Vietnamese groups in how they compared to the locals, the overall results highlighted more similarities between the two immigrant groups.



## Chapter 5: Co-designing News Chatbot with Immigrants and Journalists

### 5.1 Introduction

Mainstream news disseminated in a given society constitutes an essential venue for people living there to stay informed and make life plans. Among them, a subgroup who frequently experience struggles with news reading are immigrants.

Previous research has documented various barriers that limit immigrants' information seeking in their societies of living. Commonly noted ones include lack of full fluency in the majority language [5, 44], insufficient understanding of the local cultural environment [7, 43, 89], and mismatches between common knowledge shared among local majorities and immigrants' own lived situations [207, 260]. Recent work has found that, to compensate for their lack of engagement with mainstream news, immigrants often consume ethnic media (e.g., [41, 319]) or turn to networks consisting of other immigrants (e.g., [114, 221]). However, such workarounds can raise high-stakes concerns, as these alternative information venues may be unsustainable, vary in quality, and engender significant echo chambers.

In response to a recent call for creating reader-oriented news experiences [264], a handful of HCI scholars have discussed the design of news technologies to serve immigrant readers. For example, Gao et al. proposed redesigning automated translation systems to better support immigrants' news consumption [89]. Similarly, Heuer and Glassman developed an accessible text framework that guides the restructuring of news content for immigrants, as well as for other populations with reading difficulties [109]. Zhang et al. studied how im-

migrants seek comprehension support from LLMs while reading news articles [323]. They concluded that technology should enable these individuals to critically assess news content rather than merely offering language support. Collectively, these projects have contributed valuable knowledge for enhancing immigrants' news experiences through design solutions.

An inherent problem of this body of work, though, is that immigrant readers are often treated in isolation. They are recognized as facing challenges in news reading [7, 89, 323], and are then provided with technical tools to cope with the challenges in an entirely self-directed manner. Other stakeholders in the news ecosystem — particularly journalists, whose work strongly influences the production of mainstream news content for its readership [22, 24, 100, 199] — have rarely been considered.

The current research aims to extend the empirical understanding as well as the design thinking for immigrants' news experiences by connecting their voices with those of journalists. Our investigation involved 11 immigrant readers and 7 journalists from the same metropolitan area in the U.S. capital region. They participated in a co-design study that we organized, which included a series of interlinked activities spanning multiple days. Such a process enabled everyone at the study sessions, including ourselves, to recognize the relationship between values prioritized by immigrant readers and those emphasized by journalists. All participants also collaboratively envisioned technology designs for immigrant readers by situating their design speculations within existing links between news production and consumption.

The findings of our research surfaced multiple sets of (mis)alignments between immigrant readers and journalists on values that should be prioritized in the selection of news topics, the presentation of news content, and the processing of news information. Grounded in these insights, participants articulated four metaphors for future news technologies serving immigrant readers: as a data decoder, as a connection informer, as an empathetic friend, and as a trajectory witness. These metaphors all considered conversational AI agents the

default format for such technologies. Across metaphors, the AI agent never functioned alone; rather, it coordinated with journalists in four distinct ways to balance effectiveness and accountability. Our findings contribute meaningful insights for enhancing immigrant readers’ news experience through the appropriate alignment of roles among technology, journalists, and immigrant readers themselves.

## 5.2 Related Work

We reviewed three bodies of literature that motivated our current work: computational tools for news consumption, news reading among immigrants, and news production by journalists. Syntheses of this prior knowledge led us to adopt co-design as our research device to explore aspirational connections between immigrant readers, journalists, and technology design toward reader-oriented news experiences. We conclude the section by presenting research questions that guide our investigation.

### 5.2.1 Computational tools for news reading

As news reading today shifts from traditional media to digital platforms, a variety of commercial applications have been developed to support this evolving practice. From online aggregators (e.g., Google News, Apple News) to automated fact-checkers (e.g., FactCheck.org, NewsGuard), readers’ accessing, navigation, and evaluation of news content have become increasingly mediated by technology and more effective.

In the research domain, recent advancements in natural language processing and machine learning have led to a surge of computational tools in the news space. Some of these tools focus on comprehension, such as automated summarization or guided reading assistance across given news content and other textual materials (e.g., [42, 52, 83]). Others aim to assist with error detection, enabling users to verify claims and evaluate informa-

tion quality (e.g., [9, 65, 202, 217]). A third line of work addresses media bias by helping individuals recognize political leanings in news reports and their framing strategies (e.g., [203, 294, 315, 316]).

While such efforts point to a promising future for technology-powered news experiences, they have largely concentrated on well-bounded tasks with limited attention to a reader’s organic news journey in everyday life. To this latter end, empirical studies of human behaviors have shown that modern news consumption is highly situation-dependent, shaped by diverse backgrounds of the readers, and spanning various topics and formats ([25, 313]). Mismatches between technologies developed in labs and readers’ real-world practices sometimes prompt concerns, as reported during user studies sessions of existing tools. For example, news readers have expressed worries about inherent algorithmic biases of the tools [202, 315], difficulties stemming from steep learning curves [294], and gaps between a tool’s specific use cases and people’s habitual news reading practices [52, 294]. These issues underscore the need to bridge technology design for news consumption with the people who stand to benefit from it through a more human-centered approach.

### 5.2.2 Key stakeholders in the news ecosystem

The news ecosystem involves individuals from various stakeholder groups. Two groups central to our research are immigrant readers and journalists. They occupy distinct yet interrelated positions in news consumption and production.

#### News consumption by immigrant readers

Immigrants constitute a persistent yet often overlooked readership group for mainstream news in a given society. Prior studies have documented important differences in how immigrants and local majorities engage with news. One classical finding, repeatedly

confirmed across multiple projects, considers the purposes driving people's mainstream news reading: immigrants often harness news information to meet settlement and survival needs, whereas locals' news consumption is more frequently linked to higher-end demands such as civic participation [8, 43, 207, 247].

More detailed contrasts have been reflected in research on news sensemaking and interpretation [7, 63, 110, 323]. For instance, Alencar and Deuze conducted interviews with immigrants who relocated to the Netherlands and Spain from Latin America, Sub-Saharan Africa, and Eastern and Southern Europe. They found that the interpretations these participants derived from mainstream news often deviated from those of locals [7]. Gao et al. conducted experience sampling studies with Chinese individuals living in the U.S. and Japan. Participants' information-seeking logs revealed a lack of depth, as well as blurred focus, in their sensemaking of COVID-related news in both countries [89]. Zhang et al. examined questions asked by Asian immigrants and locals in the U.S. when reading the same set of mainstream news articles. Their data analysis showed that immigrants, compared to locals, faced significantly greater challenges in connecting the given news content with other ongoing issues in society [323].

Many scholars attribute immigrants' struggles with news reading to their limited knowledge of the local environment and imperfect fluency in the majority language (e.g., [3, 89, 198, 260]). Several projects in the broader HCI and CSCW communities have also proposed systems to support immigrants' adoption of local knowledge, as well as language learning, in everyday contexts (e.g., [39, 228, 275, 327]). To date, however, little concrete guidance has been offered to design news technologies that address the specific needs of immigrant readers.

## News production by journalists

Journalists oversee the production of news content that is ultimately consumed by the public. As detailed in numerous ethnographies and media sociology studies, this process is shaped by established professional norms and routinized practices [88, 189, 214, 234, 281].

In particular, Tuchman's fieldwork with journalists and editors working in the U.S. newsrooms documented these people's everyday routines and scheduled practices [279–281]. It demonstrates that news is not merely a neutral reflection of reality but the result of professional assessment and constructions of what is deemed newsworthy. Shoemaker and Reese synthesized empirical research on news production [223, 245, 246]. They proposed a multi-layer hierarchical framework, showing that news content is not determined by an individual journalist's or reporter's taste. Instead, it must be codified through professional routines, accessible resources, and factors operating at the ideological level. Kovach and Rosenstiel analyzed interviews with journalists and media leaders [142]. They identified a set of principles guiding journalism practices, including truth-seeking and independence.

Over time, news production has gradually moved toward a reader-oriented view, although without being entirely defined by it [10, 240, 264]. Modern practice in this domain considers local citizens as active participants who may contribute, disseminate, and provide feedback on information that goes into news [35, 72, 253, 267]. Through readers' forum columns on newspapers [287], call-in radio programs [16], call-out surveys [108], and on-line comments attached to digital articles [32, 271], journalists have become more attentive than before to readers' voices. — Yet, from the standpoint of our current research, these existing journalist-reader exchanges rarely involve immigrants.

### 5.2.3 Reader-oriented news experience via co-design

With the above sets of literature in mind, we argue that human-centered technology design for enhancing immigrant readers' news experiences should integrate insights from immigrants and journalists as a collective. Taking this approach does not mean deciding whose views are more important or legitimate. Rather, our goal is to recognize common ground across the two stakeholder groups and to experiment with bridging their gaps through collaborative efforts.

A small but growing body of recent HCI research has explored technology design for news experiences (e.g., [49, 112, 324]). However, synthesized perspectives across stakeholder groups received little coverage in the literature, despite their value. One fashion of this research has relied on experiments and usability interviews to test innovative forms of technology use in news reading. These studies are typically conducted in controlled settings, where participants, acting as news readers, try out system prototypes with specific features or mock-up interfaces [30, 49, 112, 323, 324, 326]. Another body of studies has been more design-driven and exploratory. They often conducted design activities with stakeholder representatives to outline conceptual designs for future news technology (e.g., [136, 204, 303]). Notably, the stakeholders participating in these design processes were largely limited to the news production side.

In this sense, our current work complements prior literature by engaging both immigrant readers and journalists in co-design explorations grounded in the former's needs. Following the tradition of research through design [87, 93, 331], this methodological choice enables us to generate knowledge about immigrant readers' news consumption practices, as well as to uncover organic connections between those practices and corresponding actions on the news production end [18, 93, 141, 330, 331]. Artifacts produced in this process, typically including narratives, scenarios, concepts, and sketches, are not only design out-

comes; they also function as “boundary objects” that promote constructive dialogue across stakeholder groups, each representing a unique position in the problem domain under study [93, 151, 257].

We proposed two research questions (RQs) to guide our investigation through co-design with immigrant readers and journalists. Both RQs address essential insights for successful news technology design that neither group could generate independently:

**RQ1:** What is the relationship between the values prioritized in news consumption by immigrant readers and those emphasized in news production by journalists? Where do they align and/or misalign?

**RQ2:** How do immigrant readers and journalists envision the design of technology for reader-oriented news experiences of the former? What roles do they each play in relation to the technology?

Next, we present the setup of our co-design activities, which provides “a third space [192, 193]” that transcends traditional boundaries to enhance news experiences of immigrant readers.

### 5.3 Method

We conducted co-design with 11 immigrant readers and 7 journalists, following the design process model proposed by Fails et al. [79]. The entire research process consists of three successive phases (see Figure 5.1): onboarding sessions prior to the formal study, activity set one (“News on My Radar”), and activity set two (“News Without Barriers”). Activity set one and two each included two sub-activities: during the former sub-activity, participants were tasked with producing certain materials based on our requests; these materials then enabled us to better prepare for interactions at the latter sub-activity. Participants were compensated with \$20 USD per hour via gift cards. They were also reimbursed



for transportation expenses for any in-person parts of our activities. The entire research procedure was reviewed and approved by the Institutional Review Board. We provide full details of the arrangement of our activities below.

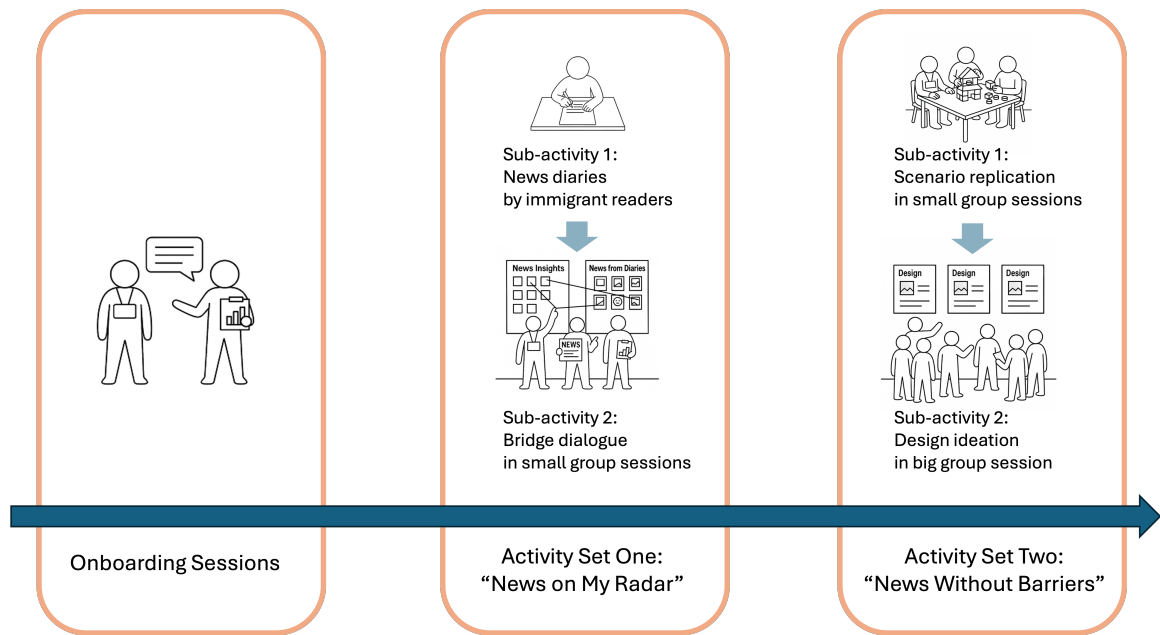


Figure 5.1: The entire research process consists of three successive phases.

### 5.3.1 Participants recruitment and composition

All participants were from the same metropolitan area in the U.S. capital region and were comfortable with English, enabling them to attend joint in-person activities for the best quality of communicating during the research process. Among them, immigrant participants were recruited through two channels: a) printed flyers distributed at grocery stores, wellness centers, public libraries, and other public facilities within the region; and b) digital flyers posted to community platforms including Nextdoor, Craigslist, and relevant Reddit forums. Journalists were contacted through professional email lists and direct messages on LinkedIn.

Table 7 summarizes the demographic characteristics of both groups. The immigrant participants (N = 11) ranged in age from 18 to 61 and included 7 men and 4 women from diverse national backgrounds, including Ethiopia, India, Vietnam, Hong Kong, and mainland China. Most had lived in the United States for fewer than five years, with a small number having longer residency. Their employment statuses varied, including students, full-time workers, freelancers, and retirees. Participants also reported varying levels of familiarity and engagement with AI technologies in their daily lives.

The journalist participants (N = 7) were all female (7 women) and ranged in age from 24 to 41. They held a range of professional roles, including video editor, digital media specialist, audience analyst, and senior producer. Across participants, AI tools were routinely integrated into their workflows. Common uses included information search and verification (e.g., GPT, Claude, Perplexity), content summarization (e.g., TLDR), brainstorming and idea generation (e.g., headlines, research directions), and language support such as grammar checking and proofreading. Several participants also used AI for technical tasks, including coding assistance, transcription and captioning (e.g., embedded tools in Adobe Premiere), and creative production such as digital illustration.

Table 7: The research process consists of three successive phases.

| Immigrant Readers |     |        |                   |                      |                   | Journalists |     |        |                                        |
|-------------------|-----|--------|-------------------|----------------------|-------------------|-------------|-----|--------|----------------------------------------|
| ID                | Age | Gender | Country of Origin | Years of Immigration | Employment Status | ID          | Age | Gender | Featured Experiences Besides Reporting |
| I-1               | 18  | Male   | Ethiopia          | <5 years             | Student           | J-1         | 24  | Female | Virtual set producer                   |
| I-2               | 18  | Male   | Ethiopia          | <5 years             | Student           | J-2         | 34  | Female | Digital media specialist               |
| I-3               | 18  | Female | Ethiopia          | <5 years             | Student           | J-3*        | 28  | Female | Media and audience analyst             |
| I-4               | 26  | Male   | India             | <5 years             | Full-time         | J-4         | 24  | Female | Video editor                           |
| I-5               | 28  | Female | India             | <5 years             | Student           | J-5         | 41  | Female | Senior producer                        |
| I-6               | 26  | Male   | India             | <5 years             | Student           | J-6         | 35  | Female | Digital media producer                 |
| I-7               | 25  | Male   | Vietnam           | <5 years             | Full-time         | J-7         | 37  | Female | Senior digital content producer        |
| I-8               | 27  | Male   | Vietnam           | <5 years             | Full-time         |             |     |        |                                        |
| I-9               | 28  | Female | Hong Kong         | 5–10 yrs             | Full-time         |             |     |        |                                        |
| I-10              | 40  | Male   | Mainland China    | >15 years            | Freelance         |             |     |        |                                        |
| I-11              | 61  | Female | Mainland China    | <5 years             | Retired           |             |     |        |                                        |

\*Note: J-3 participated only in the big group session under Activity Set Two.

