NEWS PERSONALIZATION:
DO JOURNALISM AUDIENCES PREFER ALGORITHMS OVER EDITORS?

by

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Abstract

This project-paper explores what motivates news organizations to employ algorithmically driven news personalization techniques and develops a methodology to determine whether journalism audiences have a preference between story lineups determined by an editor or by an algorithm. This work also examines whether news personalization systems meet the information needs of news audiences and works to determine what algorithmic approaches could better meet these needs.

Through the creation of a simple online news personalization system, this project has developed a method driven by analytic measurement coupled with a survey approach to determine audience opinions on news recommendation systems. A small user study was conducted that supported the feasibility of the system as a research tool and identified possible improvements to my methodological choices.

The research presented as part of this project-paper found that news organizations use news personalization systems for a variety of economic and editorial reasons. This paper also explores the social impacts of news personalization techniques and posits that there is nothing inherent to the design of personalization systems that precludes supporting the democratic and social ideals of journalism.

Keywords: algorithms, personalization, journalism, online news, gatekeeping

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Chapter 1: Introduction

The news industry finds itself at a crossroads. Traditional outlets for news dissemination—such as print, radio, and television—have faced layoffs, declining audiences, and reduced revenues, and this disruption has been the focus of significant academic research (Cohen, 2015; Edmonds, 2015; Public Policy Forum, 2017). At the same time, the evolution of internet-based digital platforms has provided novel ways for news outlets to reach new audiences, with content that is personalized, interactive, and engaging (Boyles & Meyer, 2016; Cohen, 2015).

News audiences often turn to social media platforms to stay informed about world events (Shearer, 2021). Younger people rely on social media platforms for incidental news exposure (Bergström & Belfrage, 2018; Duffy, 2021). Digital platforms and internet-enabled devices have changed how audiences consume the news, and journalism finds audiences through social media feeds and mobile notifications (Duffy, 2021). Social media and search platforms leverage significant repositories of digital data that record their user's interests, demographic information, and online activities to create news distribution experiences individualized to each user (Powers, 2017). Faced with declining revenues and increased competition, should the news industry take a page from social media and search platforms and create more personalized journalism experiences?

This project-paper explores what motivates news organizations to employ personalization and works to determine if there is an audience preference for the technique. Through the creation of a simple online news personalization system, this project has developed a method driven by analytic measurement, coupled with basic survey-based methods, to determine audience opinions on news recommendation systems. By presenting study participants with a story lineup determined by an algorithm and another determined by an editor, and measuring the changes in use between each configuration, the hope is that a clearer picture of algorithmic preference might emerge. A small user study was also conducted that measured the feasibility of both the system as a research tool and the methodological choices.

My research is informed by almost a decade of working as a digital journalist and media production professional. Specifically, in my work as a digital news producer at the CBC, I have seen firsthand how search and social media platforms have changed how we create and deliver news. Myself and my journalism colleagues focus a significant amount of our efforts on

packaging our content in ways that will appeal to both our audiences as well as the algorithms that highlight our content on platforms such as YouTube and Facebook. We tailor our headlines and our copy so that our journalism features more prominently in Google search results. The impact of platform-specific algorithms on our journalism has been significant, and this project-paper also works to critically examine the role that algorithms, and the nascent movement towards personalization in the news industry, play on the critical social role that journalism fulfils.

Chapter 2: Literature Review

2.1 The Role of Online Algorithms

Much of what audiences see online is determined by algorithms, as social media platforms, online stores, and search engines are all dependent to varying degrees on algorithmic processes (Langlois & Elmer, 2013; Smith & Linden, 2017). Despite their significant impact, there is still confusion over what algorithms are and how they are used online (Hargittai et al., 2020).

This confusion regarding algorithms is understandable. How algorithms operate and what they do is often hidden from users. The hidden nature of algorithms is often referred to as a black box (Diakopoulos, 2015). People know algorithms exist, but what they do and how they do it is hidden by this metaphorical black box.

In simple terms, algorithms can be defined as being a series of steps designed to solve a problem (Butterfield & Ngondi, 2016). Algorithms online are most often used to provide relevance to large amounts of information (Gillespie, 2014). They work to sort through mounds of data—from websites in search engines results to products in online retailer stores—to highlight content that matches well with user interests. As Striphas (2015) outlined, society has increasingly delegated the classifying and sorting of culture to computational processes in a concept described as "algorithmic culture".

2.2 Concerns Over Algorithmic Culture

As their role as purveyors of culture increases, further attention is being paid to the influence of algorithms. Striphas (2015) explored concerns over the privatization of processes related to what is and is not determined culture, when that process is wholly or partially turned over to algorithms. In part, the emergence of algorithmic culture has led to what Striphas (2015) outlined as the abandonment of society's publicness, replaced by a process where important information is determined computationally rather than through social deliberation.

Just and Latzer (2017) expand on Striphas' critique of the social role of online algorithms by positing that algorithms act as a governance mechanism, exerting power over both individuals and the collective public. In their view, algorithms not only influence what we think about and how we think about those things, but also how we act (Just & Latzer, 2017). As Just and Latzer

(2017) outline, algorithms often focus attention on some items over others which supports Striphas' view of an algorithmic culture that shapes "the construction of individuals' realities, that is, individual consciousness, and as a result affects culture, knowledge, norms, and values of societies, that is, collective consciousness, thereby shaping social order in modern societies" (Just & Latzer, 2017, p. 245).

The political ramifications of public relevance algorithms were explored in depth by Gillespie (2014), whose focus on the promise of algorithmic objectivity remains relevant today. As Gillespie (2014) describes, despite claims of the contrary from major platforms like Facebook and Google (Kyl, 2019; Verger, 2018), no algorithm is free of bias, influence, or subjectivity (Frizzera, 2018). Instilled in the mechanics of how relevance is algorithmically assigned to certain pieces of content are human values, which can be influenced by innumerable factors such as political and economic pressures.

Gillespie (2014) also introduces the concept of the calculated public. Unlike networked publics, which form when communities of like-minded people connect organically in online spaces (boyd, 2010), calculated publics are algorithmic constructions of digital platforms. Product recommendations in online retail stores and friend suggestions on social media are both forms of calculated publics. As Gillespie (2014) notes, these virtual calculated publics begin to matter when they are thought of as legitimate by users or authorities.

This research shows there is concern over the power that online algorithms have to shape our world. They are not benign computational processes. Inordinate power has been placed in the hands of the people that create and the platforms that employ online algorithms. As outlined by Striphas (2015) and Gillespie (2014), online algorithms create a form of both an algorithmic culture and a calculated public that has changed the notion of the traditional public sphere. Viewed in a modern context, algorithmic culture and calculated publics are not without their benefits as calculated publics can connect disparate communities that share common interests while algorithmic culture can work to highlight content that individuals might miss.

2.3 Information Overload

Online algorithms gauge the relevance of digital content. Google search results both match search terms and provide content that is relevant to a user's location and personal preferences (Kliman-Silver et al., 2015). Facebook feeds show content that piques users's

interest and increases engagement (Bucher, 2018). News personalization systems often work to expose audiences to stories that might find them compelling (Bodó, 2019). In each of these cases, online algorithms help make sense of vast amounts of information. Online relevance algorithms help us deal with information overload.

Information overload can occur when someone is receiving too much information and thus processing that information is challenging (Eppler & Mengis, 2004). Bawden and Robinson (2009) outlined that when faced with a "paradox of choice," users feel overwhelmed and anxious. When feeling overloaded, information feels like a hindrance, even though it could be useful (Bawden & Robinson, 2009).