### 5.3.2 Co-design process consisting of interlinked activities

#### Onboarding sessions

We arranged an onboarding session with every participant, either in person or over Zoom, depending on the participant's preference. Following practices in other co-design work (e.g., [105, 116, 326]), having this step prior to the formal research activities helped establish rapport with participants, and also supported their expectation setting and understanding of upcoming activities.

In these sessions, the lead researcher introduced our research team, provided an overview of the project, and then conducted the consent process with participants. Afterward, the researcher probed each immigrant reader to describe their daily news habits and technology usage; each journalist had a similar conversation with the researcher about their overall work routine in the news industry. The researcher took notes to document useful information to understand the person's background and prepare later activity plans. Each participant also completed a demographic survey before leaving. The onboarding session took about 1 hour on average.

#### Activity set one: “news on my radar”

Through this set of activities, we aimed to explore the relationship between values prioritized by immigrant readers and those emphasized by journalists (RQ1). We arranged two sub-activities, drawing on prior co-design research that highlights the benefit of having participants bring personal objects from daily life to spark narrative exchanges [54, 56, 76, 228, 299].

For the first sub-activity, each immigrant reader was tasked to keep a one-week diary about their daily news practices. Specifically, we encouraged participants to take written

notes or screenshots of the news they attended to in life. Every two days, participants received an email from the research team prompting them to reflect on why they were drawn to the documented news and how they made sense of it. Participants were not required to share their diaries daily.

For the second sub-activity, we paired immigrant readers and journalists into in-person small groups based on shared availability. Most small groups consisted of 1 journalist and 2 immigrant readers, and one group included 1 journalist and 1 immigrant reader. During these small group sessions, immigrant readers shared their news diaries after anonymization steps assisted by the researcher. All participants in the same small group session then engage in bridge dialogue to distill insights from the sample news pieces and exchange thoughts. These insights could include, but were not limited to, commonalities and differences across news pieces, notable attributes of each news piece, and any elements that participants liked or disliked from reading the news piece. Each small group session lasted 1.5-2 hours on average. The researcher facilitated the entire activity. They audio-recorded the session with participants' permission.

### Activity set two: “news without barriers”

Through this set of activities, we engaged participants from both stakeholder groups in collectively envisioning future technology design that addresses immigrant readers' needs (RQ2). Again, we arranged two sub-activities on different days to best support our participants' transition into design ideation.

The first sub-activity occurred on the same day as each small group session under “News on My Radar.” In particular, we provided participants with LEGO sets, craft materials, and 3D-printed objects to replicate their daily news reading scenarios. Such hands-on experiences have been proven effective for quickly immersing participants in lived scenar-



Figure 5.2: Participants working on “News On My Radar” activities in small groups.

ios of their past experience (e.g., [119, 149, 269, 302]) and, in the context of our research, revealing representative challenges they encountered in news reading. This sub-activity took about 30-40 minutes per small group. The researcher audio-recorded participants’ scenario and challenge descriptions, and photographed those LEGO-constructed scenarios.

The second sub-activity happened one week later. During that transition week, the research team worked on preliminary analysis of data obtained from small group sessions. They also synthesized the materials — including narratives, sample news pieces, and photographs — that could best elicit participants’ design speculations at the upcoming big group session. The big group session involved all participants. In this session, they reviewed materials generated from the week before, shared their reactions on immigrant

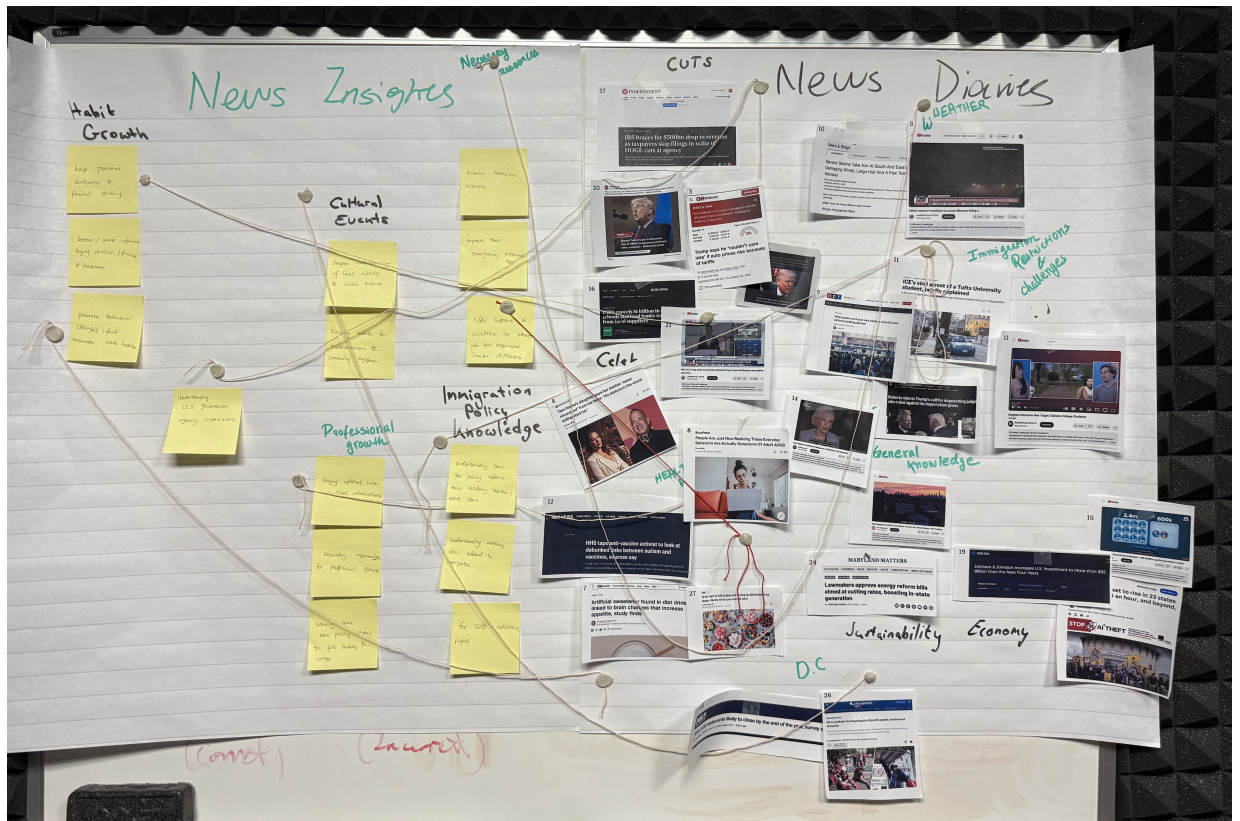


Figure 5.3: A map of news diaries and their insights emerged from the group activities of “News on My Radar.”

news reading challenges contextualized in those materials, discussed potential technological solutions, and detailed how their speculated technologies should function in relation to both immigrant readers and journalists. The big group session lasted about 6 hours in total. Multiple members of the research team joined to facilitate. They audio-recorded the session and collected design storyboards generated at the session for later analysis. No video recording was obtained, in line with participants’ requests.

Last, we reflect on our role as researchers and facilitators of the co-design process. Throughout the study, we intentionally sought to place both stakeholder groups on equal footing, while remaining attentive to well-documented challenges of co-design involving asymmetric relations [62, 210]. Power differentials, which stem from institutional author-





Figure 5.4: Example news reading scenario set up by participant.

ity, domain expertise, language proficiency, and epistemic privilege [270], were central considerations in shaping our methodological choices. To promote equitable participation, we scaffolded activities across multiple stages and created separate entry points: immigrant readers began with individual diaries and independently selected news articles to reinforce their agency over discussion topics. Participants could express diary reflections in their preferred language, and we provided 3D prints and LEGO materials to broaden opportunities for expression beyond English verbalization. These strategies helped lower barriers to voice.

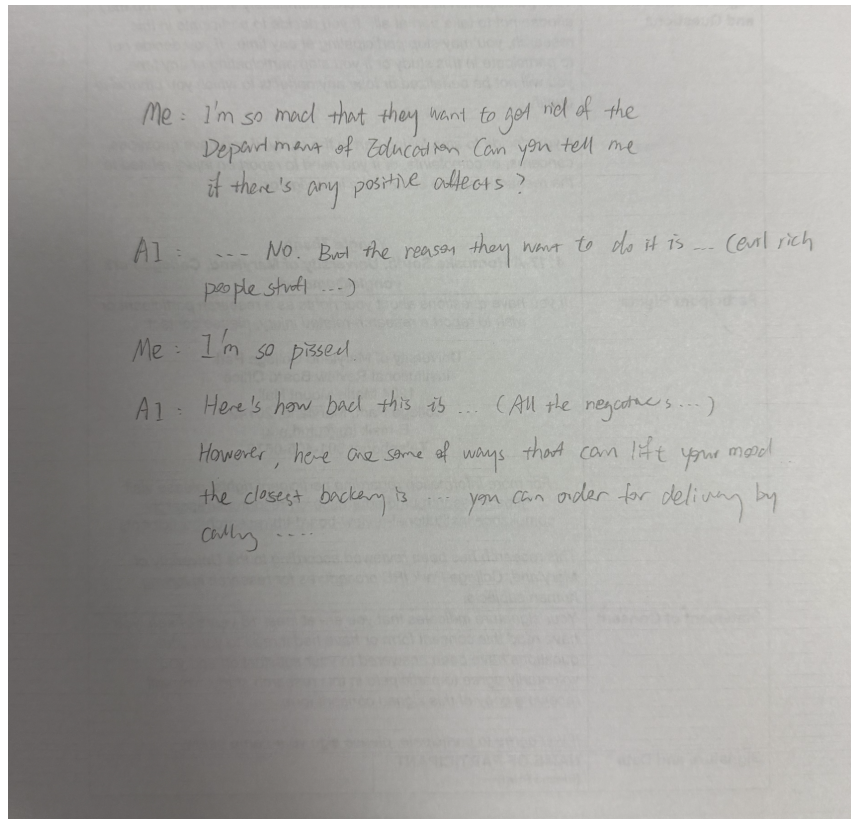


Figure 5.5: Example of participant's chat log with an imagined news AI.

### 5.3.3 Data analysis

We followed the guidance of the thematic analysis method to examine our data inductively [37]. Following an iterative process, the first and last authors of this paper independently conducted open coding on an initial subset of the data to generate preliminary codes. The two people then met to discuss these codes, resolve discrepancies, and apply shared understandings to the coding of the next batch of data. They continuously compared codes across individuals, groups, and activities to identify recurrent concepts and emerging relationships. A third external reviewer was invited to review our codes and the themes connecting them, which helped ensure the rigor and credibility of our analysis. This cycle of coding, comparison, and refinement continued until no new conceptual insights emerged.





Figure 5.6: Group discussions in “News Without Barriers.”

The final coding structure was organized hierarchically into themes, axial codes, and open codes. For immigrant participants, we identified four overarching themes: (A) news consumption ecosystem, (B) evaluation and trust frameworks, (C) sensemaking practices, and (D) barriers and AI-mediated workarounds. These themes capture how participants encounter and engage with news, assess credibility, relate information to their personal contexts, and navigate challenges through the use of AI tools.

For journalist participants, four themes emerged: (A) news production ecosystem, (B) professional standards, (C) audience-oriented sensemaking, and (D) perspectives on AI integration. These themes reflect the structural, normative, and audience-centered dimensions of journalistic work, as well as emerging attitudes toward AI-supported production.

Across both groups, each theme was further elaborated through multiple axial codes and associated open codes, allowing us to capture both high-level patterns and nuanced practices. The full coding scheme, including representative codes and examples, is provided in Appendix B.0.7.

The following section presents findings synthesized from the co-design.

## 5.4 Findings

The co-design activities with our participants, followed by careful analysis of their data, yielded inspiring insights into enhancing reader-oriented news experiences. The remainder of this section presents our primary findings concerning two aspects. We begin by comparing the fundamental assumptions held by journalists and immigrant readers regarding what’s valued in news production and what immigrants demand from news reading, respectively (RQ1). Data of activity set one contribute to our findings of RQ1. We then describe representative challenges highlighted by immigrant readers. For each challenge, we synthesize participants’ visions of how conversational AI agents may help enhance the news experiences of immigrant readers, often through coordination with journalists in specific ways (RQ2). Data of activity set two contribute to our findings of RQ2.

For clarity of presentation, we use italics within quotation marks to indicate exact excerpts from our participants’ self-reports. We also assign corresponding icons to differentiate segments of findings by how they relate to each stakeholder group:  marks alignments across journalists and immigrant readers;  alone indicates what applies primarily to journalists but not to immigrant readers; and  alone for vice versa.

#### 5.4.1 News matters but how: (mis)alignments between journalists and immigrant readers

While all participants considered mainstream news an essential venue connecting people with the society they live in, the narratives they shared revealed clear alignments and misalignments between the two stakeholder groups. Through inductive analysis of their self-donated reflections and news materials, we identify three sets of (mis)alignments with respect to news topic selection, news content presentation, and news information processing. These findings were primarily derived from participants' exchanges during the "News on My Radar" activities. They provide essential knowledge that underpins our planning for, and insight extraction from, the "News Without Barrier" activities.

Drivers of topic selection among all options.

 **Popularity attracts attention.** We invited journalists and immigrant readers to join small group sessions, reviewing all the news pieces collected in the latter's one-week diary. This part of the activity naturally prompted participants in the same session to discuss why certain topics were frequently featured in news stories, while others were not. A shared view, repeatedly mentioned across all small groups, was that news is part of today's attention economy; it thrives on the public's interest.

Topics that represent "*trends in the pop culture here*" and/or "*cared by most people [in this society]*" were thus strongly valued in both the production and the consumption of news. For journalists, reports about famous public figures, sports events, or gasoline price changes in the U.S. are almost always good choices for writing up a news article because "*they attract more views, and more views mean more revenue, which is a must for news as*

*a business.*” Such reports also received substantial coverage in our immigrant participants’ news diaries — not always because immigrants held a genuine interest in those public figures or events, but more for the purpose of social learning and adaptation. As many immigrant readers in our study explicitly pointed out, *“following what’s at the center of attention of the local majority is very important [because] it prepares us to adapt to this society.”*

 ***“Because it is news.”*** Satisfying popularity alone will not explain all the topic selections made on the news production side. Another parallel value driving journalists’ choices is to provide the public with *“what they should be aware of.”* Following this value sometimes requires a journalist to argue strongly for their proposed topics to be approved by editors. For instance, groundwater contamination in the U.S. is considered an issue of civic value by many journalists and news outlets; however, most people may not want to read about it when other options are available. J-6 shared her thoughts on why advocating for these *“hard topics”* matters for journalism as a profession. This sentiment was echoed by other journalists among our participants as well:

*“News is not all about pleasing the public, although that’s apparently important. When we studied journalism, we were taught that news carries social responsibility. The saying goes, ‘when there is no news, it is good news.’ It means not everything we cover will be pleasant to read. Still, we covered it because it is news.” [J-6]*

 ***“It is likely to affect immigrants.”*** Our immigrant participants also possess other rules of thumb that guide their selection of news topics to read. The dominant one considers the extent to which a given topic relates to the immigrant group. To our surprise, we noticed a clear emphasis on civic rights in immigrant readers’ reflections on their own news reading; this challenges the impression we previously formed during literature search, which

primarily discussed immigrants' instrumental needs. Participants at our research sessions reported paying close attention to sustaining their “*opportunities for self-advocacy*,” “*political well-being*,” and “*freedom of speech*” in this country. That said, because immigrants are not the target audience of most mainstream news, they often have to spend extra effort investigating the exact connections between a news piece and themselves. As explained by I-9:

*“The political environments surrounding immigrants and citizens are different even though [we live] in the same country. We want to think twice about news updates on employment, healthcare, education, and so on. Some of these updates can mean different things to us, like how I can protect my rights [in those domains] or how I can contribute. Most news won’t directly talk about this, and most readers won’t care, but will it affect immigrants?” [I-9]*

## Strategies of content presentation for sensemaking.

 ***Credibility comes before everything else.*** As participants reviewed news pieces documented in the immigrant participants' diaries, they occasionally asked each other questions such as “*Does this content make sense to you?*” and “*Why is this news written in this way?*” A second theme emerging from these bridge dialogues concerns what each stakeholder group values in news content presentation. Credibility appears to be a common, foundational requirement underscored by both journalists and immigrant readers.

This emphasis on being credible is closely connected with participants' daily exposure to society-wide discussions on “*misinformation*” and “*fake news*.” For journalists, stating traceable facts to support claims and opinions has become today's default norm of reputable news practice. The rise of digital media equips them with convenient tools, especially in-

text hyperlinks and embedded screenshots, to clarify essential information sources. The same mindset is adopted by news readers as well. When quoted information is linked back to the original source, immigrant readers interpreted it as *“a good indicator of high-quality content that I can trust.”* Several participants also added that they sometimes manually check whether the same information and its sources were mentioned across multiple news outlets. To them, *“if the presentation of a news piece allows easy cross-verification, we build quick trust in the news content.”*

 ***“Be careful with sensational expressions.”*** Admitting the necessity of ensuring credibility, multiple journalists made this insightful comment that having credible content *“does not mean the news report is non-leading or neutral.”* Rather, any content can be presented with sensational language; that is, expressions that are emotionally appealing and reaction-provoking. The effects of such a presentation strategy may go both ways. When used appropriately, sensational language enhances a journalist’s ability to capture readers’ attention on urgent matters. On the flipside, it can also be utilized as a technique to *“fabricate clickbait”* and to *“make credible or traceable information serve an idea the reporter is pushing.”* J-7 elaborated on this latter point by referring to some news pieces in immigrant participants’ diaries:

*“Here, the title says, ‘Will DOGE layoffs even make a dent?’ or ‘As tariffs cause chaos...’. The news article does provide data and cases with sources in its content, but the title indicates an attitude. It leads readers to interpret those data in certain ways. ... In practice, I think no news can be 100% objective or bias free. But we are trained to be very careful in choosing the way to present [the content], [and] to be careful with [being] sensational.” [J-7]*

 ***“What’s put in a rich context wins out.”*** While journalists’ caution against sensational presentation is understandable to immigrant readers, we did not hear them initiate

much reflection on this exact point. In fact, a few immigrant participants explicitly stated that they “*are not sensitive to the connotation of those adjectives and expressions in English*” because it is in their second language. For these individuals, what makes their news reading effort payoff is not scrutinizing the tacit meaning behind certain language styles, but rather encountering the news in a rich context that facilitates sensemaking. This value is clearly reflected in the coverage of video-based news pieces among immigrant participants’ diaries. Many were created by individual YouTubers or TikTokers. The video usually includes a grassroots “*reporter*” who describes recent news by connecting the immediate event to its broader social contexts, as well as by grounding the narratives in the person’s own lived experiences. I-11 explained what he appreciated about such videos, in a way that mirrors the perspectives of other immigrant participants:

*“I am following many YouTubers, some in English and some in other languages [I speak]. Part of the routine of their channels is to talk about local news featured in U.S. mainstream medias. Their content is a mixture of describing the news, usually with [explanations on] where the issue originates from or the local context I didn’t really know, and adding their own comments on it. It’s very easy for me to resonate [with the news] this way, or to just stay cool about it ... because I can easily tell how much this news overlaps with things I know.” [I-11]*

Levels of information processing with constraints.

 **Optimization for constraints.** Last but not least, conversations at all small group sessions continuously reminded all participants that news reading in today’s information world “*is always constrained.*” Such constraints may stem from a person’s intermittent availabil-

ity, limited cognitive resources outside daily work, lack of ubiquitous access to big-screen devices, or some combination of these. Participants from both stakeholder groups found it is unrealistic to expect people to “*do very in-depth processing*” or “*digest many details*” when engaging with news at most moments of the day, if at all. Journalists repeatedly mentioned that a major decision they face on the production side is how to “*optimize the amount of information going into a news piece.*” This aligns with shared views among our immigrant participants, who noted that “*it’s easy to just browse for a main idea, but any steps beyond that take up time.*”

 **“Take things out, or people won’t read it.”** To adapt to those constraints, journalists often choose to include only a subset of the whole information they have gathered during behind-the-scenes investigations. Participants described the specific criteria determining what is filtered in or out as “*highly dependent.*” Nevertheless, some common heuristics were reported by more than one person, such as the one J-2 pointed out:

*“I always do a lot of research — checking several databases, interviewing different people, [and] collecting all sorts of perspectives — when drafting my [news] article. But not all that will be included [in the published version]. From the very first journalism class, we were told to ‘always think about your audience.’ Especially, think of the audience like they are tired engineers who come back home after a long day, sit on the couch, and open a newspaper, or turn on the TV, or get on social media. You do not want to give them an extra hard time.” [J-2]*

 **“One piece of information at a time.”** Somewhat in deviation from journalists’ assumptions, our immigrant participants all believed that they are able to manage complex information processing despite limitations in availability and such. The solution, specifically, is to distribute their mental load by staging it across steps. A frequently mentioned



reading flow begins with “*scrolling through a list of news during breakfast or before bed for main ideas*,” followed by “*more serious reading or extended searching on what’s important when I’m more free*.” All immigrant participants also reported that they had tried using AI to assist this reading flow, similar to how they leveraged AI to process bulky documents at work. As I-5 reported:

*“Sometimes I see news that I’m curious to know more about but don’t have time [for deep reading] immediately. I just copy and paste the entire thing into GPT or similar tools and get a summary. It gives me a quick sense on whether I should remember to read [anything in this news] more carefully later. . . . When I want to do extended reading [beyond the given news content], I use GPT to get recommendations too.” [I-5]*

***In sum***, our findings above suggest that journalists and immigrant readers do not always align in their views regarding what is valued in the production versus the consumption of mainstream news. While journalists strived for careful gatekeeping grounded in their professional training, immigrants place greater emphasis on situating news reading within their everyday lives — lives that often feature their unique social statuses in the society, varying levels of familiarity with the local culture, and distinctive rhythms or paces of reading in the majority language.

#### 5.4.2 Co-designed metaphors for conversational AI agents in challenging news scenarios

The bridge dialogues in the “News on My Radar” activities consolidate the ground for both stakeholder groups to delve into the most salient issues raised by our immigrant participants, and to collectively envision solutions. Our data analysis, primarily based on the “News Without Barrier” activities, identified four representative challenges described by

immigrant readers. For each challenge, participants envisioned a specific form of coordination connecting technology, immigrant readers, and journalists. Across these exchanges, technology consistently emerged as conversational AI agents, which, in our view, reflects the pervasive influence of ChatGPT and similar tools in contemporary everyday life. We structured our findings around the four metaphors of agent design synthesized through the analysis. While these design metaphors are presented in a linear order, participants did not rank any as more pressing than the others.

### The data decoder

Given their often-limited fluency in the society's local cultures as well as the majority language, immigrant readers identified numerical data cited in news reports as their best entry point for making sense of the news. They described such data as "*more accessible*" and "*more objective*" than verbal descriptions. Many further commented that reading numbers exempts them from the comprehension challenges posed by local references and idioms, which they have frequently encountered in mainstream news.

However, just like verbal expressions can be written in sensational ways, numerical data may also be framed to contain meanings beyond the numbers themselves. Our immigrant participants were acutely aware of this latter point. One challenge discussed extensively at the big group sessions was how to enhance readers' decoding of the data cited in news reports. We detail the thoughts exchanged between stakeholder groups in the context of a news piece that they frequently referred to for grounding their discussion. The news piece stated, "*Survey shows 40% of D.C. restaurants are likely to close by the end of the year,*" and it used this data to support the claim that the D.C. area was experiencing severe financial distress due to rising supply costs and unemployment. Immigrant readers envisioned that a conversational AI agent could act as a data decoder, assisting them in delving into

the source dataset from which this “40%” originated. Journalists also contributed to this discussion, with particular reflections on how the speculated reader-agent interaction may mirror their own investigative work with data during news production.

 ***Immigrant-agent conversations to interpret data in news.*** News articles today, especially those published by reputable outlets, often include hyperlinks or notes specifying the source of the data they cite. But immigrant readers want more than just a link. The following excerpt of their technology ideation at big group sessions offers a closer look into what our immigrant participants hoped the AI agent could communicate with them:

*“I-6: I definitely want to know more about where the source dataset is. AI can tell us more [about that dataset], but I want to make sure it does not just summarize. We don’t want important details to be missing.*

*I-4: Right. We don’t want AI to just provide an overall image. For example, if there were 200 restaurants surveyed here and 40% of them are closing, that would mean 80 restaurants. I don’t think D.C. only has 200 restaurants. It seems low. So, can AI tell me what defines ‘a restaurant’ here?*

*I-8: Yeah, it’s about how they sampled. We want a clearer picture. If there are actually 2,000 restaurants in total, that means something totally different [from what the current news means].*

*I-4: Also, what type of restaurants are these? Maybe they serve a food that’s no longer in demand. Food habits change. If the survey was done by a public association, they may provide more details [in the source dataset]. The AI can point us to that for a more complete image of the D.C.’s restaurant ecosystem.”*

The central idea underneath this conversation, and in others like it, was that the AI agent should help immigrant readers better understand the nature of the source dataset. All immigrant participants agreed on three essential aspects in this regard: size of the data,

composition, and sampling strategy. They wanted explanations not just about the source dataset referenced in the news article, but also about other comparable sources that the AI agent could identify in its own knowledge base or through external search. In addition, several immigrant participants underscored the importance of historical trends in interpreting numbers. As explained by I-1:

*“It always requires context to know whether a number is big or small, like the 40% of restaurant closing, or the \$25 billion investment said in another [news piece]. Are those a lot? Are they significant changes? It would be useful to know how the same thing was like in the past, if there are some records about it.” [I-1]*

 **Journalist for curated evidence, AI for open examination.** The assistance that immigrant readers seek from talking to an AI agent reminds journalists of their own use of AI in curating news content, including the data being cited. Journalists noted that commercial tool, such as ChatGPT, are already part of their practice for identifying “*candidate datasets to study*” during news production. That said, they all strongly objected to the idea of relying on AI without personally reviewing the datasets.

For these journalists, human oversight must accompany every single number cited in news, since “*most news articles do not have the room for many numbers, and that makes those few numbers [going into the article] carry a lot of weight.*” They explained why it could be risky to let an AI agent interpret numbers, and the source datasets behind them, entirely on behalf of people. J-2 and J-1, for instance, shared with immigrant participants the roots of their concerns about AI:

*“AI can surely talk to people and answer their questions about the data. What worries me, though, is which perspectives will get highlighted in those responses and the hidden choices behind them. There are articles published*

*by the Atlantic Council, talking about how thousands of propaganda messages were produced with malicious purposes. AI tools were using that information in their training and ended up spreading that propaganda. Most people won't be aware this is happening. AI may have a lot of power over what people think."* [J-2]

*"It makes sense to explore the data with AI. But you want to make sure that's explored are facts, not explanations of 'why this reporter cited this data but not the other.' Reporters usually have looked into different datasets, and we sometimes have data teams working with us too, to choose the right data to include. We may leave out some data because it's sponsored by institutes with specific perspectives, or it's hard to verify under time pressure. There can be many valid reasons. But AI may just speculate, 'because this report is biased.' Then it confuses readers rather than clarifying the meanings. "* [J-1]

Through all these exchanges, immigrant readers and journalists converge on a future scenario, where a conversational AI agent serves as a **data decoder** in coordination with human stakeholders. In this arrangement, an immigrant reader initiates their conversation with the AI agent to request factual descriptions about a source dataset related to the news they read. The AI agent answers the reader's questions while also detailing steps the reader can take to verify each answer themselves. Part of the new report's metadata contains notes produced and authorized by the journalist. These notes do not appear in the published article, but the AI agent can access them to prepare for "*why-questions*" raised by the reader, such as "*What makes the referred data a more valid choice for this news piece?*" In this way, the journalist and the AI agent combine their strengths in explaining already-curated evidence and enabling more open examination, respectively, to help immigrant readers decode the meanings behind data in news.

## The connection informer

With sufficient content comprehension, immigrant participants are eager to grasp the real-world implications of a news piece. In particular, they shared prior experience of encountering news that suggested incoming, high-stakes adjustments to their everyday lives, such as “*care pathway updates during COVID*” or “*job market shifts over the last year.*” As individuals who must navigate a different set of regulations in healthcare, employment, education, and many other areas compared to local citizens, they constantly wonder, “*Am I taking the right actions in light of what the news just said?*”

There is, unfortunately, no easy answer to this question in most cases. Several immigrant participants described the difficulty with the notion of “*dominoes*”: the news signals that some changes will bring consequences for immigrants down the line, but “*nobody outlines a concrete connection to you until it’s already late.*” A substantial portion of the big group discussions focused on this challenge. In the same format of the previous section, we synthesize design ideas exchanged between stakeholder groups in a frequently cited context: U.S. mainstream news about taxes. Immigrant readers speculated that a conversational AI agent could serve as a connection informer, highlighting connections between tax-related administrative updates and actions they might need to take in life. Their thoughts prompted journalists’ reflections on the inherent “*popularity-inclusivity*” tension within societies characterized by diverse populations.

 ***Immigrant-agent conversations to locate self-connections.*** The conversations our immigrant participants envisioned with an AI agent closely resemble existing interactions between users and ChatGPT. Key steps in this interaction included an immigrant reader providing the URL of a news piece, or URLs of multiple news pieces they considered related, and asking the AI agent to specify what the news meant for them in actionable terms. The difficulty, in their view, was not obtaining a response, but obtaining one that was

adaptive to the reader's immigrant status and included calibrations based on their personal circumstances.

Most immigrant participants initially suggested setting up a personal profile when using the AI agent. This profile would contain basic demographic information, similar to a Facebook profile, allowing content to be curated for the person's interests and needs. However, debate soon arose about how personal such disclosure would need to be:

*"I-8: If we want the AI to fully assist us, it's better to provide detailed information [about ourselves].*

*I-7: So, for this news example, "DOGE plans to downsize the IRS (Internal Revenue Service) by nearly 20% ahead of tax filing season," I want to know what it means for my tax filing. I can ask AI to tell me the amount of tax I need to pay, and what consequences [will happen] if I missed anything in the current situation.*

*I-2: Then I need to tell the AI my location, immigration status, and also my income and family situation?*

*I-7: Yes, that helps, and it's all sensitive information.*

*I-2: I have mixed feelings. I think personalization is good, but there are limits at some point.*

*I-5: Of course. I understand not everyone is comfortable with that. Our information may be leaked."*

As demonstrated above, our immigrant participants were hesitant about the price of receiving personalized, action-oriented exchanges with the AI agent. Their adjusted idea, therefore, was to ensure the AI agent would run locally whenever a person sought to understand self-referential connections to the news content. This way, immigrant readers still receive actionable guidance without exposing sensitive information to a public server.

When this idea was communicated to journalists, it was refined further. A recurring question from journalists was, “*Are you sure the agent’s responses are really the guidance you can follow?*” Different from explaining the composition of a dataset, which is largely fact-based and immediately verifiable, connecting a news report with an immigrant reader’s life actions can often be “*interpretive rather than conclusive.*” Journalists worried that AI might generate misleading responses to such inquiries, despite its ability to provide seemingly reasonable rationales.