While there is consensus that information overload exists, it has been found that it does not affect a majority of online users. A British survey found that 35% of respondents felt stress from data overload, which impacted their sleep and relationships with their families (Esri UK, 2015). An American survey found that 20% of respondents had experienced information overload, down from 27% percent a decade earlier (Horrigan, 2016). Research has revealed that younger people feel higher levels of information overload (Schmitt et al., 2018). Among U.S. adults, it has also been shown that less educated and lower-income people feel higher levels of information overload (Horrigan, 2016).

When a surplus of online news causes information overload, each individual's ability to mitigate their own feelings of anxiety can impact their participation in the social discourse that journalism affords (Song et al., 2017). Throughout history journalism has filled an important role in fostering the development of a healthy democratic public sphere (McNair, 2000). Be it citizen-based or practiced by professional journalists, online journalism—with its potential for inclusion, engagement, and transparency (Dahlgren, 2013; Karlsson et al., 2017)—has played a key role in fostering political movements and social change (Aitamurto, 2015; Allen et al., 2007).

Lee et al. (2019) found that news audiences dealt with information overload via selective scanning and news avoidance. With selective scanning, users narrowly focus on content that interests them. Song et al. (2017) outlined that news consumers practice news avoidance by employing prioritization and management techniques; they "simply shut down through the rejection or avoidance of information" (p. 1175).

To help mitigate feelings of information overload within the realm of online news, it has been shown that audience could turn to news personalization techniques (Haim et al, 2018; Powers, 2017).

2.4 Changes in News Distribution

The journalism industry has seen significant shifts in both where and how audiences consume news. A recent Reuters Institute study found that audiences have increasingly turned to social media platforms to discover news, moving away from print and television offerings (Newman et al., 2020). That same study revealed that in most countries surveyed, smartphones have surpassed desktop computers as the preferred digital device to engage with news (Newman et al., 2020).

Before the introduction of social media and other digital platforms, news organizations had relatively exclusive access and ownership of the distribution channels required to reach a wide audience with their content (Ekström & Westlund, 2019). With the advent of new forms of journalism distribution, afforded by social media spaces and the emergence of user-generated content and citizen journalism, mainstream news organizations have lost some of their monopoly over news distribution (Ekström & Westlund, 2019).

The news industry's loss of control over journalism's primary distribution channels has led to the emergence of what Bell and Owen (2017) have dubbed the "platform press." They outline that major tech companies have essentially become publishers, and they foresee a future where news organizations cede publishing to companies such as Facebook, Snapchat, Google and Twitter (Bell & Owen, 2017).

The expansion of the use of social media as a news platform has also led to incidental discovery of news information (Bergström & Belfrage, 2018; Duffy, 2021; Kim et al., 2013). Younger audiences have been found to be passive consumers of news information, relying on social media algorithms and their online peer networks to share news information (Duffy, 2021).

A further disruption felt by the news industry has been the emergence of both user-generated content (UGC) and citizen journalism. Professional journalists are no longer the exclusive creators of journalism content, as everyday citizens are increasingly using social media platforms and digital devices to share information about news events (Chung, 2018; Noor, 2016). Duffy (2021) outlined that the development of citizen journalism and UGC has altered the

journalist-audience dynamic, scattering information authority to a broader group of content creators both inside and outside of the news industry. This has led to a "horizontal connectivity" which has allowed regular people to entirely bypass traditional media structures to share information with one another (Duffy, 2021).

Given these external pressures and disruptions, news organizations find themselves in the position of having to decide whether they should develop new paradigms of news distribution and content creation. The decision for many might be whether their newsroom should further embrace social and search platforms as news publishers, or whether a greater focus should be placed upon developing proprietary systems, such as algorithmic news personalization approaches, to mimic some drivers of success these platforms have enjoyed.

2.5 The Changing Nature of the Journalistic Gatekeeping

Journalists have long served as gatekeepers of social information, but the emergence of algorithmic digital platforms has significantly altered the news industry's monopoly on determining what audiences are exposed to.

As Shoemaker and Vos (2009) outline, "Gatekeeping is the process of culling and crafting countless bits of information into the limited number of messages that reach people each day, and it is the center of the media's role in modern public life" (p. 1). My examination of the issues surrounding information overload has revealed that audiences often have a limited capacity to process large amounts of information, and editorial gatekeeping invokes a curatorial process that makes the flow of news information more manageable and understandable to mass audiences.

There has been significant research into the concepts of, and issues surrounding, journalistic gatekeeping throughout communication scholarship. Early forms of journalistic gatekeeping were seen in the selection processes of telegraph news wire editors, who passed on stories from around the world to local audiences (Bro & Wallberg, 2015). Inspired by the work of Lewin (1947), who explored gatekeeping in food consumption processes, David Manning White (1950) provided an early examination of gatekeeping within journalism. White (1950) profiled a newspaper wire editor responsible for selecting stories and editing articles from wire services such as the Associated Press for inclusion in daily editions. Given the pseudonym of Mr.

Gates, White (1950) found that the editor's decisions were often based on measures of subjective merit and space constraints.

To better understand what motivates journalists and editors such as Mr. Gates, it is necessary to examine the roles of newsroom workers, particularly editors and reporters. Sumpter (2000) outlines that reporters gather and create stories, and editors determine the prominence of these stories to news audiences. Duffy (2019) outlined that editors differentiate themselves from other journalism roles in that they both manage newsrooms and undertake editorial tasks. Duffy (2019) provides a helpful definition for an editor:

> An individual who oversees newsgathering and dissemination in order to benefit society by contributing to informed debate in the public sphere; who negotiates a balance among audience interests, organisational interests and journalistic principles in order to achieve this goal; who is an arbiter of what is distributed as journalism; and who in doing so helps to legitimise the place of journalism as a form of cultural production and a generalised social good. (p. 5)

As Duffy (2019) outlines, editors maintain a tricky balance of ensuring that a news organization's editorial and business goals are met, while at the same time meeting the information needs of larger society. While journalism still maintains an element of White's (2015) historic notion of editor-based gatekeeping, digital platforms have significantly altered the level of exclusivity the news industry once held over information curation aimed at mass audiences.

Even before the rise of social media and algorithmic platforms, the emergence of internet-based digital journalism significantly altered traditional journalism's monopoly on gatekeeping. Blogs, discussion forums, and even the commenting systems on news organizations's own websites introduced a form of news-making that Singer (2011) has described as "participatory journalism," where news audiences fill a much bigger role in creating and shaping what is news. In later work, Singer (2014) outlined that news audiences have become secondary gatekeepers, highlighting and amplifying the content of news organizations both to their own peer circles and to larger audiences. The impact of digital audiences on journalistic gatekeeping need not always be as direct, as several studies have also shown that audience-based web metrics are affecting which stories are highlighted over others (Blanchett Nehli, 2018; Tandoc, 2014; Vu, 2014).

The emergence of both citizen journalism and user-generated content have also affected the news industry's gatekeeping role. Social movements such as the Arab Spring have not relied upon the mainstream media to pass on information about significant events to a larger global audience (Duffy, 2021). User-generated content has shown that any person with a smartphone can be eyewitness to a major event and share that news with the world (Duffy, 2021).

Social media sites have played a key role in facilitating this new form of audience-led gatekeeping (DeVito, 2017). Social media platforms rely on algorithmic processes to make curatorial decisions (Bucher, 2018). These relevance algorithms have become gatekeepers, determining what an audience should see in a similar fashion to journalists. As social media sites further advance notions of algorithmic curation, academic research has compared this automated form of gatekeeping to traditional journalism's editorial processes.

Journalism is often guided by a loosely defined set of professional ethics and standards (Carlson, 2018; Schultz, 2007). These values work to guide an editorial selection process that often strives to make objective and subjective curatorial judgements in an effort to "represent the world to audiences" (Carlson, 2018, p. 1757). While editors and journalists select stories based on notions of perceived social importance to a mass audience, relevance algorithms most often tailor content to individual interests (Carlson, 2018). The creation of a personalized news experience, which has been dubbed by Negroponte (1995) as "The Daily Me," has shown that when compared to journalistic judgement, algorithmic judgement moves from "what deserves attention" to "what does this person want" (Carlson, 2018, p. 1765). Given this, Carlson (2018) concludes that algorithmic judgement is not an extension of journalistic judgement, it is an entirely new creation with a distinct set of motivations and actors.

Wallace (2018) outlined that algorithmic gatekeeping, particularly within social media spaces, is far more complex than traditional forms of gatekeeping. Since social media and search platforms rely on online behaviors and the actions of multiple users to drive their relevance algorithms, Wallace (2018) explains that digital platforms can feature a multitude of gatekeepers. Compared to a traditional newsroom, where the gatekeeping processes might be centralized among a small set of editors or senior reporters, what one sees in a social media space could be determined by one's neighbours, friends, family, or even people one has never met. This form of curation, which Shaw (2012) called "decentralized gatekeeping," relies upon the larger community to provide relevance to online content.

The gatekeeping role of journalists has shifted due to the emergence of digital platforms, which are often reliant on algorithmic processes. These forms of digital gatekeeping differ from journalistic curation approaches and are often driven by entirely different motivations. Despite journalism's diminishing gatekeeping role, digital platforms have not eliminated the notion of gates as outlined by Lewin (1947) and White (1950). As Singer (2014) states, algorithmic systems have introduced "more gatekeepers than ever" (p. 68), as a multitude of actors, including audiences, journalists, and social media platforms, all help to determine what is seen online.

2.6 Defining Personalization

News personalization systems have been a significant area of academic research in the fields of journalism, communications, and computer science. Within humanities focused disciplines, research has often focused on the social impact of algorithmic curation systems. Such research has typically employed survey analysis, interviews of system users or industry stakeholders, or the analysis of use of pre-existing personalization systems such as Google News (Bandy & Diakopoulos, 2020; Bodó, 2019; Bodó et al. 2019; Dillahunt et al., 2015; Haim et al., 2018;Trielli & Diakopoulos, 2019).

Online personalization in its most basic sense alters the online experience to individual interests. Thurman (2011) provides an oft cited definition that personalization approaches are:

> A form of user-to-system interactivity that uses a set of technological features to adapt the content, delivery, and arrangement of a communication to individual users' explicitly registered and/or implicitly determined preferences. (p. 397)

As Thurman (2011) describes, a personalization system will often alter online content, change how that content is delivered, and shape how the content is presented to audiences. From a news personalization perspective, based on Thurman's (2011) definition, a personalization system could alter a news article to appeal to individual tastes, create a custom delivery system such as personalized smartphone notifications, or alter the appearance and prominence of stories on a news website.

Bodó (2019) outlined two strands of personalization that have impacted journalism consumption: a "platform logic of personalization" and a "news logic of personalization". Platform logic is most evident in social media spaces such as Twitter and Facebook. With a

massive user base and virtually limitless content, these platforms have access to significant amounts of data. Driven by a wildly successful ad-revenue based model, these tech behemoths also have access to immense amounts of technical infrastructure and expertise. As Bodó (2019) outlines, they have shown strong resistance to editorial oversight or control. On the other hand, a news logic of personalization can be seen when newsrooms implement personalization techniques in their own digital spaces such as on their websites or mobile apps. Compared to platforms, news organizations have far smaller user bases, less tech resources, a weaker ad model, and strong editorial oversight (Bodó, 2019).

Beam (2014) outlined that the terms personalization and customization are often used interchangeably, but he describes key distinctions between the two terms. As Beam states personalization is "referred to as a product or message changed with regard to a specific customer" (p. 1022) while customization refers to the "degree to which a user explicitly interacts in the personalization process" (p. 1022). Beam (2014) uses this distinction to outline two typical approaches to online personalization. First, a customized recommendation system is a system that relies significantly on user input to form its recommendations, while alternatively a "computer-generated recommender system" (Beam, 2014, p. 1022) does not feature user-based customization options.

In a similar vein, Thurman and Schifferes (2012) outline that online personalization most often relies upon audience insight to formulate personalized experiences, and this insight is gathered either explicitly or implicitly. Explicit forms of personalization rely upon direct input from users to guide the personalization process. Implicit personalization makes curatorial judgements based upon an indirect collection of user data, relying on browsing and transaction histories to build comprehensive profiles of individual interests (Bodó, 2019).

News personalization systems make recommendations based upon two broad approaches, content-based and collaborative filtering. Content-based filtering makes recommendations based upon the interests of an individual user (Bozdag, 2013; Lavie et al., 2009). In a content-based news personalization approach, if a person has been found to be interested in stories related to sports and business, they will see more stories of these types.

Collaborative filtering bases recommendations upon the interests of other users that are determined to be similar to subject users (Bozdag, 2013; Lavie et al., 2009). For example, if Mary reads articles about Canadian politics and sports, and Jennifer shares these same interests

but also enjoys reading articles related to the environment, a collaborative system recommends environmental stories to Mary based on her shared interests with Jennifer.

Lops et al. (2011) outlined some advantages and disadvantages of content-based personalization techniques. Content-based systems are not reliant on other users to make their recommendations and provide an independent content experience for each user (Lops et al., 2011). With content-based approaches, new items can be recommended to users without having to be explicitly rated or read by other users, a significant drawback to collaborative systems (Lops et al., 2011). Content-based recommendation systems can however lead to over-specialization as they do not have the inherent ability to recommend something unexpected (Lops et al., 2011). These disadvantages and advantages often lead to personalization systems using a hybrid approach that combines content-based and collaborative filtering (Torman & Can, 2015).

2.7 The Push for Personalization

Having a clearer understanding of what personalization is, it is important to also understand why news organizations might use the technique. Personalized recommendation systems can increase site traffic, help develop loyalty to one online news source, and promote audience concentration (Hindman, 2012). Bodó (2019) found that algorithmic news recommendation systems allowed journalists to highlight stories in meaningful new ways. Algorithmic personalization systems also allow news outlets to highlight stories that audiences were missing and serve underserved audiences with stories specific to their interests (Bodó, 2019). Personalized news approaches also allowed news organizations to re-aggregate disaggregated news and recontextualize journalism in ways that were not possible in a purely human-chosen story lineup (Bodó, 2019). Like many journalism technologies, some news workers that Bodó (2019) spoke to cited economic concerns as a motivating factor for embracing personalization, thinking of it as a service that audiences would pay a premium for. Many of Bodó's (2019) conclusions on the motivations for news personalization can be seen in current implementations of the technology.

The BBC has found success with its personalization efforts on its mobile app, where it provides audiences the opportunity to follow specific topics in a customized feed (Kelion, 2015;

Stahl, 2020). BBC News Labs editor Robert McKenzie described some of the challenges of creating meaningful personalized content:

> Personalization means so many different things to so many different people. That's one of the things we're grappling with now, how do we produce the different varieties of content that are needed for that—at a time when the BBC is trying to save money—and how do we work out who wants what. (TVNewsCheck, 2020)

As McKenzie outlines, even with a personalized content approach, it is still challenging to meet the needs of all users.