During this part of the discussion, participants recalled that one information piece previously shared in immigrant participants’ diaries was a TikTokker telling his audience: “*You can skip tax filing next season because the IRS will soon be understaffed.*” All participants felt alarmed at the prospect of an AI agent generating similar misleading responses. After careful consideration, immigrant readers decided to frame their envisioned AI agent as a connection informer, which underscores the agent’s limited accountability in providing action suggestions to people. As I-5 elaborated:

*“We can make this AI agent more like someone I talk to for seeing a list of possibilities, but not take those [responses] as absolute facts or guidance to follow. Instead, we think about it, collect other information, and make our own decisions. . . Also, it’s helpful to let this agent always speak to us with a disclaimer, saying that its responses are just suggestions and it strongly encourages [an immigrant to] double-check before acting on them.” [I-5]*

 **Journalist for verified implications, AI for swift initiation.** The big group discussion with immigrant readers provoked journalists’ reflections on the arguably “*vacuum space*” within their news practice: immigrant lives and perspectives are frequently missing from mainstream narratives; thus, the self-news connections outlined by an AI agent hold unique value, even though they must be interpreted with caution. All journalists em-



phasized that providing accountable interpretations is ultimately “*a human responsibility*.” To this end, the idea of working with an AI-powered connection informer may also help improve coverage of immigrants’ needs from the news production side.

Some journalists introduced a case from the COVID pandemic in the U.S., which revealed a similar “*popularity-inclusivity*” tension in their work, though under a different context. Specifically, mask wearing for health protection was a heated news topic during the pandemic. One news article that left a lasting impression on our participants asked, “*How do African Americans feel about wearing masks?*” It surfaced important insights overlooked by the majority. — For example, many African Americans reported feeling racially profiled more often because of masks; police officers might see a Black man in a mask and assume he was “*up to no good*.” By describing this case, journalists explained that, even with a genuine willingness to make news content inclusive, “*the connections with someone not like myself don’t always immediately click*” because people live through different experiences. Pre-discussions with an AI agent could quickly surface audience diversity to a journalist’s attention. When possible, the journalist could proceed to produce a complete news report that elaborates on the information needs of a specific audience group. As J-4 speculated:

*“If I were to use the AI agent in the newsroom, I might already have a topic focus but want different angles representing different groups of audience. I would discuss that topic with the agent, and keep digging into the suggestions it gives me until I find something newsworthy. Then, to confirm if that angle is really valid to the specific group, I must do my own research with that community. This will ensure I cover their perspectives professionally and accountably. ”*

[J-4]

As these discussions continued, participants from both stakeholder groups arrived at a

future scenario, where a conversational AI agent acts as a **connection informer** in coordination with human stakeholders. This AI agent would run locally on an immigrant reader's device. It informs the reader, offering disclaimers, about potential connections between a given news piece and possible life actions to take. With the reader's permission, the AI agent summarizes the types of connections it had discussed with the reader and shares anonymized metadata with news outlets. By taking this latter step, the journalist would gain insights into immigrant-specific inquiries about recent news, along with any tentative implications already surfaced by the AI agent. They could then choose to investigate and produce follow-up news articles on the same topic, providing verified implications for the benefit of immigrant readers.

### The empathetic friend

News reading triggers emotions. For immigrant readers, the emotions associated with mainstream news were largely negative, at least during the period of our research. Immigration policies underwent updates, disputes over U.S. international trade tariffs continued, and layoffs at big tech companies occurred. Participants found themselves feeling “*stressed*,” “*unpleasant*,” and “*worried*” when following such news.

Yet they did not have the luxury of disengaging. Hard truths still conveyed information that immigrant readers needed to know. Many immigrant participants explicitly stated that they “*have to accept it even if the news just comes and slaps [them]*.” Others admitted that they had thought about avoiding negative news, but soon realized they “*couldn't afford not knowing it*.” Their reflections flagged the following challenge during the big group discussion: Can news be presented with more empathy so that it is less emotionally taxing to consume? Immigrant readers envisioned that a conversational AI agent could behave as an empathetic friend, easing their feelings by adjusting the presentation of given content in

various ways. While journalists shared enthusiasm for this idea, they reminded immigrant participants that it would be dangerous to make serious news content overly trivialized.

 ***Immigrant-agent conversations to experience empathy.*** We received two top-voted ideas from immigrant participants on how they would like to experience empathy through conversations with the AI agent, thereby restoring mental energy to keep up with hard news. One idea was grounded in people's common practice of browsing a list of news at once rather than delving abruptly into one single piece. When an immigrant communicates to the AI agent that they felt anxious after browsing immigrant-unfriendly content, the AI agent could respond, *"I understand your feelings, and I want you to know that there are also positive changes around you."* In the following turns, the AI agent would guide this person toward news pieces carrying positive sentiments and discuss their meanings with the person. These purposeful combinations would enable immigrant readers to experience a more balanced set of emotions.

The other idea involves altering the presentation of the original news piece directly. Inspired by the fact that AI systems today are good at transferring the style of given content or converting texts to visuals, multiple immigrant participants imagined that the AI agent could pre-process news pieces relevant to immigrants but containing emotionally taxing content. When an immigrant communicated with the AI agent, the agent could deliver the news content in non-textual formats, for instance, *"with stories demonstrated by cute cartoon characters"* and *"with humorous narratives."* Some immigrant participants also specified that the AI-reworked format might mimic the style of satirical news shows in the U.S., such as The Daily Show or Last Week Tonight with John Oliver. As I-1 explained:

*"For news that can deeply affect immigrants, I would prefer having technology to help me understand it in a way that does not hurt [me]. I think fun cartoons or comedy shows are good, like when there are two characters speaking. That*

*way you can understand what happened, but you won't feel [as] unease. It won't make you enjoy what's happening [as described in the news], but it would make you feel better.” [I-1]*

 **Journalist for communicating facts, AI for comforting feelings.** As much as journalists agreed with the AI agent's promise underlying both ideas, they were seriously concerned with the second one. The following reactions from J-5 and J-3, respectively, captured the common ground among all journalists in this part of the big group discussion:

*“I like watching satirical news shows too. Constantly reading negative news in the traditional format can be disheartening, I agree. But those shows make news more palatable only after people have already engaged with the serious content. I wouldn't recommend using them to replace the serious content.” [J-5]*

*“[Presenting news content with] cartoons or characters in comics is really interesting and engaging. But to what extent does it cover the full picture? That's not enough [for news readers] to fully understand the news story. So, for me, I think people still need to click into the original news to get a full understanding... I would criticize that being too creative with the format means you are very likely to simplify the content itself. If people get used to this, they may not be able to read serious news anymore.” [J-3]*

Considering views across both stakeholder groups, our participants outlined a future scenario, where a conversational AI agent acts as an **empathic friend** attending to immigrant readers' needs. In this scenario, an immigrant reader seeks help from the AI agent after encountering U.S. mainstream news that indicates negative consequences for immigrants living in the country. The AI agent would express empathy with the reader, and

then comfort them by introducing other news pieces about constructive changes or favorable events. The agent might also recommend relaxing background music to accompany this immigrant’s news reading; however, it would not rework any content produced by the journalist in their original news report.

## The trajectory witness

As our participants reached the end of our big group session, the challenge at the center of their discussions gradually shifted from “*how immigrants can read each news piece more effectively*” toward “*how immigrants can become wiser news readers themselves.*” We interpret this insightful shift as a consequence of the prior exchanges described under the other three metaphors. Specifically, participants began to reflect on the issue of personal agency after outlining each metaphor, noting that “*I hope we can still make sure our brains are not going to be robbed by depending on AI too much,*” and “*it feels complicated when we propose using AI to help adjust human emotions from news reading.*” These reflections set the stage for their proposal of the last design metaphor: the AI agent as a trajectory witness, enabling immigrant readers’ awareness, review, and analysis of their own news consumption over time. Although the remaining time in the session was not sufficient for extensive exchanges on this point, participants spent it well by generating the following thoughts.

 ***Immigrant-agent conversations to reflect on past trajectories.*** Conversations with the AI agent, as envisioned by immigrant readers under the other three metaphors, contain valuable and comprehensive information about their own news reading patterns and habits. These past records were viewed as these individuals’ best tool to learn about themselves and, more importantly, for planning future steps toward “*[being] more sophisticated.*” Immigrant participants mentioned several ways in which they would want the AI

agent to analyze their news reading records, including by topical categories, by perspectives (e.g., left-wing, right-wing, or mixed), by presentation styles, and by types of questions they had raised. Several named additional analytic angles they considered important but discussed among others, such as whether the person had followed a series of reports on the same topic, or whether they had been drawn to news reports written by specific journalists.

 **Journalist for guiding principles, AI for assistive practices.** Building on the above thoughts, journalists saw potential in using such an AI agent to cultivate immigrants' literacy in consuming mainstream news. The central idea, albeit lacking many details, was to “*add a bit more structure*” to reader-agent interactions by incorporating guidance rooted in journalists' professional knowledge. As J-1 emphasized:

*“It would be cool if the agent can help immigrants understand the process of how news is produced, like what journalists value during the process, and why we may highlight one thing [in the news content] but not another. Then, if they want to, they can adopt similar logic [when reviewing their own news behaviors], and it can build [their] trust in news, especially in today’s world with so much misinformation. . . I think this would require journalists to work with people who build this AI.” [J-1]*

The aforementioned exchanges point to a future scenario in which a conversational AI agent serves immigrant readers as their **trajectory witness**. In this arrangement, the AI agent can walk an immigrant reader through their news reading records by drawing on past conversations with them. It assists in analytical retrospection, allowing this person to explore their news reading patterns along dimensions guided by professional principles as well as in aspects nominated by themselves. Through these practices, immigrant readers would be better equipped to consume mainstream news in their country of residence with enhanced literacy and personal agency.

*Together*, the four design metaphors portray distinct ways in which technology — particularly conversational AI agents — may contribute to enhancing reader-oriented experiences for immigrants. All of these metaphors underscore a coordinating relationship between journalists and AI agents in jointly addressing the immigrant readers’ needs; meanwhile, they also demonstrate important differences in how the roles served by each party are connected.

## 5.5 Follow-up Study with Technology Experts

To further examine the technical implications of the design directions that emerged from the main study, I conducted a small follow-up study with technology experts. As key stakeholders in the news ecosystem, chatbot developers and technical specialists shape the architecture, programming, and natural language processing capabilities of news AI systems. Their perspectives differ from those of journalists, whose primary concerns focus on editorial goals, newsroom workflows, and audience engagement. Prior work comparing these viewpoints—such as Jones and Jones’ study of media professionals and technical developers—shows that while developers prioritize system performance (2019), journalists emphasize communicative value and user impact. This literature also highlights the lack of comprehensive metrics for evaluating chatbots’ value to the public, as traditional measures like reach or clicks often fail to reflect users’ comprehension or engagement.

Building on these insights, I conducted a preliminary follow-up study to explore how technical experts interpret the design considerations identified in my main study. I recruited participants through computer science departmental mailing lists and word-of-mouth referrals. By November 24, 2025, five participants (T1–T5) with backgrounds in NLP, recommender systems, and computational social science were enrolled. Each took part in a 40 to 60-minute online interview. The interviews covered participants’ technical background,

recent projects, connections to the news domain, and reflections on the design ideas derived from the main study (see Appendix for the protocol). All interviews were transcribed and analyzed thematically.

## Chatbot data as an enabler of more nuanced news–reader interaction

Participants viewed chatbot interaction logs as a valuable and underused data source for understanding how people interpret and engage with news. Unlike click-based metrics, conversational data reveals users’ questions, uncertainties, and reasoning processes, offering richer signals for modeling preferences and concerns. Participants noted that such data lowers the barrier to designing news recommendation systems by making users’ information needs more observable.

They emphasized that chatbot exchanges surface subjective and contextual cues often absent from standard datasets. As T5 (computational social scientist) described, conversational traces provide “*tiny windows into how people think through news,*” enabling systems to “*meet users where they are, not just where the clicks say they are.*” T3 (news recommender researcher) similarly highlighted how chat logs support more grounded personalization: “*The chatbot lets you see what the user is trying to make sense of... that’s data we didn’t have before.*”

Across interviews, chatbot interaction data was therefore framed as both an informational resource and a methodological bridge—one that supports more nuanced human–AI interactions and reduces the cost and complexity of building early-stage recommendation models.



## Designing agentic news systems: how to define metrics and how

Participants also described a significant methodological gap in evaluating AI-driven or agentic news systems. Unlike single-task domains (e.g., translation, summarization), news reading is a multi-layered activity that blends factual comprehension with emotional resonance, personal relevance, and contextual interpretation. This complexity makes standard benchmarking insufficient and raises foundational questions about what “good” performance means for agentic systems.

T2 (NLP and AI researcher) contrasted easily measurable dimensions—such as fluency or safety—with experiential qualities that matter to users but are difficult for AI to assess. He noted that systems struggle with “*things like empathy or relevance to someone’s actual situation,*” arguing that current models, trained on normative cultural data, cannot reliably evaluate these aspects, especially for multilingual or immigrant readers. T4 (NLP researcher) expanded on this by identifying a structural mismatch: while AI research focuses on narrow, task-specific metrics, real-world news engagement involves simultaneous informational, emotional, and interpretive efforts. As he put it, “*People aren’t just summarizing or translating—they’re trying to understand what this means for them, right now.*”

Together, these accounts underscore a core challenge: defining evaluation metrics that reflect the layered, subjective, and dynamic nature of news consumption.

## Requirements for accessing high-quality data

A recurrent theme across interviews concerned data quality, especially in annotation and model-training pipelines. Participants argued that building responsible news AI requires attention to cultural, contextual, and demographic nuances rather than treating language-based assumptions as sufficient.

Annotation quality and cultural representation. Several participants critiqued industry

practices in which annotators are selected based solely on language proficiency. T2 (NLP researcher) explained that this approach risks collapsing culturally distinct groups into a single category—*“They just pick annotators based on language and assume they represent the culture... Portuguese from Brazil and Portugal get treated as equivalent, but they are not.”* This mismatch is particularly problematic for systems intended to support immigrant readers, whose identities cannot be reduced to linguistic markers alone. Without culturally grounded annotation, evaluation pipelines risk reinforcing misinterpretations of user needs.

Model inputs and sensitive attributes. T3 (recommendation system researcher) described a parallel concern with LLM-based recommenders that rely on prompt-engineered user profiles. While summarizing user histories into attribute-rich prompts can improve accuracy, it can also amplify bias—especially as models become more sensitive to inferred user attributes. As he explained, *“Bigger models understand sensitive attributes very well... but in the same way they bias more.”* He noted that prompts often over-emphasize specific attributes, creating a paradox in which more capable models may generate more problematic recommendations.

Overall, participants framed high-quality data as a design requirement that extends beyond technical precision. It demands culturally informed annotation, careful handling of user attributes, and recognition that data practices deeply shape fairness, relevance, and usability in news AI.

## Connecting expert needs with findings from the main study

The perspectives shared by technical experts align closely with insights from journalists and immigrant readers in the formal study, offering complementary views on the same design challenges. For instance, in the Empathetic Friend design metaphor, immigrant readers described wanting emotional support without losing access to essential informa-

tion—highlighting a balance between comfort and accuracy. This example illustrates the design boundaries identified across both studies: news AI must be supportive without being evasive, and informative without being insensitive. These insights provide technical experts with clearer criteria for defining what constitutes a “*good*” or well-balanced news AI system.

## 5.6 Discussion

We reflect on the current work by revisiting our overarching inquiry: what positions should immigrant readers, journalists, and technology adopt with respect to one another in creating reader-oriented news experiences? These reflections comprise four successive lines of thought. First, we revisit the notion of immigrants as marginalized news readers, using our findings to contextualize the unique position they occupy within the mainstream news ecosystem (Section 5.6.1). Then, we delve into issues that would inevitably arise if either journalists or immigrant-favored technology were positioned as an isolated driver of the news experience sought by immigrants (Section 5.6.2). These reflections prepare us to re-examine the four participant-proposed design metaphors with a more critical lens. We consider the human-AI workflows underpinning these metaphors highly informative, particularly because each workflow illustrates a distinct and reconciled path for connecting our two stakeholders whose inherent values do not always align; nevertheless, we also note conditions that may limit a workflow from fulfilling its intended potential (Section 5.6.3). Several roadblocks will need to be cleared before conversational AI agents can be implemented in ways that deliver the benefits our participants envisioned. We conclude the Discussion with four concrete action items toward this end (Section 5.6.4).