The New York Times has experimented with personalizing its homepage based upon a user's location and by highlighting a mix of editor-chosen and personalized content based on audience reading behavior (Bilton, 2017). Motivated by a desire to change how they distribute their content, The New York Times hoped personalization would meet the diverse needs of their audience. As the Times's Caroline Que describes, the paper wanted to move to a model, "where everyone sees the exact same thing all the time is not the only way to expose people to our work" (Bilton, 2017). Que outlined that The New York Times wanted to maintain the notion that journalism should be a shared experience with a mix of editor selections and algorithmic personalization (Bilton, 2017). The prevailing motivations revealed in Bodó's (2019) work were outlined in the Times's own explanation of why they personalized their web content:

> We publish hundreds of stories each day, but we know that you sometimes miss stories that you may have enjoyed. By using personalization, we hope to surface content that you may like, keep you up-to-date with topics you're interested in, and ultimately help you better understand what's happening in the world. (The New York Times, n.d.)

As Bodó's (2019) research also revealed, The New York Times uses their personalization techniques to highlight content that an audience might miss.

Like The News York Times's personalization efforts, the NPR One app—the mobile audio app of U.S.-based National Public Radio—works to highlight content based on perceived user interest, while also ensuring audiences hear a variety of viewpoints and content types (Charney et al., 2016). NPR's algorithm works to promote editorial balance by sharing stories that might highlight multiple sides of one issue, but normally would be aired on different

broadcasts (Charney et al., 2016). Bodó's (2019) observations that newsrooms are using personalization to reaggregate and recontextualize disparate content are clearly visible in the practices of NPR.

Bodó's (2019) interviews also reveal that news organizations are often motivated by economics to personalize content. The most significant use of news personalization in Canada has clear links to the business side of journalism. The Globe and Mail has created a custom AI personalization system called Sophi, which places over 99% of the pages on the newspaper's website (Sophi, 2020). Sophi uses artificial intelligence to determine what content is most valuable and needs highlighting, based upon how much each article retains audiences, gains subscribers, and generates advertising revenue (Sophi, 2020). After introducing Sophi, The Globe and Mail has claimed both greater click-through rates on articles and increased subscriber growth (Sophi, 2020).

2.8 Audience Acceptance of Personalization

Having investigated the news industry's motivations for personalization, it is crucial to also examine personalization from an audience perspective. The 2016 Reuters Institute Digital News Institute report found that audiences had mixed feelings regarding personalization (Newman et al., 2016). The Reuters survey revealed audiences preferred their news to be automatically selected for them based upon what they have read before, over having their stories selected by editors (Newman et al., 2016). However, audiences preferred both selections from editors and stories based upon previous story consumption, over stories being automatically selected based upon what their friends had read (Newman et al., 2016). Participants surveyed also expressed concerns that automated news personalization could result in missing key information or not being exposed to challenging viewpoints, and expressed worries about privacy (Newman et al., 2016).

Outside of a journalism context, this preference for algorithmic judgement over human judgement was also confirmed in the work of Logg et al. (2019). Across several subject domains, Logg et al. (2019) discovered that their study participants relied more on algorithmic advice than advice from other people, and even trusted algorithmic advice over their own judgement. They found that people were willing to accept algorithmic judgement regardless of their age and those who considered themselves experts were less open to accepting algorithmic advice (Logg et al.,

2019). While not focused on algorithmic use in journalism, this study confirms that there is general acceptance of allowing algorithms to have some decision-making authority, but the level of acceptance is variable depending on an individual's level of knowledge of the practice.

Performing a secondary analysis of the 2016 Reuters digital news survey results (Newman et al., 2016), Thurman et al. (2019) provided insight into algorithmic acceptance in a news setting. Their research revealed that as age increases, audiences are more likely to prefer editor-based selection over algorithmic personalization (Thurman et al., 2019). It was also found that lower levels of education result in lower levels of acceptance of algorithmic news personalization (Thurman et al., 2019). Individuals that relied upon mobile devices to access their news were found to be more accepting of news selection in general, and algorithmic judgement in particular (Thurman et al., 2019). Similar higher levels of algorithmic acceptance were found among audiences that relied upon social media as a news source (Thurman et al., 2019).

2.9 The Problem with Personalization

Journalism consumers vary in their acceptance of algorithms and the motivations for news organizations to employ personalization techniques vary, but what challenges to both groups might personalization present?

Early scholarship on news personalization expressed a general worry that the practice would lead to filter bubbles. A term first explored by Eli Pariser (2011), filter bubbles can be loosely defined as confined idea spaces that online algorithms lock a person into. In a filter bubble you are only exposed to ideas, content, and viewpoints that an algorithm has determined best meet your interests. As Kitchens et al. (2020) outline, filter bubbles can lead to "intellectual isolation and social fragmentation" (p. 1621). The term "echo chamber" is often used interchangeably with filter bubbles, but a commonly outlined distinction is that within an echo chamber you are sharing a narrow set of views with a group of individuals, while filter bubbles are a construction that affects a person individually (Sunstein,s 2006; Kitchens et al., 2020). Whatever the distinction between the two terms, significant debate has been generated over whether echo chambers and filter bubbles result from the use of news personalization systems.

Bodó et al. (2019) have outlined that Pariser's (2011) notion of online filter bubbles relies upon several oversimplifications. Pariser (2011) assumes that news users do not value content

diversity and only want to read content that most matches their interests and viewpoints. From Pariser's (2011) viewpoint, the use of personalization in news was growing, and he predicted that a personalization approach would soon be the only type of news experience available. However, a cursory examination of the current news landscape reveals that users still have significant options for non-personalized news such as newspapers, radio, and television.

As Bodó et al. (2019) outline, Pariser's (2011) filter bubble premise relies on the assumption that online algorithms are only designed to meet the narrow needs of users and cannot serve users who desire diverse news. Several studies of emergent forms of online news personalization have supported the notion that there is nothing inherent to the technology of news personalization design that cannot counter filter bubble concerns.

By simulating three common approaches to news personalization design, Möller et al. (2018) worked to determine how content diversity exposure changes when algorithmic recommendation is compared to human editor story selection. Performing recommendations based upon the general popularity of news items, past article consumption, and insight from other users, their study revealed that there was no significant reduction in content diversity exposure when using these personalization techniques (Möller et al., 2018).

Via an examination of the Google News platform, Haim et al. (2018) explored whether implicit and explicit forms of personalization in the popular online news aggregation site led to audiences being exposed to a lower diversity of story types, supporting the concept of filter bubbles and echo chambers. Using constructed user profiles of several media consuming archetypes, Haim et al. (2018) measured whether different users would be exposed to a narrow set of story types and news sources via Google's news algorithms. Their findings revealed that Google News's personalization techniques did not significantly affect the types of stories and sources of news individual users were exposed to (Haim et al., 2018). Given that the study did not employ human participants and did not measure whether actual audiences read stories they were recommended, the study does not prove that filter bubbles do not exist, but it supports a notion that algorithmically driven personalization systems can be designed in a way that still ensures a person is exposed to a variety of viewpoints.

The conclusions of Haim et al. (2018), were confirmed in very similar work by Nechushtai and Lewis (2018). Focused less on constructed news profiles, Nechushtai and Lewis (2018) asked actual news audiences from a variety of political perspectives and demographic

groups to search for news about Donald Trump and Hillary Clinton in the run-up to the 2016 U.S. presidential election using the Google News platform. By analyzing the search results of these participants, Nechushtai and Lewis (2018) learned that despite differences in political leanings and geographic locations, most users were exposed to very similar news stories.

Despite research that indicates that at least in certain news personalization implementations filter bubbles may not be a concern, worries that algorithmically driven digital platforms might lead to misinformation remain (Fernandez & Alani, 2018; Rhodes, 2021). Social media platforms in particular have amplified misinformation, and emergent personalization techniques must grapple with this issue.

A further concern of news personalization system use has been their potential effect on journalism's role in supporting a democratic society. Helberger (2019) outlined that journalism serves two significant roles in supporting the democratic process: informing audiences and creating a diverse public forum. The role that journalism plays in supporting notions of Habermas's (1989) public sphere has been a significant area of academic research (McNair, 2000) and the impacts of algorithmic news personalization on the construction of this collaborative form of discourse has become a growing area of focus.

Caplan and Boyd (2016) argued that the use of algorithms within journalism has significantly disrupted the traditional public sphere. As they outline, personalization algorithms have changed news consumption from a collective social experience to one focused on meeting individual consumption needs (Caplan & boyd, 2016). As they state, "As people turn to media and topics that they find of interest, not ones deemed to be of interest to the public good by those by cultural elites, this often produces a rejection of both universality and diversity" (Caplan & boyd, 2016, p. 9).

While his analysis was more focused on social media platforms and smartphones, Duffy (2021) also explored how journalism has moved towards a focus on individual consumption rather than a shared social experience. Particularly referencing how smartphone notifications often shared stories that matched individual interests, Duffy (2021) explained that these algorithmic approaches have changed the potential communal experience of consuming the news:

> ...the collective is replaced by a focus on the individual, altering the relationship between the news and the reader to become one of individual choice consumption, rather than a

> shared, communal experience. First, push notifications alert a reader to breaking news or to news relevant to their own interests. The effect here is to separate the single story from the newspaper, losing the critical mass of 'news' to become more customised to the individual's tastes (p. 36).

Similar to Negroponte's (1995) notion of "The Daily Me," the individualization of the news experience that could come through personalization has the potential to impact the social and discursive role that journalism can play. As Duffy (2021) references, gone are the days where an entire train full of people would read the same newspaper, replaced by a sea of passengers with their heads buried in a smartphone engaging with their own unique content experience.

Despite worries regarding the individualization of news consumption that personalization may afford, there is nothing inherent to the design of news personalization algorithms that suggests they cannot support the democratic ideals of journalism. Helberger (2019) proposed news recommendation models that could support journalism's democratic purposes. In her work, Helberger (2019) outlines four different types of recommendation systems. Liberal recommenders are the most used recommendation system and base their recommendations on information most relevant to a user's interests (Helberger, 2019). Despite their focus on individual interest, Helberger (2019) believes that liberal recommenders can still fulfil a democratic purpose if news audiences have access to a variety of news sources and if their privacy and autonomy is still respected. Participatory recommenders were defined as systems that strive to represent all viewpoints on an issue (Helberger, 2019). Similarly, critical recommendation systems worked to challenge audience conceptions with alternative viewpoints (Helberger, 2019). Finally, deliberative recommendation systems work to reconstruct common spaces that do not exist in a fragmented news environment, exposing audiences to ideas that they may have not encountered otherwise (Helberger, 2019). All these models add to the notion that news personalization systems can be designed in a way that eases many of the social concerns related to their implementation. As Bodó (2019) outlined, "a news logic of personalization" can balance individual consumption needs with editorial goals of highlighting socially important content.

From a legal and policy standpoint, Eskens et al. (2017) argued that news personalization techniques could impact news audiences's right to receive information. Citing the European

Convention on Human Rights, Eskens et al. (2017) assert that individuals have the right to both receive and share information and ideas. Eskens et al. (2017) describe that news personalization systems can both support and detract from this right to information. News personalization can support information rights by both highlighting content that might be hard to discover and sharing information that better matches a user's interests (Eskens et al., 2017). However, a recommendation system that purposefully reduces access to news, reduces story and source diversity and leads to less social cohesion, could be a threat to universal information access (Eskens et al., 2017).

Faced with declining levels of trust (Newman et al., 2020), transparency has quickly become an important issue for news organizations. Some news outlets have implemented processes that have made formerly hidden elements of their editorial process visible. Open data disclosure, the use of public editors and ombudsmen, increased prominence of correction notices, and editor blogs are all efforts by news organizations to increase transparency in their work (Fenlon, 2021; Ferrucci, 2019; Zamith, 2019).

This push for transparency however becomes complicated when news organizations employ algorithmic processes. The operations of news algorithms are often obfuscated by the metaphorical black box (Diakopoulos, 2015) and even if algorithmic code was open source, not every audience member has the technical knowledge to understand complex computer code.

By consulting stakeholders across both academia and the news industry, Diakopoulos and Koliska (2016) explored possible opportunities to make news systems driven by algorithms more transparent. Specifically regarding news personalization systems, study participants wanted clear indications that content was being recommended to them based upon algorithmic curation or editorial selection (Diakopoulos & Koliska, 2016). Users also expressed a desire to see how news lineups would look both with and without personalization (Diakopoulos & Koliska, 2016). As algorithmic technology becomes more ubiquitous, it has become challenging to determine where algorithmic influence ends and begins on websites and news organizations might face increased pressure for algorithmic transparency.

The calls for algorithmic transparency in journalism are often motivated by worries over bias. Gillespie (2014) explored the notion of the "promise of objectivity" describing how algorithmic driven platforms publicly state that their relevance algorithms are free from human intervention while at the same time they hide content that is illegal or block dissident speech in

certain countries. There has been no shortage of claims within the U.S. political establishment that search and social media platforms are biased against certain forms of content (Thompson, 2020), and this notion raises the importance of ensuring news personalization approaches embrace transparency within their design.

A prevailing theme throughout modern news personalization research is that how recommendation systems are designed has a significant effect on their social impact. It has been shown that filter bubbles and echo chambers are not an inherent consequence of the use of algorithmic systems. While the individualization of news experiences has the potential to weaken the public sphere supported discourse that journalism can create, the work of Helberger (2019) has shown that personalization algorithms could be designed in a way that supports democratic processes. Potential biases evident in personalization systems are a valid concern but implementing transparency measures within these systems could work to mitigate these apprehensions.

News personalization systems are reliant on algorithms. This form of algorithmic culture works to determine what news audiences may or may not see, partially supplementing the traditional gatekeeping role of journalists. While personalization approaches can help with feelings of information overload, their use has the potential to disrupt the social role that journalism fulfils. The choice between having journalism content curated either by algorithm or editor is not an easy decision and is often motivated by both economic and editorial concerns. From an audience perspective there is not universal acceptance of algorithmic approaches in journalism, and as newsrooms contemplate employing personalization systems, audience needs must factor into their decisions.

Chapter 3: Research Questions

As revealed through my literature review, news personalization preference, both from an audience and news organization perspective, can depend on many factors. This project-paper focuses on news audiences and works to develop a method that can provide insight into why someone might prefer a news lineup determined by an editor or an algorithm. Specifically, this work explores the following research questions:

RQ1) Can preference for news personalization be determined by observing the use of an online system that presents audiences with a story lineup determined by an algorithm or a human editor?

RQ2) How do survey-based methods compare to web metric analysis for determining news story lineup curation preference?

RQ3) How do algorithmically determined story lineups compare to human-selected story lineups at meeting the information needs of audiences?

RQ4) How might the system design characteristics of a news personalization system impact its ability to meet audience needs?

Chapter 4: Methodology

This project-paper attempts to develop a method which could determine whether journalism audiences prefer a story lineup curated by either an algorithmic approach or by a human editor. This project embraces methodologies often used within computational social sciences by employing computational systems to analyze social behavior.

The method developed for this project-paper is centered on the creation of a rudimentary news personalization system that is both open and configurable by the researcher and serves as a research tool that provides insight into audience preference for news personalization systems through use of the systems themselves.