### 5.6.1 News experiences of immigrants as a marginalized readership

Mainstream news often does not benefit its immigrant readers and the remaining local public equitably. Our research findings, especially those value misalignments detailed in Section 5.4.1, illustrate the disadvantages uniquely imposed on immigrants – *not* by considering what immigrants might gain if they were provided with additional assistance (e.g., would adding richer context improve immigrants’ news reading? would it benefit local readers too?), *but* by surfacing the enduring burdens already produced by a news ecosystem that lacks so much of what is essential to immigrants (e.g., has the absence of richer context hindered immigrants’ news reading? has it affected local readers to the same degree?). The former approach alone risks flattening the structural disadvantage immigrants experience, leading to a (mis)conclusion that immigrant readers need nothing really different from other readers.

Values prioritized by our immigrant participants highlight a key facet of their structural disadvantage. They inhabit a position where multiple constraints compound – being a social-status minority, navigating an often non-native language environment, *and* striving to piece together past and present societal contexts that are typically taken for granted by the local public. When local residents face difficulties in news reading, such as needing richer background information to understand a newly emerging societal issue, they can usually draw on their language proficiency and prior knowledge of the society’s history to fill in the gaps. Because of the intersecting constraints they shoulder, immigrants have far fewer resources available to support comparable forms of compensation.

In addition, values prioritized by our journalist participants illuminate another essential dimension of the structural disadvantage immigrants experience. While the mainstream news system allocates resources to equip journalists with professional skills and ethics training for high-quality news production, such preparation is not designed to address the

compounded constraints immigrants face on the news-consumption side. A consequence of this mismatch, evident in both our findings and prior research [89, 111, 127], is that immigrants often turn to alternative channels (e.g., explanatory YouTube videos, GPT-generated news summaries) to keep up with societal updates. Although these non-mainstream channels each respond to immigrants’ needs in their own way, they lack systematic safeguards [26, 44, 277, 322]. News produced by professional journalists still carries essential qualities that cannot yet be fully replaced by such alternatives.

### 5.6.2 The “unaddressed-or-unaccountable” paradox

To mitigate the structural disadvantage discussed above, something within today’s news system must be updated to respond to immigrants’ requests or to the difficulties they encounter in news reading. Both stakeholder groups in our research agree on this point; however, our findings reveal two distinct perspectives on what constitutes the first-order issue that needs to be addressed.

Our immigrant participants, throughout the entire co-design process, consistently signaled that their needs and demands as news readers remain unaddressed. In the first half of the research activities, they explicitly emphasized the anxieties caused by not being able to comprehend various aspects of meanings embedded in mainstream news. As researchers working with these participants, we interpret such anxieties as an inherent driver of the “conversational AI enthusiasm” they expressed in the second half of the process. Conversational AI agents hold the promise of always responding to immigrant readers whenever they seek information and doing so in formats adaptive to their situated requests. This responsiveness speaks directly to immigrants’ concerns about repeatedly being left unaddressed within the news information loop.

A different underlying message emerged from conversations involving journalist par-

ticipants: unaccountable responses are no better than no responses. The training journalists receive and uphold requires them to consistently exercise professional gatekeeping in determining what information to cover, how to cover it, and at what level the information should be processed by its readership. This strong commitment to gatekeeping matters because news, if produced without such discipline, may mislead its readers in irresponsible ways. It helps explain why journalists viewed human oversight as crucial for several aspects of news writing, such as ensuring that sensational expressions do not become manipulative, or carefully weighing information to be included or omitted in a news piece.

The significance of this “unaddressed-or-unaccountable” paradox lies in that (a) both perspectives are valid in their own contexts, and (b) neither perspective alone, in our view, can fully represent the appropriate or legitimate form of support for immigrant readers. Efforts to enhance reader-oriented experiences should not aim at simply “picking one side” or “forcing different stakeholders to reach consensus on everything.” Instead, we seek to identify ways for stakeholders to collectively manage their disagreements and, in the spirit of HCI, to recognize opportunities where technology can be positioned to support this cross-stakeholder dialogue.

### 5.6.3 Human-AI workflows that underpin the four metaphors

The four design metaphors reported in Section 5.4.2 offer informative clues for managing the “unaddressed-or-unaccountable” paradox. Across these metaphors, human and AI always coordinate within workflows where both operate under boundaries carefully defined for the benefit of immigrant readers. Journalists remain responsible for ensuring the quality of foundational news content, but refraining from presuming immigrants’ needs without conducting direct inquiry with this readership group. AI, in turn, conditionally augments or adapts the communication of that foundational content for end readers, and it operates with

explicit disclaimers or uncertainty acknowledgments when delivering information that is interpretative in nature.

To the best of our knowledge, the current work is among the relatively small number of HCI projects where multiple stakeholder groups directly work together, transparently communicate their (mis)alignments, and collectively outline possible workflows to manage tensions. A more commonly reported practice is to engage one stakeholder group at a time, with the research team later deciding how to prioritize among different stakeholders' views and preferences (e.g., [48, 95, 115]). Although the design outcomes generated from these two processes may appear similar, we argue that the core value of research through (co-)design is to return voices to the stakeholders themselves. The human-AI workflows identified in our research carry significance largely because they emerged from constructive exchanges and negotiated inputs across both journalists and immigrant readers.

Feasibility-wise, prior work already offers a solid technical basis for many interactive features that our immigrant participants desire. For example, systems like DataDive [128] use data visualizations to help users grasp the reasoning behind a given piece of information; recommendation algorithms, once initialized with users' own inputs, show strong potential for connecting people with content aligned with their informational or affective needs [139, 180]; and recent advances in personal informatics propose frameworks for self-tracking that support reflection on past behavior and planning for long-term change [259, 293]. These forms of technical readiness can be leveraged to address immigrants' needs as articulated through the four participant-proposed metaphors.

That said, the central value of the four design metaphors lies less in the specific ways immigrants might interact with AI-powered news interfaces. Rather, it rests in the orientation toward shared accountability among journalists, immigrants, and AI systems that the workflow beneath each metaphor articulates. We note two observations with our journalist and immigrant participants that are essential for critically examining these workflows:

### Over- vs. under-estimation of AI agents' intelligence.

Participants in both stakeholder groups lacked systematic knowledge about the limits of an AI agent's capabilities. As a result, they relied on heuristics to form expectations. Journalists, guided by their professional training and routines, tended to adopt a cautious stance toward AI, sometimes expressing concerns about accountability that felt overly conservative to immigrant participants. Immigrants, by contrast, showed greater enthusiasm for AI's potential, likely shaped by positive reinforcement from using AI tools in other work and life contexts. However, evaluation criteria from one context do not always transfer cleanly to another. For instance, while immigrant participants expressed strong confidence in AI's ability to perform style transformations on existing text, journalists emphasized that in the news domain, even small losses of nuance could introduce high-stakes risks for readers. The two groups simply did not share common reference points for assessing what AI can or should do, nor where the red lines ought to be drawn.

### Single- vs. multi-layered news information processing.

Perhaps due to time constraints of the research sessions, participants did not discuss much about the information complexity introduced by their own design envisions. However, many of the human-AI workflows they envisioned require journalists and/or AI to layer additional information on top of the original news piece. For example, the data decoder metaphor presumes that journalists can embed multiple tiers of data explanation into the foundational news content, enabling an AI agent to surface specific layers upon the reader's request. Likewise, the connection informer and empathetic friend metaphors entail AI agents directing immigrants to supplementary information beyond the initial article. During co-design, journalists warned that AI-assisted interpretations might risk diminishing the legitimacy or flattening the nuance of the original reporting. Although immigrants



agreed with this concern in group discussions, their news diary reflections prior to the sessions revealed the difficulty of digesting complex information all at once. It remains unclear how the increased information can best be displayed, organized, or reassembled for immigrant readers.

Together, these reflections suggest that our co-design findings are highly informative for guiding follow-up technology design endeavors in the news space. Nevertheless, it does not mean the four metaphors and the human-AI workflows underpinning them should be implemented as-is, without attention to their limitations.

#### 5.6.4 Are conversational AI agents the way out?

By identifying value (mis)alignments and collectively envisioned human-AI workflows across the two stakeholder groups, our research shows that tensions are inherent to design efforts involving heterogeneous stakeholders. Rather than acting as obstacles, these tensions create opportunities to move the news ecosystem toward greater inclusion and adaptiveness for its diverse readerships. The design metaphors surfaced through our study point to concrete directions for future work, helping ensure that conversational AI agents can deliver meaningful benefits as participants envisioned:

##### Equip journalists to produce AI-ready news content.

Our findings make clear that many immigrants would like to consult conversational AI agents for urgent help with news reading even though such actions might introduce risks. Thus, we argue that the safeguarding effort for accountable news interpretation must occur upstream, at the level of journalistic practice. Journalist training in the near future should consider how foundational content may later be processed by AI agents that attempt to elaborate, rephrase, or contextualize the source content. News writing practices could

therefore be upgraded to incorporate structural or metadata cues that differentiate “facts that must stay fixed” from “context that can be safely elaborated.” Such practices do not change the core of journalistic work; rather, they prepare news content for downstream AI interactions that are already common in immigrants’ news routine.

### Scaffold immigrants news reading with guided AI-safety protocols.

Our immigrant participants portrayed AI agents as a reliable companion: a news reading partner they consult for summaries when short on time, explanations when confused, and reassurance when emotionally strained. While this practice speaks to the “unaddressed” side of the unaddressed-unaccountable paradox, it also heightens risks of overreliance and misinterpretation. Follow-up design efforts should consider building accessible safety reminders into future news platforms, starting with concrete cases surfaced in our findings; for example, AI may be applied to explore how a numerical index compares historically, but not to infer the legal consequences of a civic action. Toolkits of this type would allow immigrants to continue benefiting from AI support as they already are, while maintaining an appropriate distance from outputs that may be overreaching or misleading.

### Connect journalists and immigrants for periodic reviews of AI edge cases.

Our co-design activities revealed essential benefits of having journalists and immigrant readers examine concrete examples together, especially for cases where AI assistance can become ambiguous or risky. Whether AI agents speculated on journalists’ data choices, oversimplified sensitive topics, or suggested irresponsible life decisions, these moments highlighted shared values between news content producers and consumers underneath apparent disagreements. We therefore consider a structured review of such “edge cases” as a practical step that should be built into the routine of reader-oriented news technology

design. Journalists and immigrants can jointly annotate AI outputs, discuss where interpretations go astray, and identify misunderstandings or confusions. This process extends the collaborative spirit underpinning the four metaphors and generates grounded input that AI engineers can use when designing safety mechanisms.

## Document emerging improvisations of AI usage for transparency and caution alerts.

The capabilities of AI agents continue to evolve, and so do the people who interact with them. This ongoing co-evolution means that new improvisations in AI use will inevitably emerge, and not all of them will be free of concern. Our co-design data revealed one vivid case within the news domain: journalists envisioned using AI as a shortcut to understand variation in information needs across readership groups. Similar ideas have also been explored in recent HCI work that leverages LLM-powered system infrastructures to simulate human behaviors and report notable results, primarily in terms of the human-likeness of simulated behaviors [13, 212, 213]. We argue that such improvisations must be carefully documented and evaluated with caution. As recent critical reviews emphasize (e.g., [118, 161, 291]), LLM-based AI models generate distributions of token sequences derived from training data; it does not possess human cognitive processes or the sensory and experiential grounding that shape real-world judgment. Consequently, these systems can produce highly human-like narratives without being capable of substituting for, or reliably predicting, genuine human cognition in contextualized scenarios. We recognize that both journalists and readers can benefit from receiving well-crafted, human-like text, which is already evident in the widespread use of AI-assisted editing and rephrasing tools. Yet, we remain concerned that everyday users may overextend such capabilities, introducing high-stakes risks such as diminishing the actual news experiences of marginalized readership

groups, or allowing AI-generated information to overshadow journalists' own exploration of alternative framings. These concerns underscore the need to systematically document emerging improvisations in AI use, increase their transparency, and incorporate explicit cautionary alerts as new issues are identified on the fly.

We propose the above actions not only to guide the design of conversational AI agents, but also to support the ongoing coordination and calibration of the roles assigned to immigrant readers, journalists, and the technologies available to them.

## 5.7 Limitations and Conclusion

Similar to previous work in the news space, our research has its limitations. In particular, all insights drawn from our co-design activities were bounded by the local media landscape familiar to specific participants, as well as by the technologies feasible within their speculations. While our activity setup was effective for surfacing and connecting the perspectives of multiple stakeholders, it captured their reflections within a compressed timeframe and thus cannot fully account for the longer-term dynamics of everyday news practices. Despite these limitations, findings from this research provide a concrete account of common ground and value conflicts between news consumers and producers, distinct metaphors for news technology design, and nuanced formats of human–AI coordination that future research can further extend. By foregrounding appropriate role alignments among immigrant readers, journalists, and technology, our work underscores opportunities for more inclusive and accountable news ecosystems with AI in the loop.

## Chapter 6: Conclusion

In this last chapter, I summarize prior chapters by highlighting the goals, research approaches, contributions, and limitations. With the lessons learned, I discuss opportunities for future work and end this dissertation with a concluding remark.

### 6.0.1 Summary of Prior Chapters

#### Summary of background

Chapter 1 introduced the central problem that motivates this dissertation: although local news is a crucial information source for immigrants' adaptation, many immigrants struggle to fully comprehend and apply news information due to language barriers and limited local social knowledge. At the same time, news reading is becoming increasingly reader-driven in the digital era, creating opportunities for personalized engagement. I positioned conversational interfaces, especially AI-powered chatbots, as a promising avenue for enhancing interactivity and supporting immigrant readers during the news reading process. However, existing news chatbots remain limited: most rely on rule-based designs focused on content distribution rather than open-ended conversations. This gap raises fundamental questions about what immigrant readers need during chatbot-assisted news reading and how chatbots should be designed to support those needs.

Chapter 2 reviewed three major bodies of literature to motivate these research questions. First, I synthesized insights on immigrants' news consumption, highlighting how

local news supports social adaptation but remains underutilized due to difficulties in interpreting complex or unfamiliar content. Second, I reviewed journalism and HCI scholarship on reader-driven news exploration and interactivity, noting opportunities for technologies that enable non-linear, personalized engagements with news. Third, I examined the emerging role of chatbots in journalism, tracing their evolution from workflow automation tools to potential facilitators of conversational news engagement. I also discussed participatory design as a “third space” for integrating journalists, immigrants, and designers in envisioning future technologies. Together, these bodies of work shaped the dissertation’s two primary research questions: (1) What needs do immigrants have when reading news with the assistance of a chatbot? and (2) How can chatbots be designed to better support those needs?

## Summary of research questions and approaches

To address these questions, the dissertation comprises three major studies that span controlled experimentation and participatory design, together forming a cohesive investigation of reader-centered chatbot design.

Chapter 3 examined RQ1 through a between-subjects study comparing Chinese immigrants and U.S.-born local readers as they read news articles with the assistance of an AI-powered chatbot. This design enabled systematic observation of reader-initiated questions, analytical engagement, and takeaways from the articles. The study revealed a typology of reader-initiated questions and highlighted clear differences: Chinese immigrant readers posed more foundational and context-seeking queries, while local participants more frequently asked interpretive or evaluative questions. Immigrant readers also demonstrated different patterns of analytical processing and practical interpretation of news content. These findings provide empirical insight into how immigrants articulate information gaps

during real-time news reading.

Chapter 4 extended this controlled approach by introducing a second immigrant group—Vietnamese immigrants—to cross-validate the findings from Chinese immigrants and examine whether similar patterns hold across immigrant communities. The comparison confirmed the broad structure of the typology while revealing nuanced differences in the distribution of question types and takeaway framing. This chapter also evaluated the quality of chatbot responses, identifying conditions under which the LLM-generated answers introduced inaccuracies or misinterpretations. These analyses deepen the empirical foundation for understanding immigrants’ news-related needs and highlight design considerations for ensuring safe and contextually appropriate chatbot support.

Chapter 5 addressed RQ2 by shifting from controlled comparison to participatory design. Here, immigrant readers and journalists from the same metropolitan region joined a multi-day series of interlinked activities to collectively envision future news chatbot systems. This study surfaced areas of alignment and tension between immigrant readers and journalists regarding what news should provide, how information should be presented, and what kinds of processing support are appropriate. Through collaborative exploration, participants articulated four metaphors that describe desired roles for future conversational AI in challenging news scenarios: the data decoder, the connection informer, the empathetic friend, and the trajectory witness. These metaphors translate stakeholder values into design directions for reader-centered news technologies.

Across the three studies, the dissertation connects immigrants’ articulated needs, systematic behavioral data, and stakeholder-driven design visions to provide a holistic understanding of how chatbots can meaningfully support reader-driven news engagement.

## 6.0.2 Summary of Contributions

This dissertation contributes to HCI, journalism studies, and technology design for immigrant communities through methodological, empirical, and design-oriented contributions.

### Empirical findings

Empirically, this dissertation advances understanding in three areas:

- **Reader-initiated question typology:** A detailed typology of news-related questions posed to chatbots, organized into seven categories serving four overarching purposes. This typology contributes a foundational lens for studying reader-driven news engagement.
- **Cross-group differences in news sensemaking:** Quantitative and qualitative analyses reveal distinct patterns in how immigrant and local readers seek clarification, interpret content, and extract practical guidance from news. These findings underscore the need to design systems that respond to diverse information gaps and reasoning processes.
- **Stakeholder alignments and tensions:** The co-design study uncovers where immigrant readers' needs align with or diverge from journalistic norms—particularly in topic relevance, content framing, and expectations for AI assistance. These insights highlight the importance of situating design within the broader news ecosystem.

### Design and implementation contributions

Through the co-design activities in Chapter 5, participants co-produced four design metaphors that articulate desired roles for future conversational news agents:



- The Data Decoder, supporting readers in unpacking complex policies and statistics.
- The Connection Informer, helping readers bridge personal, cultural, and civic contexts.
- The Empathetic Friend, recognizing emotional dimensions of news reading.
- The Trajectory Witness, helping readers track changes across time to support sense-making.

These metaphors serve as conceptual tools for guiding the design of future reader-oriented news chatbots, offering a vocabulary that aligns stakeholder values with design directions.

## Methodological contributions

Methodologically, the dissertation demonstrates how mixed-methods approaches can uncover real-time news reading needs among immigrants—an area previously dominated by retrospective interviews or surveys. The between-subjects experiments in Chapters 3 and 4 illustrate a novel way to elicit information-seeking behaviors by embedding open-ended chatbot interactions into the reading process. In Chapter 5, the participatory design framework creates a “third space” where journalists and immigrant readers can collaboratively negotiate values and expectations for news technologies. This combination of controlled experimentation and multi-stakeholder PD provides a transferable model for studying complex information practices involving marginalized groups.

### 6.0.3 Discussion

This dissertation reflects a broader shift toward multimedia platforms, such as TikTok, and AI-mediated technologies in the news ecosystem. It brings these developments

together as part of a unified discussion that examines their implications for how news is produced, accessed, and understood.

## Rethinking “media literacy problem”: immigrants, TikTok, and the limits of deficit framing

A recurring pattern in the data collected across this dissertation — most explicitly in participants’ diary entries during the co-design study in Chapter 5 — is that immigrant readers regularly supplemented, and at times replaced, their engagement with mainstream news through informal channels: YouTube creators, TikTokers, and generative AI tools such as ChatGPT. This section reflects on the media literacy implications of this pattern, because it surfaces a tension that is directly relevant to the broader contributions of this work.

A common impulse in media literacy discourse is to respond to TikTok’s rise as a news source by calling for stronger individual media competencies — better source evaluation, cross-verification habits, and critical thinking skills [249, 314]. Implicit in this response is the assumption that the problem lies primarily with the reader. There is certainly cause for concern that motivates this impulse. Research on TikTok as an information space has documented that the platform’s affordances — particularly its reuse, stitching, and duetting features — tend to decontextualize information and complicate authority assessment, while digital influencers construct narratives that feel authentic without necessarily being accurate or evidence-based [27, 206]. TikTok’s recommendation algorithm further compounds this risk by encouraging prolonged engagement in ways that discourage cross-verification with outside sources [90]. For immigrants navigating an unfamiliar civic environment, the stakes of acting on misinformation are unusually high. The case surfaced during our co-design activities — a TikToker advising his audience that they could skip IRS tax filing

because the agency would soon be understaffed — illustrates the kind of real-world harm that can follow when civic misinformation circulates without accountability. Scholarship on misinformation targeting migrants more broadly corroborates this concern: social media platforms have been documented as sites where false information about immigration law, health, housing, and financial obligations circulates freely, and where many migrants express frustration at being unable to reliably distinguish credible from misleading information [268].

Yet deficit framing is insufficient as an account of what the data in this dissertation actually shows, and potentially counterproductive as a design directive. Participants did not turn to TikTok and YouTube because they lacked critical thinking skills or were indifferent to accuracy. They turned to these channels for the same reason that Participant I-11 articulated so vividly: TikTok creators connected news events to broader social contexts and grounded their commentary in lived experiences that resonated with immigrant readers. What these channels offered — embeddedness in everyday life, cultural resonance, and accessible sensemaking — was precisely what mainstream news failed to provide. This is consistent with a broader pattern documented in research on immigrants' social media use: when people do not receive timely and accessible information from credible sources, they tend to fill that vacuum by seeking information from trusted networks and platforms, regardless of whether those platforms carry formal accountability mechanisms [111].

The findings of this dissertation, read alongside prior scholarship, suggest that immigrants' turn toward informal news channels reflects a structural failure in the mainstream news ecosystem — one that this dissertation has spent three studies documenting: professional journalists operate under gatekeeping norms that were not designed with immigrant readers in mind, and the resulting gap in contextual, culturally responsive coverage leaves immigrants without reliable tools for civic sensemaking. This is precisely the “unaddressed” side of the unaddressed-unaccountable paradox developed in Chapter 5. When

news fails to address immigrant readers' needs, those readers find alternatives — but those alternatives, as the IRS TikTok example demonstrates, often fail them in different ways by being unaccountable. Neither pole of this paradox represents an adequate information environment for immigrants, and framing the problem solely as one of individual media literacy deflects attention from the structural conditions that produce it.

The takeaway, then, is neither that TikTok is simply a threat to be warned against, nor that AI is a straightforward solution to the gaps that drive people toward TikTok. Both are symptoms of the same structural condition, an information environment that has not yet found adequate ways to serve immigrant readers, and both carry real risks when used without accountability mechanisms. The work of this dissertation has been to take that structural condition seriously and to ask what technologies, designed with and for immigrant communities, might begin to address it responsibly. That question remains open, but the co-design process documented here offers a grounded and stakeholder-informed foundation from which future research and design can build.

## The shifting terms of news engagement

Scholarship on news consumption has long tracked a transformation in the *informational* structure of engagement, from journalist-guided linearity toward reader-driven exploration. But in parallel, another shift has been underway in the *affective* structure of news engagement, and this second transformation deserves equal attention.

The emotional burden of following the news is not particular to immigrants. A Pew survey found nearly seven in ten Americans felt exhausted and worn out by the news [96], and Reuters Institute data showed that globally 29% of people sometimes or often avoided news, with rates ranging from 6% in Japan to 57% in Turkey and Greece, with negative emotional impact being the most commonly cited reason [200]. Research has linked re-

peated exposure to negative news to decreases in individual well-being over time, and the desire to recover a positive emotional state has become a documented driver of intentional news avoidance [81]. What the Empathetic Friend metaphor contributes to this picture is not a new problem, but a sharper one: for immigrant readers navigating news whose content directly threatens their daily lives and legal standing, the emotional stakes of engagement are substantially heightened, and the option of avoidance is structurally less available.

The growing scholarly recognition of an “emotional turn” in journalism — where emotions are increasingly understood as constitutive of how readers make sense of public information, rather than as noise to be filtered out — has raised questions about what an emotionally sustainable news encounter would look like [168, 288]. Within HCI, this has been answered by a growing body of work on technology-enabled emotion regulation, with researchers proposing frameworks for how design can scaffold users’ emotional responses through targeted interventions [254]. Yet there is a risk worth naming: when emotional sustainability becomes a design parameter — something the system manages on the reader’s behalf — it can quietly reframe a civic and structural challenge as a technical one.

The conditions that make news emotionally costly for many readers, and acutely so for immigrants, are not interface problems. They are products of how news is produced, what events are unfolding, and who bears their consequences. The question of how to make news more emotionally habitable cannot, and should not, be answered by technology alone — it also implicates journalism practice, platform policy, news literacy education, and the social conditions readers bring to the encounter. What design can reasonably contribute is a more honest acknowledgment of that complexity, rather than a smoother surface over it.

#### 6.0.4 Future directions

Building on the empirical and design insights of this dissertation, I outline three directions for future research. These directions extend the core themes of reader-centered news technologies, immigrant information needs, and conversational AI design, while situating them within the broader landscape of AI-mediated information practices.

#### Designing AI systems for more informed and equitable information access

This dissertation highlights how immigrants navigate substantial linguistic and contextual barriers when engaging with civic information such as local news. As AI-powered language technologies become increasingly embedded in everyday life, they hold significant potential to scaffold these information gaps. Yet the findings across Chapters 3–5 indicate that readers—especially those unfamiliar with local norms—struggle to evaluate, contextualize, and trust AI-generated responses. Future work will extend these insights to examine how diverse populations perceive, calibrate, and rely on AI systems during everyday information seeking.

I plan to investigate how individuals assess the trustworthiness, usefulness, and limitations of LLM-driven outputs when dealing with both low-stakes needs (e.g., transportation, housing) and high-stakes domains (e.g., healthcare, social services, legal information). This work will identify the social cues, contextual signals, and interaction patterns that help users make confident and well-informed decisions when relying on AI-mediated information.

By centering the lived experiences of multilingual and culturally diverse communities, this research will contribute to HCI by advancing theoretical understandings of how AI systems participate in people’s situated information practices. These insights will inform the design of information tools that support trustworthy, transparent, and context-smart interactions, which ensure that advancements in AI broaden, rather than constrain, equitable

access to knowledge.

## Human-in-the-Loop design for multi-agent news and information systems

Findings from this dissertation show that readers expect more from news chatbots than factual retrieval: they seek contextual explanations, social implications, and even emotional grounding during the reading process. These expectations speak to a broad shift toward co-agency, where humans and AI jointly shape interpretation, decision-making, and sensemaking. As emerging AI systems become increasingly agentic—capable of proactive assistance, autonomous decision-making, and multi-step reasoning—questions arise about how people collaborate, delegate tasks, and share control with such systems.

In future work, I will investigate human–AI coordination within multi-agent ecosystems, where multiple autonomous agents may perform distinct roles: synthesizers, verifiers, contextualizers, or translators. I will study how people negotiate responsibility, maintain oversight, and resolve breakdowns such as goal misalignment, conflicting agent recommendations, or over-delegation.

Building on the co-design outcomes from Chapter 5, I will develop interaction frameworks and design principles that support shared agency in complex information tasks such as news reading. These include guidelines for when and how users should specify, revise, or override agent goals; strategies to visualize uncertainty; and mechanisms that support accountability within multi-agentic systems.

This thread advances theories of human–AI coordination and contributes practical design approaches for interfaces that help users stay oriented, informed, and in control.

## Using and evaluating chatbot interactions as instruments for understanding reader insights

A central contribution of this dissertation is demonstrating how LLM-powered chatbots can serve as a scalable and naturalistic instrument for eliciting rich reader-generated insights during news reading. Although these systems enabled the collection of high-quality, situated question data across diverse groups, the work also revealed challenges related to accuracy, representativeness, and cultural alignment.

This motivates a third line of future research: examining how LLMs can be used responsibly and critically as data collection tools and analytical partners in HCI and news research. I plan to investigate what human–AI interaction data can reveal about people’s values, interpretations, and decision-making processes—and, importantly, how reliable and valid such insights are across languages, cultures, and contexts.

This includes studying how LLMs reproduce or distort the perspectives of underrepresented groups, how biases emerge when AI is used to summarize or categorize human responses, and how to design methodological safeguards that support ethical use of AI-generated or AI-augmented data. Through this work, I aim to develop validated frameworks for using LLMs as instruments for behavioral and interpretive research, while foregrounding questions of representational justice and cultural fidelity.

### 6.0.5 Concluding remarks

This dissertation examined how conversational AI can support immigrant readers as they navigate local news—an important but often difficult information source for understanding and participating in their communities. Across three studies, I showed that immigrants draw on news reading not only to make sense of events but also to bridge linguistic,



cultural, and social gaps. By observing how readers ask questions, interpret information, and articulate their needs in real time, the work revealed both the promise and the limitations of LLM-powered chatbots in scaffolding these information practices.

The findings demonstrate that reader-centered news support requires more than accurate summaries or factual clarifications. Immigrant readers seek contextual grounding, cultural interpretation, and emotional reassurance—dimensions that current news technologies rarely address. The participatory design study further highlighted the importance of acknowledging the perspectives of journalists, whose professional norms and practices shape what information becomes available to readers in the first place. Bringing these stakeholders together illuminated meaningful alignments as well as tensions, and surfaced shared visions for more equitable and responsive news technologies.

Through this work, I aimed to contribute not only empirical findings but also methodological and conceptual foundations for designing AI systems that align with the lived realities of the communities they serve. The dissertation emphasizes that creating equitable information technologies requires careful attention to people’s contexts, values, and constraints, and that AI systems intended to support public-facing knowledge work must be designed with a deep understanding of how information is interpreted, negotiated, and acted upon.

As AI-mediated information access becomes increasingly pervasive, the questions raised in this dissertation—about trust, context, agency, and representation—will grow in relevance. I hope that the insights developed here will inform future research and practice in human–AI interaction, journalism, and information equity. More broadly, I hope this work contributes to a future in which intelligent systems empower diverse communities to engage more fully and confidently with the information that shapes their everyday lives.

## Appendix A: Materials for Experiment Studies with News Readers

### A.1 Task Surveys

#### A.1.1 Background survey

##### Introduction

Q1. We appreciate your interest and time dedicated to our research! This study is led by Yongle Zhang, a PhD candidate at the University of Maryland. Our research aims to understand how newcomers engage with news media while using AI technologies. Your input is invaluable to us. By participating, you are contributing to a broader understanding that could potentially reshape the way we integrate technology into news consumption in the future.

The sign-up survey will gather basic demographic information, such as your gender, age, and language background. Please rest assured that all information provided will remain confidential. If you are not qualified for our study, your data will not be collected or stored.

The survey should take no more than 3 minutes to complete. For any queries, please contact the principal investigator Yongle Zhang at [yongle@umd.edu](mailto:yongle@umd.edu).

##### Demographics

Q2. Please indicate your age in numbers: (Example: 21) \_\_\_\_\_

**Q3.** Please indicate your sex:

- Male
- Female
- Non-binary/third gender
- Prefer not to say
- Prefer to self-describe (please specify): \_\_\_\_\_

**Q4.** Where are you currently residing?

- United States (please specify the state): [Textbox]
- Outside of the United States

**Q5.** How long have you been living in the United States? Example: 21 years, 6 months, etc. [Textbox]

**Q6.** What is your education level? If you are a student, please indicate the educational program you are currently enrolled in; If you have graduated, please indicate the highest degree that you completed:

- High school or below
- Undergraduate
- Master
- PhD
- Other (please specify): \_\_\_\_\_

**Q7.** What is your native language (or languages)? [Textbox]

**Q8.** Do you speak a second language (or languages)?

- Yes. Please specify: \_\_\_\_\_
- No, I do not speak a second language.

**Q9.** What is your ethnicity? \_\_\_\_\_

**Q10.** On a scale of 1 to 7, how would you rate your English fluency?

- Minimum 1
- 2
- 3
- Moderate 4
- 5
- 6
- Native 7

**Q11.** Your self-identified level of English proficiency:

(Please refer to the table below for a detailed definition of each level.)

**Elementary proficiency**

- Can understand basic questions and speech, which allows for guides such as slower speech or repetition to aid understanding
- Can perform most basic functions using the language (e.g., buying goods, reading the time, ordering simple meals)

**Limited working proficiency**

- Can usually handle elementary constructions quite accurately but does not have thorough or confident control of grammar
- Can handle with confidence most basic social situations including introductions and casual conversations

**Professional working proficiency**

- Have an accent which may be obviously foreign, but never interferes with understanding
- Can speak with sufficient structural accuracy and vocabulary to participate effectively in practical, social, and professional conversations

**Full professional proficiency**

- Accent may be foreign but does not interfere with understanding
- Can speak fluently across practical, social, and professional contexts

**Native or bilingual proficiency**

- Level equivalent to an educated native speaker
- Full fluency including idioms, colloquialisms, and cultural references

**Scale:**

- 1 – Elementary proficiency
- 2 – Limited working proficiency
- 3 – Professional working proficiency

- 4 – Full professional proficiency
- 5 – Native or bilingual proficiency

**Q11** Which of the following best describes your current employment status?

- Student
- Full-time employee
- Part-time employee
- Gig worker / Contractor
- Self-employed
- Unemployed
- Retired
- Other (please specify): \_\_\_\_\_

## Contact

**Q14** Your email address for researchers to reach out:

\_\_\_\_\_

## A.1.2 Survey – after each news reading

### Introduction

**Q1** This survey consists of two parts:

- Gathering your feedback on the news article you’ve just read.