Participants were asked to use the news personalization system over a two-day period, one day with the system configured to recommend stories via an algorithmic approach and a second day where users saw a story lineup selected by human editors. Audience preference is determined through measuring the use of the system via web analytics software and via simple surveys which allow study participants to reflect on their use of the system.

4.1 News Personalization System Overview

For this project-paper, I created a methodology that could reveal audience preference for news personalization via the creation of a rudimentary online news personalization system. This system employs a simplified algorithmic approach to increase the understandability of how its recommendations are formed.

The online news personalization system's frontend and administrative backend were built using the Django web framework. I styled the user interface using the Bootstrap CSS framework. Further backend functionality was created using the Python programming language and its many libraries, most particularly the scikit-learn machine learning library, the pandas data manipulation library, and The Natural Language Toolkit (NLTK) library. News articles and user information are stored within MySQL databases and PHP was used to create a story interest selection interface. A commonality between these programming and system design tools is that they are open-source, free, and readily available. The eventual goal of the system created for this project is to make it openly available to other researchers, and it is hoped that by using both simplified recommendation techniques and easily available tools, the system will be more

accessible.

Using frameworks such as Django and Bootstrap has meant that the system was created without having to develop much of the key functionality from scratch (Bootstrap, n.d.; Mozilla, n.d.). Django is well suited for the rapid creation of web prototypes, as a developer does not have to create common system functionality such as user-authentication systems or administrative interfaces. Similarly, Bootstrap provides a significant amount of out-of-the-box web-based user interface functionality and eases the process of making a responsive website that is usable on a variety of devices. Employing frameworks allows tech literate researchers who are not everyday developers to more easily adapt and configure this system.

My news personalization system displays customized news lineups to a user in two configurations: 1) a customized story lineup that is determined by an algorithm and, 2) a story lineup that is determined by a human editor. This system is hosted on a virtual private server, a form of web hosting that allows for greater access to server resources. This web server can host Django projects, run PHP scripts, and possesses the ability to operate MySQL databases. Each user of this system was provided a unique username and password.

For this project-paper, news articles were read into the system from the Canadian Broadcasting Corporation (CBC), Canada's public broadcaster. Article website addresses were read via publicly available RSS feeds for eight subject areas: top stories, world news, Canadian news, politics, business, health, arts and entertainment, Indigenous news, and sports. Article information was then scraped from these story pages using the Beautiful Soup and Newspaper3k Python libraries and was stored in a MySQL database. The RSS feeds were checked for new articles every 10 minutes. For each article, the following information was read from the RSS feed and in some cases scraped from the article website: article title, article author, article body text, article description, article section and publication date. The article section information provides slightly more detail than the broader subject area, such as the region of interest of the story or the specific sport of a sports article. The headline image for each article was also downloaded.

The algorithmically determined story configuration shows a customized story lineup for each user with stories selected from three categories: 1) articles that match the story interests of the user, 2) stories that are trending on Reddit and 3) stories that are trending within Google search. For this project, I showed users a story lineup comprising 20 different articles. The

number of stories selected from each category is customizable by the researcher, and for this project-paper was set as 50% based upon story interest and 25% each from stories trending on Reddit and Google, respectively. The editor-determined story lineup shows 20 articles from the CBC's top stories RSS feed, which represents the top stories on the CBC News main page. These top articles are wholly determined by CBC News staff, who select these stories based upon editorial priorities including social importance, newsworthiness and analytic performance. In both the algorithmic and editor chosen story lineup configurations, user analytics were gathered using Google Analytics. Measures recorded include how often and when a user logged into the system, session lengths, articles read, and the categorical source of each read story.

Within the algorithmically determined story lineup, for articles recommended based upon user interests, this system employs a content-based recommendation approach that determines a user's interest explicitly. This approach was chosen because of its simpler implementation and its suitability for use over a shorter user test period.

The news personalization system was first designed to determine story interests using implicit methods, building a profile of user interests as a person reads individual stories. This approach was problematic over a short user test period as it suffered from a common challenge of personalization systems, the cold start problem (Lika et al., 2014). When a user first uses a content-based filtering system that relies upon implicit methods, such systems have not yet built a profile of user interests as stories have not been read or engaged with. This sparsity of user information causes a cold start, as the system struggles to create meaningful recommendations. Shortening the user test period from two weeks to two days necessitated using an explicit method for determining user story interests to avoid any potential cold start challenges. The user test period was shortened as funding was not available to compensate study participants for a longer test period.

Before using the personalization system, I asked study participants to select between 5 and 10 stories that interested them from a list of 41 recent CBC News articles. These stories were selected from each of the eight subject areas, 20 of which were from CBC News's top story feed while three each were selected from the other subject areas of world news, Canadian news, politics, business, health, arts and entertainment, Indigenous news, and sports. This story selection page can be seen in Appendix I. These selected stories represented the story interests of the system users and recommendations were made based upon this interest profile.

Basing the story lineup recommendations upon both articles that aligned with a user's interests and stories that were trending on Reddit and Google, simulated a common approach used in personalization systems of recommending stories based on individual interests and the interests of the larger community. Reddit and Google were selected because of the ease in programmatically determining trending news articles and topics. Other platforms such as Facebook or Twitter, did not have as open access to this type of trending data. While not as refined as a fully collaborative system, as no attempts were made to match interests between different users, this approach exposed study participants to stories outside of their typical interests.

Research has shown that serendipity, the notion that a user will be surprised by the content presented to them, is an important aspect of any personalization system (Kotkov et al., 2016). By showing users a certain number of stories that are resonating with audiences on other digital platforms, I hope a certain element of serendipity is introduced to the story lineups. Basing the story recommendations not just on individual story interests, the study participants would also be exposed to a larger diversity of story-subject types and elements of the collective news experience of traditional news distribution would be maintained.

For articles recommended based upon user interests, the system uses a common method within information retrieval studies to make those recommendations. Employing term frequency-inverse document frequency (TFIDF) calculations along cosine similarity measures, the system can determine which articles ingested into the system are most similar to the user's interests. A full exploration of this computational approach is beyond the scope of this paper, but in basic terms, TFIDF calculations determine the importance of a particular word in a document by measuring its frequency within a document compared to the frequency of its occurrence within a larger corpus of documents (Hakim et al., 2014; Oh et al., 2014; Tata & Patel, 2007). Using TFIDF calculations, a matrix of term importance is created serving as a rudimentary form of topic modelling. These matrices can be represented as vectors in a multidimensional vector space, and cosine similarity calculations determine the distance between these vectors. The closer the vectors are to one another, the more similar the subject matter of the documents. For my purposes, this calculation compares a user's interests to each individual article within the system and a cosine similarity score is created between 0 and 1. The closer that measure is to 1, the more closely an article matches the user's pre-selected story interests.

Regarding the user's pre-selected story interests, two different TFIDF-cosine similarity calculations are made. The body text of all pre-selected user interest articles is combined into one document, and this combined document is compared to ingested story articles. Another calculation is made comparing the similarity of the combined pre-selected articles's sections to the sections of ingested story articles. These two measures provide a similarity score based both on the article text and article section. A sample of these measures are available in Figure 1.