- A writing task where you will retell this story.

Please ensure you read all questions and instructions carefully before proceeding.

**Q2** Participant ID:

*\*Should you require assistance in locating your participant ID, please reach out to the researcher immediately.*

**Q3** News ID:

*\*Should you require assistance in locating your news ID, please reach out to the researcher immediately.*

## Block 1: Experience with the News Article

**Q4** Considering your experience with the news article you just read, please rate your agreement with the following statements using a scale from 1 (Strongly Disagree) to 7 (Strongly Agree).

**Scale:**

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Somewhat Disagree
- 4 – Neutral
- 5 – Somewhat Agree
- 6 – Agree
- 7 – Strongly Agree
- It was easy to follow the content of the news article.

- It was easy to read the news article.
- I was able to identify the important words and concepts.
- I understood all of the content of the news article.

**Q5** Considering your experience of the news article just read, please rate your agreement with the following statement using the same 1–7 scale:

**Statement:** The reading enhanced my understanding of local events and current affairs. Specifically, it improved my grasp of the cultural and sociopolitical aspects of my local environment, aiding in activities such as attending community events, interacting at social gatherings, and navigating bureaucratic processes.

- Strongly Disagree (1)
- Disagree (2)
- Somewhat Disagree (3)
- Neutral (4)
- Somewhat Agree (5)
- Agree (6)
- Strongly Agree (7)

**Q6** Considering your experience of the news article just read, please rate your agreement with the following statement:

**Statement:** The reading deepened my understanding of linguistic nuances and communicative subtleties in my language use. For example, the reading has enhanced my ability to read and write more effectively on topics covered in the news. It has also equipped me to better interpret and respond to related questions and requests from others.



- Strongly Disagree (1)
- Disagree (2)
- Somewhat Disagree (3)
- Neutral (4)
- Somewhat Agree (5)
- Agree (6)
- Strongly Agree (7)

**Q7** Considering your experience of the news article just read, please rate your agreement with the following statement:

**Statement:** The reading has enriched my knowledge about essential local services and functionalities. This includes understanding community services available, navigating the area effectively, and adapting to the local pace and lifestyle.

**Q8** Before moving forward, please notify the researcher that you have completed the first part of survey questions.

## Block 2: Retelling

**Q9** Writing Task – Retelling this story to a friend

**Instructions:** To share and retell a news story you’ve read with the assistance of the Bing AI. The aim is to convey the story and any relevant information that might be useful for a friend. Your friend is interested in understanding what’s going on in their local community based on the news topic and wants to adapt to this new environment.

Imagine a friend who is similar to you in terms of background. They just moved to your local community. Focus on the main points of the news and any information that you

believe would be particularly helpful for your friend. You can also share any content or insights provided by the conversational AI that you found valuable.

**Rules:**

- There is no word limit, but please ensure you cover all the main points.
- Think about what information would be most relevant to someone new to the country.
- Share any personal insights or connections you made while reading the news.
- The goal is not just to retell the news but to make it useful and relatable for your friend.

**Please start your writing in the space below:**

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- Strongly Disagree (1)
- Disagree (2)
- Somewhat Disagree (3)
- Neutral (4)
- Somewhat Agree (5)
- Agree (6)
- Strongly Agree (7)

**Q10** How would you assess your workload during the tasks associated with this news article? Please review the statements below and select the numbers that most closely align with your experience. *\*Please note that your reflections should be based on your task experience of this particular news article.*

**Scale:**

- 1 – Very Low

- 2

- 3

- 4

- 5

- 6

- 7 – Very High

- **Mental Demand:** How much mental and perceptual activity was required during the task?

- **Temporal Demand:** How much time pressure did you feel due to the pace of the task?

- **Performance:** How successful do you think you were in accomplishing the goals of the given tasks?

- **Effort:** How hard did you have to work to accomplish your level of performance?

- **Frustration:** How insecure, discouraged, irritated, stressed, and annoyed did you feel during this task?

### A.1.3 Survey – end of the whole task

**Q1** Please reflect on your entire task experience, ensuring to include all aspects of the news reading tasks and surveys you completed.

**Q2** How did you feel about your level of workload during the full experiment session? Please read the following statements and choose the numbers that best describe your experience.

*\*Note: The full experiment session contains all the news reading and survey completion.*

**Scale:**

- 1 – Very Low
- 2
- 3
- 4
- 5
- 6
- 7 – Very High
- **Mental Demand:** How much mental and perceptual activity was required during the full lab session (e.g., thinking, deciding, writing, searching, etc.)?
- **Temporal Demand:** How much time pressure did you feel during the full lab session due to the rate or pace at which the task or task elements occurred?
- **Performance:** How successful do you think you were in accomplishing the goals of the given tasks during the full experiment session?

- **Effort:** How hard did you have to work (mentally and physically) to accomplish your level of performance during the full experiment session?
- **Frustration:** How insecure, discouraged, irritated, stressed, and annoyed did you feel during the full experiment session?

## A.2 News Materials

### A.2.1 Article 1

#### **Rents have peaked, but construction challenges down the road loom large**

“I do think we’ve seen the peak rent price for 2023,” Danielle Hale, Realtor.com chief economist, told Yahoo Finance Live.

For the third consecutive month, asking rent prices — or vacant units advertised by landlords — have fallen, declining 1% over the same period a year ago, according to Realtor.com’s Mid-year rental report.

“We’re at the point in the season where we typically see rents decline. And rents are down from a year ago as they have been for the past few months and so that means we are likely to see that 2022 was the peak for rents. And we’re starting to see some decline,” Hale added.

The big reason for the slowdown: more housing. In the past three years, builders have added 1.2 million apartments to the market, with 2023 shaping up to be a peak year as developers expect to open 460,860 rentals by year-end, according to RentCafe’s construction report.

“While the time-to-completion on multifamily properties is much longer than single-family homes, in our view this glut of multifamily supply will eventually suppress apartment rent growth,” Vinay Viswanathan, a fixed income strategist at Goldman Sachs, wrote

in a note for the firm's housing team. But new financing challenges are emerging that could threaten the supply — and rental price — outlook beyond next year.

Already, West Coast metro areas are facing an apartment construction slump.

Data from CoStar Group shows developers are on pace to build less than 32,000 apartments in Los Angeles, San Francisco, San Diego, San Jose, Seattle, and Portland this year — marking a roughly 20% drop compared with 2021 levels.

“It’s the worst thing that could be happening,” Jay Lybik, national director of multifamily analytics at CoStar Group, said in a statement. “The region still doesn’t have enough housing.”

So far this year has been the slowest for the West Coast, developing less than half as many apartments as the first two quarters of 2021. The tally hit 10,687 in 2023. That falls short of the 19,434 starts recorded in the first half of 2021.

A memo from a Los Angeles project's development team revealed in June that it wanted to reduce the project's total units and commercial space in response to “rising construction costs and the increasingly uncertain climate for capital sources to fund the project.”

But the lack of construction could become a bigger problem nationwide after next year.

The number of new apartments is expected to drop by nearly 16% to 408,000 in 2025 from 484,000 in 2024, with new completions bottoming out in 2026 at approximately 400,000 units, according to RentCafe's construction report.

“We’re seeing a pullback in projects moving forward across the country right now because developers are unable to get financing for construction loans and they’re also struggling to get equity to start new projects,” Lybik said.

As a result, Lybik warned that by 2025, vacancies could decrease, pushing the rate of rental growth nationwide to triple from the 1.1% increase seen in the second quarter to between 3% and 3.5%. He forecasts average monthly rent to increase to \$1,799 from \$1,677.

“At the end of 2025, the average renter will be paying about \$1,500 more a year for housing costs,” Lybik said.

## A.2.2 Article 2

**Biden rolls out ‘Renters Bill of Rights’ as lawmakers push for federal rent control laws** In the face of sky-high rents, President Joe Biden is rolling out a new set of principles the White House is calling a “Renters Bill of Rights” in an effort to improve rent affordability and protections for tenants.

The president is directing the Federal Housing Finance Agency (FHFA) to examine limits on rent increases for future investments and actions promoting renter protections. The Federal Trade Commission (FTC) and the Consumer Financial Protection Bureau (CFPB) have been tapped to root out practices that unfairly prevent applicants and tenants from accessing or staying in housing. This rollout comes as progressive Democrats have asked Biden to direct different agencies, including the FTC, to limit rent increases. While rent control is common in some cities, there has never been federal residential rent control.

Nearly 50 progressive lawmakers, including Sen. Elizabeth Warren (D-MA) and Rep. Alexandria Ocasio-Cortez (D-NY), sent a letter to Biden earlier this month urging the president to take executive action to protect tenants from rising rents.

“In the absence of robust investments in fair and affordable housing, it is clear that additional timely executive action is needed to address the urgent issue of historically high rental costs and housing instability,” the lawmakers wrote. “... We urge your Administration to pursue all possible strategies to end corporate price gouging in the real estate sector.”

Specifically, lawmakers had called on the president to direct the FTC to issue new regulations defining excessive rent increases and enforce actions against rent gouging, sug-

gestions that are aggressive than what the administration has so far put forth. The letter also asked to have FHFA put in place rent protection for tenants living in properties financed with government-backed mortgage properties, which is more closely aligned with what the president outlined on Wednesday.

In Wednesday's announcement, the administration also sought to rally state and local governments — as well as the private sector — to protect renters. The Wisconsin Housing and Economic Development Authority and Pennsylvania Housing Finance Agency, for instance, have agreed to cap annual rental increases to 5% per year for federal- or state-subsidized affordable housing.

In the private sector, the National Association of Realtors has also agreed to put new resources towards property managers in their network to promote practices like advertising to prospective tenants that Housing Choice Vouchers are accepted at their property, providing information about rental assistance, and using alternative credit scores for applicants without a detailed credit history.

Despite Wednesday's action, Rep. Jamaal Bowman (D-NY) and Sen. Warren think the actions fall short. "We believe that the administration can go significantly further to help tenants struggling to pay rent as soon as next week," Bowman said. "We need actions that will urgently address skyrocketing housing costs, keep people housed, and rein in corporate profiteering...I look forward to continuing to work with the Biden Administration on this issue."

Bowman said he plans to work with colleagues in Congress to work on legislation to address high rents.

In advance of receiving the letter, the White House held several conversations with staff from Rep. Bowman and Sen. Warren's offices about ensuring rental markets are fair and affordable for renters. Lawmakers argued the FTC already has the power to limit rent increases, given Congress has granted the agency power to police unfair and deceptive acts



and practices. The argument is that rent hikes which are not proportional to higher costs for the landlord are unfair or deceptive.

But analysts are skeptical the FTC could impose rent controls and that courts would uphold these policies if put in place.

“The Supreme Court is more conservative. It is less inclined to let agencies assert authorities that Congress did not explicitly give them. Congress never empowered the FTC to limit how much residential rents may increase,” Cowen analyst Jaret Seiberg said in a recent note. “It is why we would expect the courts to reject this type of regime.”

Seiberg also questioned how a federal regime would actually work, given costs vary from city to city and buildings may get remodeled or upgraded. “The FTC is a relatively small agency,” Seiberg added. “We don’t see how it could account for all this in a way that could survive court challenges.” While legislation could accomplish this, Seiburg said he doesn’t see Congress adopting federal rent control.

Rent prices rose 7.45% year over year in November, according to the latest available data from the Rent Report, the slowest annual rise over the last 15 months. Still, this increase is more than triple the 2.2% annual rent increase seen during the same month two years ago.

### A.2.3 Article 3

#### **3 new laws in Virginia to impact renters, landlords starting soon**

Landlord-tenant disagreements are some of the most common issues seen before Virginia’s district court judges. Attorneys told News 3 that renter problems amount to roughly 60% to 70% of district court cases. That’s why they said it’s a good idea for you to know your rights, whether you’re the renter or the landlord.

From living conditions to price hikes and unexpected policies, Hampton Roads resi-

dents say renting can be great or a headache.

“The place that I am in now, it’s okay, but the one before that was an apartment. I had a lot of mildew trouble,” said Lisa Golson, of Portsmouth. “It was hard to get the landlord or the realtors to come to the house and check out the property.”

Three new laws that took effect in Virginia earlier this year will attempt to address some of these issues.

“For the most part they’re well thought out,” said Larry Lockwood Jr., an attorney at Hunter Law Firm. The first law, H.B. 1702, requires your landlord, if they own or have more than 10 percent interest in more than four rental units, to give tenants more notice before raising the rent. Renters will get 60 days’ notice so they will have more time to find other living arrangements if needed.

“It doesn’t really put any additional burdens on landlords but keeps landlords from doing some unscrupulous business practices,” said Lockwood. The second law, H.B. 2441, prevents apartment complexes from evicting tenants one by one. This applies mostly to landlords that are planning to stop renting to a large number of their tenants.

“If a landlord decides they are going to go out of the rental business, or turn their rental building into a condo or tear it down and turn it into a hotel or resort or whatever,” Lockwood said. “They can’t just let the apartment’s agreements expire one by one.”

In addition, landlords will have to give tenants 60 days of notice if they’re not going to renew many leases (either 20 or more month-to-month tenancies or 50 percent of the month-to-month tenancies within a 30-day period, whichever is greater). The third law, H.B. 1635, gives tenants a refund option if they move in and then find the apartment is uninhabitable.

“There are rodents, or something you missed on the original walk-through, something you couldn’t have seen until you were living there,” Lockwood said. “It gives you seven days to give notice to the landlord that it’s uninhabitable, you’re moving out, you’re done.”

It's meant to help folks get money back and then into a new place more quickly.

But if you have an issue, Lockwood said you shouldn't just stop paying rent. Instead, he said, check with an attorney.

"The lawyer would typically say go down to the courthouse and do a tenant's assertion. This is what you do. And they would have been protected. A little bit of knowledge goes a very long way, especially when you're dealing with renting apartments," said Lockwood.

#### A.2.4 Article 4

##### **'Slow yet competitive': In Virginia, housing prices remain high and supply tight**

Even as the housing market in Virginia has slowed, prices remain high statewide, researchers told the Virginia Housing Commission Tuesday.

"The theme is slow yet competitive," said Ryan Price, chief economist for Virginia Realtors. "A lot of things are driving that, primarily the increase in interest rates, which has deterred both buyers and would-be sellers."

While new home construction in Virginia has continued to grow in 2022, building still lags levels seen in the state historically, said Hamilton Lombard, a demographer for the Weldon Cooper Center for Public Service at the University of Virginia.

Before the financial crisis of the late 2000s, "we were around 60,000 new homes annually," he said. "We're below 40,000 right now."

Declines, however, aren't even across Virginia. Data presented to the commission shows new home construction is down significantly in Northern Virginia and Hampton Roads compared to a decade ago. In contrast, Richmond and smaller metropolitan areas in places like Halifax and Danville have seen upticks in activity.

"Richmond has really been the one big standout area when you look at Virginia," said Lombard.

At the same time, high interest rates are discouraging not only buyers but sellers. While the average interest rate on mortgages held by existing Virginia homeowners is 3.8%, the average interest rate for new mortgages is 6.4%, said Price, making many reluctant to move.

“The incentive to lose that 4%, 3%, 2.5% rate and get a 7% rate — there is no incentive unless you’re forced to move,” he said.

In response, home sales have slowed. Between January and June of this year, sales statewide were down 24% compared to the same period last year. Simultaneously, Virginia home prices are trending upward in the majority of jurisdictions. Since 2018, Price found they have risen 36%, from an average statewide price of \$285,000 in 2018 to \$389,000 now.

In some regions, the uptick in remote work spurred by the pandemic appears to be exacerbating price hikes as higher-paid workers move from larger metropolitan areas to smaller ones where wages are lower.

“What we’ve seen in metro Richmond is that if you’re coming from the West Coast and making West Coast wages or you’re coming from Northern Virginia and D.C. making those wages, you’re coming into this region, folks who live here and are living with our wages are being beat out every time when they’re going for a purchase,” said commission member Laura Lafayette, who is also CEO of the Richmond Association of Realtors.

While many of the trends Virginia is experiencing are playing out nationwide, Virginia home construction is lagging that of neighboring Tennessee and North Carolina. Lombard said Tennessee is building about a third more housing units than Virginia, while North Carolina is building double. Both have also seen far higher job growth than Virginia since January 2020, with Virginia adding 56,800 jobs, Tennessee 172,900 and North Carolina 284,500, according to Price. “North Carolina is kicking Virginia’s butt as far as job growth,” said Del. Danny Marshall, R-Danville, Tuesday.

More affordable housing elsewhere may be a key driver of population losses from Vir-

ginia to more southern states, said Price.

“They’re building more housing in these states,” he said. “So the fact there are homes available, there are good jobs there, it is attracting a lot of folks away from Virginia. We also have good jobs here, but our housing is more expensive, particularly in the job centers.”

Asked by Del. David Bulova, D-Fairfax, if there was anything the state could do policywise to ease some of the housing pressures, Price said many solutions have emerged from local governments.

“The places that have started to move the needle particularly on the supply side are really making strides at the local level more so than the state level with respect to zoning changes — whether it be loosening up the zoning in some places, whether it be concentrating a lot of the new housing in specific corridors that are near transit, that are near job centers, whether it be making the process to densify in some cases easier, making the permit process easier,” he said.

## A.2.5 Evaluation of news articles

This table summarizes the evaluations of the four news articles utilized in this dissertation study. For each news article, I present its word count along with subjective ratings provided by Prolific workers on 7-point Likert scales. These ratings encompass several dimensions, including comprehensiveness, depth, clarity, structure, and tone of the content, as well as the style and perceived professionalism of the writing. Each cell displays the mean and standard deviation of the corresponding evaluation.

|                                                                                                               | News Article 1 | News Article 2 | News Article 3 | News Article 4 |
|---------------------------------------------------------------------------------------------------------------|----------------|----------------|----------------|----------------|
| Word count                                                                                                    | 546            | 762            | 500            | 692            |
| I find the information provided for the topic discussed in this news article is:<br>Limited - Comprehensive   | 5.13/1.25      | 5.33/1.41      | 5.75/1.28      | 5.33/1.00      |
| I find the information provided for the topic discussed in this news article is:<br>Straightforward - Complex | 3.63/1.41      | 3.44/1.59      | 4.50/1.77      | 3.78/1.79      |
| I find the information provided for the topic discussed in this news article is:<br>Shallow - In-depth        | 5.13/1.73      | 4.89/0.93      | 5.75/1.28      | 5.22/0.67      |
| While reading this news article, I feel its content is: Ambiguous - Clear                                     | 6.13/0.64      | 5.78/0.67      | 5.50/1.60      | 5.22/1.79      |
| While reading this news article, I feel its content is: Disorganized - Logically structured                   | 5.75/1.28      | 5.00/1.41      | 5.38/1.60      | 5.00/2.12      |
| While reading this news article, I feel its content is: Confusing - Accessible                                | 5.63/1.19      | 5.44/1.13      | 4.75/1.67      | 5.11/1.62      |
| The voice or perspective in this news article appears: Causal - Professional                                  | 5.38/1.30      | 5.67/1.32      | 5.88/1.36      | 6.00/1.00      |
| The voice or perspective in this news article appears: Superficial - Insightful                               | 5.88/0.83      | 5.44/1.13      | 5.25/1.39      | 5.56/0.88      |
| The voice or perspective in this news article appears: Unsubstantiated - Validated                            | 5.75/1.04      | 5.22/1.20      | 5.63/1.19      | 5.56/1.01      |
| I find the overall tone of this news article is: Negative - Positive                                          | 3.63/0.92      | 4.67/1.50      | 3.63/0.74      | 4.67/1.32      |
| I find the overall tone of this news article is: Subjective - Objective                                       | 5.50/1.31      | 4.67/1.50      | 5.38/0.92      | 5.22/1.72      |
| I find the overall tone of this news article is: Informal - Formal                                            | 5.50/1.07      | 5.00/1.73      | 5.50/1.20      | 5.67/1.00      |

### A.3 Evaluation of Chatbot Responses

Here is the prompt to ChatGPT for evaluating chatbot responses:

```
“You are a meticulous fact-checking evaluator.
Instruction: Examine the following model response for factual accuracy.
Step 1: List each factual statement in the response.
Step 2: For each statement, explain whether it is supported, contradicted,
or cannot be verified using either the provided article (cited by NewsID) or your
Step 3: Based on your analysis, decide: Does the response contain factual \
hallucinations? (Answer yes or no.)
Return ONLY a JSON object with this schema:
{
  “step1_statements”: [“...”,“...“],
  “step2_assessments”: [
    {“statement”:“...“, “status”:“supported|contradicted|unverifiable“, \
      “evidence”:“short explanation with source (article NewsID or \
        world knowledge)”}
  ],
  “hallucinations”: “yes|no“,
  “reasoning”: “2-3 sentences summarizing how you decided”
}
Be concise but specific. Do not include any text outside the JSON.”
```

## Appendix B: Materials for Co-design with Immigrant News Readers and Journalists

### B.0.1 Review of related design studies

Table B.1: Summary of Participatory Design Studies Involving Immigrant Communities

| Study                 | Goal                                                                                          | Core Participants                                            | Participant Involvement                                                                                                                                                | Researcher Facilitation                                                                                                           |
|-----------------------|-----------------------------------------------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Cho et al., 2019 [56] | Help low-income Latinx families access local, affordable out-of-school learning opportunities | 40 low-income, majority Latinx participants in CA; in-person | Ethnographic research and interviews to understand daily contexts and technology use; group discussions based on personas; participation in a pilot study and feedback | Creation of personas; brainstorming and prototyping; presentation of design prototypes with scenario cards; system implementation |



| Study                                             | Goal                                                                     | Core Participants                                                                      | Participant Involvement                                                                                                             | Researcher Facilitation                                                                                                                 |
|---------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Dickinson et al., 2019 [70]                       | Design technology for underserved communities to improve quality of life | civic 55 residents from underserved neighborhoods in Chicago; in-person                | Group workshops to identify community assets and challenges; brainstorming solutions                                                | Use of photographic images and Google Street View images; creation of poster-size community maps for icebreaking and group ideation     |
| Wong-Villacres et al., 2017; 2019; 2021 [299–301] | Enable Latin migrant parents in the U.S. to navigate educational systems | 40 Latin parents in Atlanta, mostly Spanish-speaking, low-income immigrants; in-person | Creation of “Tree of Life” for reflecting on parenting strengths; photo diary activities; fictional inquiry to envision solutions   | Ethnographic interviews and observations; preparation of sample materials (trees) and visual aids; persona creation                     |
| Gautam et al., 2020 [92]                          | Support the reintegration of sex trafficking survivors in Nepal          | 28 sister-survivors and 18 staff members in Nepal; in-person                           | Discussion and sharing photos of surroundings; participation in Hamrokala workshop for craft marketing; future envisioning sessions | Design of Hamrokala app tailored to participants’ skills and interests; collaboration with anti-trafficking staff to support activities |

| Study                        | Goal                                                                                                                                 | Core Participants                                                                                         | Participant Involvement                                                                                                     | Researcher Facilitation                                                                                                                                     |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Chen et al., 2020 [54]       | Develop a chatbot to assist migrants with life information in host countries                                                         | 29 migrants from 15 countries in Finland; chatbot developers; in-person                                   | Online questionnaires for experience sharing; empathy probes for elicitation; co-design workshops to create chatbot avatars | Creation of empathy probes with expressive icons; provision of a generative toolkit with visual and tangible components for persona-driven chatbot creation |
| Zhao, 2023 [325]             | Empower immigrants to preserve and express cultural heritage through technology                                                      | Three British-Chinese families spanning three generations; remote                                         | Informal discussions through WeChat; individual interviews; co-design workshops on Miro for digital heritage scenarios      | Observation of family chats; distribution of Arduino toolkits for technology familiarization and creative expression                                        |
| Rohanifar et al., 2022 [228] | Design a Fin-Tech platform for community-driven international money transfers for immigrants from politically marginalized countries | 16 participants (Iranian immigrants, UI/UX designers, software engineers, academicians in Canada); hybrid | Surveys on informal money transfer practices and trust factors; co-design sessions for brainstorming and sketches           | Sessions in Farsi and English; provision of materials like whiteboards and storyboarding sheets; development of Kabootar platform based on survey insights  |

| Study                         | Goal                                                                                           | Core Participants                                                                     |                                                                                       | Participant Involvement                                                                                                                              | Researcher Facilitation                                                                                |
|-------------------------------|------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| Navarro and Shaer, 2022 [195] | Use participatory design to develop technology addressing challenges faced by migrant students | 10 undergraduate students, 4 with migrant backgrounds;                                | in-person                                                                             | Icebreaker activities for finding commonalities; teamwork on relevant issues using persona and prompt cards; design solution development and sharing | Preparation of design guides and persona cards to facilitate ideation                                  |
| Brown et al., 2014 [38]       | Create health-supporting technologies for Afro-Caribbean immigrant women                       | 20 Caribbean immigrant women in the U.S.;                                             | Afro-Caribbean immigrant women in the U.S.; in-person                                 | Focus group discussions on health challenges; participatory design process with storyboarding; design remixing across groups                         | Trust-building through community leaders; use of storyboarding for brainstorming                       |
| Ropponen et al., 2010 [230]   | Develop a social media platform to foster civic participation among immigrant communities      | 10 immigrants, two employees from the Moniheli network, web developer, 6 researchers; | immigrants, employees from the Moniheli network, web developer, 6 researchers; hybrid | Eight in-person workshops for brainstorming and scenarios; online feedback on Owela platform; platform testing via online chat sessions              | Collaboration with Moniheli for trust-building; iterative website revisions via online voting/comments |

| Study                    | Goal                                                       | Core Participants                                                                                  | Participant Involvement                                                                                                                 | Researcher Facilitation                                                                                                                                         |
|--------------------------|------------------------------------------------------------|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Duarte et al., 2018 [74] | Design mobile tools for young forced migrants' integration | 25 young forced migrants (Afghanistan, Syria, Iran, Iraq) in Germany; 20 local students; in-person | Brainstorming work-shops; field trips for local info gathering; co-design workshops for mobile app wire-frames; feedback questionnaires | Collaboration with school staff; sessions in English with Ger-man interpretation; provision of accessible prototyping materials (e.g., paper wireframes, icons) |

## B.0.2 Screening surveys

**Q1.** Please specify your age:

---

**Q2.** Please indicate your gender:

- Male
- Female
- Non-binary / Third gender
- Prefer not to say
- Prefer to self-describe: \_\_\_\_\_

**Q3.** [Immigrants] How long have you been living in the United States?  
(e.g., 3 months; 5 years)

---

**Q4.** Please indicate your highest level of education:

- Less than high school
- High school diploma or equivalent
- Some college
- Bachelor's degree
- Master's degree
- Doctorate or Professional degree
- Others (please specify): \_\_\_\_\_

5. Please specify your ethnicity:

---

**Q6. Language Background and English Proficiency**

- Native language(s): \_\_\_\_\_
- Second language(s): \_\_\_\_\_

**Q7. [Immigrants] Self-reported English Proficiency:**

Please select your proficiency level based on the provided scale:

**Elementary Proficiency:** Can understand basic questions and speech, requiring aids such as slower speech or repetition. Can perform basic functions using the language (e.g., buying goods, reading time, ordering simple meals).

**Limited Working Proficiency:** Can handle elementary constructions but may not have full control of grammar. Can confidently handle basic social situations, including introductions and casual conversations.

**Professional Working Proficiency:** May have a foreign accent but it does not hinder understanding. Can speak the language effectively in most conversations on practical, social, and professional topics.

**Full Professional Proficiency:** Can speak fluently and is rarely mistaken for a non-native speaker. Can use the language fluently in all professional contexts, including conferences, lectures, and debates.

**Native or Bilingual Proficiency:** Has proficiency equivalent to an educated native speaker. Speaks with complete fluency, including using colloquialisms and cultural references.

**Q8. News consumption:**

Please list up to five news sources you frequently use to stay informed about news specifically in the United States. These sources may include national news websites, global newspapers, local TV news channels, regional radio stations, or specific social media accounts/pages.

Your response: \_\_\_\_\_

*(You may share news texts or screenshots of their commonly read news.)*

**Q9. [Immigrants] Language proportion:**

Please estimate the proportion in which you consume news from the host country in the following languages (total must equal 100%):

English: \_\_\_\_\_%    Native Language: \_\_\_\_\_%

**Q9. [Media Professionals] Experience in news media production:**

Please provide a brief description of your experience in news media production (3–5 sentences), or share links to your published work.

\_\_\_\_\_

**Q10. Prior experience (1: very rarely – 7: very frequently)**

- How often do you interact with conversational AI tools? (e.g., smart chatbots, Chat-GPT, Siri, Google Assistant)
- How often do you use language translation tools in your daily work and life?

**Q11.** Please share your email of contact:

---

### B.0.3 Diary Activities

#### Immigrant Diary Task

##### **Welcome to the News Reading Diary Task!**

Over the next week, you will complete two diary entries detailing your daily news reading experiences. Your contributions are important for enhancing our upcoming brainstorming sessions.

##### **Instructions**

- **Completion Date:** Ensure both entries are submitted by [insert date]. Any additional entry will give you a credit of [\$2]. The maximum credit you can receive is [\$10] in total.
- **Content Requirement:** Focus on news related to your life in the U.S.
- **Language Preference:** You may write in any language you are comfortable with.

**How Will Your Data Be Used?** We will utilize your entries in a “show and tell” format to inspire and guide our discussions in the upcoming group session. There are no right or wrong answers; your responses will help us understand your news reading habits and preferences.

If you have any questions, feel free to contact the researcher, Yongle.

## News Diary Entry Example

**Task 1: Share news you read today.** Share a link, a photo, a screenshot, or a brief summary of the news you read. If it is not in English, that's completely fine. We are interested in understanding what you read in your daily life. *[Share your answer here]*

**Task 2: How did you come across this news?** Describe the circumstances under which you encountered this news (e.g., where you saw it, whether it was through digital media, TV, or another channel). *[Share your answer here]*

**Task 3: What did you learn from this news? Why did you pay attention to it?** Please describe what you took away from the news and why it stood out to you. *[Share your answer here]*

**Task 4: Any additional thoughts about your news reading experience?** Feel free to discuss any questions that arose, how you shared the news with others, or any further actions you took after reading the news. *[Share your answer here]*

**Date:** \_\_\_\_\_

## Journalist News Reading Task

### Welcome to the News Review Task!

Thank you for participating in this exercise. Over the next few days, you will complete at least two entries reflecting on your media practice. Your insights are invaluable and will play a critical role in enriching our upcoming brainstorming sessions.

### Instructions



- **Completion Date:** Please submit each review within three days of receipt.
- **Compensation:** You will receive \$6 for two completed entries. Each additional entry will earn \$2, up to a total maximum of \$10.
- **Access:** Editing access is provided via your registered email from the signup survey. If you encounter any issues, please ensure you are logged in with the correct email.

**How Will Your Data Be Used?** We will utilize your entries in a “show and tell” format to inspire and guide our discussions in the upcoming group session. There are no right or wrong answers; your responses will help us better understand your process of reading and examining news content.

If you have any questions, feel free to contact the researcher, Yongle.

### Task Entry Example

**Task 1: Read the news shared by an immigrant participant.** Please share your main takeaways in the text box below. *Note: Please approach this task as you would your typical news reading routine.*

**News Link:** \_\_\_\_\_

**Main Takeaways:** *[Share your answer here]*

**Task 2: Assess the “quality” of the news.** How do you perceive the quality of this news? Please outline the criteria you use to judge news quality.

*[Share your answer here]*

**Task 3: Analyze the immigrant participant’s comment:**

“It’s going to be rough. What will be the negative impact of this?” – Immigrant reader

**Question:** Help this reader. Briefly explain the potential immediate or long-term implications of the news content, and explain how you derive such implications.

*[Share your answer here]*

**[Optional] Task 4: Additional insights or questions** Do you have any further reflections or questions from this news reading experience?

*[Share your answer here]*

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