Figure 1: Cosine similarity measures for based on article body text and article section

User selected articles of interest:

EU suing AstraZeneca over delayed COVID-19 deliveries
Should Alberta reconsider COVID-19 vaccine prioritization? It's complicated, expert says
Hamilton man in his 60s hospitalized after rare blood clotting from AstraZeneca vaccine
Chemawawin Cree Nation reports 1st COVID-19 death as outbreak continues
Health Canada to start real-time review of Medicago COVID-19 vaccine

Cosine similarity measures based on body text with TFIDF score:

What Johnson & Johnson's 1-shot vaccine could mean for Ontario's most vulnerable - 0.346
Vaccine envy: Why can't Canada make COVID-19 doses at home? - 0.307
Does the AstraZeneca vaccine cause more common side-effects than others? - 0.262
As B.C. suddenly lowers AstraZeneca age limit to 30, people line up for hours to get the - 0.242
Alberta to send Janssen vaccine shipment to Banff and Wood Buffalo, health minister - 0.206

Cosine similarity measures based on article section with TFIDF score:

With camps, summer programs awaiting the go-ahead, what are kids in for - 0.630
Bad things happening' in Ontario real estate market as homebuyer complaints surge - 0.630
The pandemic isn't stopping this Yellowknife teen from focusing on her Olympic dream - 0.630
Proposed legislation would allow police to intervene in domestic violence - 0.630
KPMG disputes leaked emails - 0.630

Stories that are trending on Reddit are determined by using the Pushshift Reddit API, which provides a more fulsome archive of Reddit posts than the social media platform's built-in functionality (Gaffney & Matias, 2018). Twice an hour the Pushshift API is searched for the top Reddit posts that share a link to a CBC.ca article. The top performing articles are determined by measuring and ranking the Reddit submission scores. Reddit submission scores are calculated by the platform as the number of upvotes an article receives minus the number of downvotes (Horne

et al., 2017). Reddit post scores act as a measure of popularity for a post and provide a useful metric within a news personalization system.

Stories trending on Google Trends are determined using the pytrends Python library, which returns the top 20 stories that are trending on Google Trends for Canada. Stories performing well on Google Trends are the top stories that people are searching for using Google at a given moment (Google, n.d.-a). Twice an hour the system checks to see what stories are trending via Google search and works to determine whether any articles recently ingested into the system are similar to these story trends. This measure of similarity is performed by searching both the body and title of recent articles for the trending keyword. A simple weighted similarity score was created that prioritizes recent articles over older articles.

A customized story lineup is created for each user of the system based on articles similar to a user's interests, stories that are trending on Reddit, and articles that are similar to topics that are popular on Google Trends. As indicated, both the number of articles shown to a user and the amount of articles recommended from each category are customizable by the researcher. With this project-paper, 20 articles were shown to the user and 50% of those stories were recommended based on a user's interests, and 25% each were shown based upon stories that were trending on Reddit and topics that were trending on Google Trends. Thus the 20-article lineup should have 10 stories based on user interests, and 5 each from Google and Reddit trends. 20 articles were selected as it matched the number of stories that were read in via the top stories feed during the editor selected story lineup.

Recommendations based upon a user's interests are first recommended via the similarity score based upon the body text of an article. All articles with a cosine similarity score over 0.2 over the previous 24-hour period are added to the story lineup. If this calculation has not provided enough recommendations of required stories based on user interests, in this case 10 articles, articles are then added to the story lineup based upon the section similarity, with the top stories with a section cosine similarity score over 0.3 over the previous 36 hours being added to the lineup. These two score thresholds were determined to provide a good mix of stories that both matched the specific story and topic interests of a user. Any recent articles matching trending topics on Google Trends were then inserted into the story lineup. If not enough articles were found for trending Google topics, additional trending Reddit articles were added to the story lineup. The top trending articles from the previous 72 hours on Reddit were then added to

the story lineup. Any duplicates among these recommendations were disregarded, and the next highest performing article was selected. If the combined number of these recommendations did not equal 20 stories, the remaining articles were added based upon the body text-based user similarity score from the previous 48 hours ranked by the cosine similarity score. An example of the makeup of a story lineup and the source of those recommendations can be seen in Appendix II. As can be seen in Appendix III, when the system is used in algorithmic mode users are displayed the story lineup via a simple index page which shows the title of an article, a short description, a small icon the shows the source of the recommendation as either "Trending" or "For You" and a headline image. Any individual story can be clicked on, providing the full text of the story as indicated by Appendix IV. In the editor-selected story mode the appearance of individual stories is the same and the story lineup is also similar except for the removal of the recommendation source icon as seen in Appendix V.

This system has a few capabilities that were not used during the user-pilot of this project-paper. As indicated, the system can make recommendations based upon an implicit determination of story interests but given the short test period of the pilot project, it was determined this approach would not provide good recommendation results. The system also can read news articles from any RSS feed, and an early version of the system also read in stories from the BBC and The Conversation news websites but accommodating the different formats of each site within one system was challenging. An early approach also attempted to provide a mix of both breaking news stories and longer in-depth articles that provided more background information on a particular issue, but this approach again created unnecessary complexities. I hope that future iterations of this system software will better accommodate some of these functions.

4.2 User Test Pilot

I tested my proposed method for measuring audience preference between algorithmically determined and editor-chosen story lineups using a two-day user pilot. I recruited my test participant pool from undergraduate and graduate students at Ryerson University, who were over the age of 18. These students were also required to be regular online news consumers. Over a one-month period, participants were recruited via social media, by speaking to individual university classes, and by distributing the participant recruitment callout over university email

lists.

My goal was to have 20 participants for the pilot project of the news personalization system to determine if the proposed methodological approach was sound and could be applied on a larger scale. After my recruitment efforts, 28 students expressed an interest in participating in the study. I held a short information session about the project that outlined the goals of the research project, answered participant questions, and briefly introduced the news personalization system. A recorded information session was also produced for those participants who could not attend the live session.

Of the 28 students that expressed interest, 10 students took part in the pilot project. I believe the limitations of recruiting during the COVID-19 pandemic hampered my efforts, and campaign held during a regular on-campus semester would have yielded better results. Ryerson Research Ethics Board approval was granted for this project (REB reference ID 2020-420) as this project-paper involved human participants. My pilot project participants were provided with a $10 Amazon eGift card upon completion of their participation in this project.

As stated in my system overview, the original intention for this pilot project was for it to run over a two-week period, which would have seen study participants use the system for one week each in algorithmically determined and editor-chosen story lineup configurations. Given a two-week user pilot period, the intention was to have user interests be determined implicitly by building a user profile of each user, as they read individual stories. Upon further reflection, it was determined that it would be challenging to recruit participants to use this system for this length of time without more significant compensation for their efforts, and I decided that a two-day test period would be more realistic. Because of the cold start challenge, as explored in my system overview, the system was switched to having user interests be determined explicitly by having users select from stories that interested them from a list of recent articles.

After completing a consent agreement, each study participant was provided with a unique username and password for the system. No personal information was stored on the news personalization system as I provided each user a generic username and an automatically generated password.

In the week before the pilot project began, I asked participants to select their story interests. I instructed participants to use the news personalization system on March 15, 2021 in algorithmic mode and on March 17th, 2021 in editor-selected mode. I made participants aware in

advance what the configuration of the system would be on each day. On March 16th, 2021, I switched the system between configurations.

On each of the test days I asked participants to use the system at least three times a day, once during the following time periods: 1) 5 AM until 12 noon 2) 12 noon until 6 PM and 3) 6 PM until midnight. From my work as a digital journalist, I have learned that there are more significant story lineup changes among these three periods. It was hoped that by having participants engage with the news personalization system during each of these time periods, there would be a higher likelihood that they would see new articles within their story lineups. After each one of the test days, I asked study participants to fill out a short anonymous survey that had the following questions: 1) Did the stories presented match your personal interests? 2) Did you find that you were presented a diversity of story topics? 3) Did you feel that this story lineup presented a complete picture of what was going on in the world? 4) Did you find the system showed stories you wouldn't typically read? For questions 1 through 3, participants rated their responses using a numeric linear scale, while question 4 was a yes / no response as seen in Appendices VI and VII. After the second test day, I also asked participants which system configuration they preferred. These surveys were conducted using Google Forms, and I emailed the survey links to participants after the completion of each test day.

These questions were selected to get a sense of how each news lineup configuration met the information needs of each participant. News personalization systems work best when at least a certain amount of the stories presented match well with audience interests. As explored in my literature review, presenting audiences with a diversity of story types is an important consideration of any news recommendation approach (Eskens et al., 2017; Möller et al.,2018). It is also important for news personalization approaches to share a complete picture of what is going on in the world, hopefully mitigating concerns regarding echo chambers and filter bubbles. Finally, as shown through the work of Kotkov et al. (2016), serendipity adds an element of surprise to a news personalization approach, and my goal with question 4 was to determine whether that existed in either of the story configurations.

Chapter 5: Results

Despite the limitations of my methodology, the pilot project produced some interesting results. The survey results showed a clear preference for the editor-chosen story lineup configuration with seven participants selecting this as their preferred configuration, compared to three participants who preferred the algorithmic story lineup. As seen in Table 1, measured on a scale of 0 to 5, the editor chosen lineup was believed to better match participant interests (average score 3.9), presented a higher diversity of story topics (average score 4), presented a more complete picture of what was going on the world (average score 3.4) and was believed to better show stories that a participant would not typically read.

Table 1: Survey Results

	Algorithmic Mode (average score)	**Editor-Chosen Mode (average score)**
Did the stories presented match your personal interests?	3.4	3.9
Did you find that you were presented a diversity of story topics?	3.0	4
Did you feel that this story lineup presented a complete picture of what was going on in the world?	2.7	3.4
Did you find the system showed stories you would not typically read?	4 - no 6 - yes	6 - no 4 - yes

Preference between the algorithmically determined and editor chosen story lineup was not as clear when analyzing actual use of the news personalization system via measures provided by Google Analytics. Nine out of 10 participants read news articles on the first test day where stories were recommended via algorithm. That number dropped to seven on the second day where the story lineup was determined by a human editor. Test day one saw the system used for 4954 seconds in total compared to 4546 seconds on test day two. Users used the system on

average for 550 seconds each in algorithmic mode and 649 seconds each in the editor-chosen story lineup configuration. On each test day, one user had a session that lasted the entire day on their mobile device, and this session length data was disregarded.

The algorithmic test day saw participants use the system for 23 different sessions, while the editor-chosen story lineup was used for 28 different sessions. Participants used the algorithmic mode for less total sessions per user then the editor chosen story line, with 2.5 sessions per user in algorithmic mode compared to 4 sessions per user in editor chosen story mode. Google Analytics defines a session as "the period of time a user is active on your site or app" (Google, n.d.-b) and this measure essentially represents the number of times the participants used the system during a given test day. The participants used the news personalization system on average for 215 seconds per session in algorithmic mode, compared to 162 seconds per session in the editor chosen story lineup configuration. 52 articles were read by the participants when the system was set up in algorithmic configuration, compared to 54 articles read while the system was in editor-chosen mode on the second test day.

There was also some observed disparity between system use by individual users on the individual test days. One participant did not use the system at all on the first day, while two separate participants did not use the system on test day two. One further participant barely used the system on either day, and upon following up with this user they outlined no stories interested them on either test day.

Testing of the news personalization system also revealed some limitations of the algorithmic approach. While the TFIDF-based algorithm performed well while making recommendations based upon story-subject section similarity, the results based upon the body text of an article were often underwhelming. There often was overlap between the recommendations based upon participant selected story interests and articles that were trending on Reddit and Google Trends, which lead to stories being replaced in the story lineup by less suitable selections. The method used to determine whether topics that were trending on Google Trends were represented in stories within the article database did not always perform well. The subject keyword approach was too simplistic and suitable ingested articles that matched these trends were not often found, as articles that are like these subjects do not always contain the same keyword as what is trending.

Chapter 6: Discussion

Examining the results of the user pilot provided insight into audience preference for news personalization systems in comparison to traditional story lineups determined by human editors.

Regarding RQ1, analyzing the use of the two story lineup configurations using Google Analytics provided web metrics, the preference between the editor-chosen and algorithmically determined story lineups was not clear. The participants used the editor-chosen configuration for more sessions per user than the algorithmic configuration, but individual sessions on average were longer when using the algorithmically chosen story lineup.

Addressing RQ2 survey-based methods provided clearer insight into news personalization preference than system use analysis via web metrics, but with my anonymous survey results, it is challenging to garner more insight into these preferences.

The survey results also found that when examining RQ3, the human editor-selected story lineup better met the information needs of the test participants. The survey clearly revealed the editor-chosen configuration performed better at matching user interests, was believed to present a higher diversity of story topics, presented a clearer picture of what was going on in the world and showed users articles they would not typically read. Despite clearer results, the surveys employed for this project were not without limitations. My surveys were composed of entirely closed-ended questions and including a few open-ended questions would have allowed for insight into motivations behind system configuration preference. One-on-one interviews after the pilot project could have also provided better insight than the survey-based method, but this could prove challenging with a larger test group. Essentially, my method did a good job of identifying what system configuration was preferred but did not provide background on why.

Having the survey results submitted anonymously, did not allow for cross-referencing of the results of the surveys with the web analytic measures. A more in-depth analysis of which articles study participants read could have revealed whether users deviated from the declared story interests. System preference between the algorithmically determined story lineup and one chosen by an editor, as revealed through the survey, could have been compared to use of the actual system as shown through the collected web metrics had the surveys not been anonymous.

Preference between the system's algorithmic and human-selected configurations may relate to the design of the news personalization system, addressing RQ4.

There was no significant consideration of ensuring a diversity of story topics within the recommendation algorithm's design. A certain amount of serendipity might occur based upon the Reddit and Google Trends-based recommendations, but as these recommendations represent articles and subjects that are popular with internet users, there is no guarantee that these recommendations would either be surprising or represent a diverse body of article topics.

The news personalization system design employed explicit story interest declarations, and as discussed within my system overview, this approach has some disadvantages. The most significant drawback of such an approach is the static nature of a participant's story interests.

Once selected, these story interests were unchanged throughout the pilot period. These static story interests are not a realistic representation of how audiences engage with journalism. Typically, as an audience member scans a news site, they will organically discover stories that interest them. An implicit approach to determining story interests allows for natural shifts in audience interests that might occur from day-to-day. A particular story might occur during the test period that piques a participant's interests, and an implicitly built user interest profile could recognize this short-term interest and recommend further related articles, while a static interest profile determined explicitly would not.

When explicitly pre-selecting their story interests, there is no guarantee that the stories presented for selection will truly match the interests of a user. While a cross section of subjects was presented during the story interest selection phase of this project, these subject types are still quite broad, and the niche story interests of a user may not be represented. Another approach could have seen users being presented a larger selection of stories to choose their interests from, but I was weary of overwhelming study participants.

The story recommendation algorithm design could have also been improved by increasing the volume of articles ingested into the system, perhaps by including more than one news outlet beyond the CBC. As shown within my system overview, the TFIDF-based algorithm is simplistic and employing a more advanced recommendation method could have resulted in a story lineup that more effectively matched the interests of users. There is no shortage of advanced news personalization approaches studied within the field of computer science, and future iterations of this news personalization system could implement one of these methods.

Some of the issues surrounding the system design were exacerbated by limitations of the user pilot configuration, most significantly the short test period. With a limited pilot period, the success of the pilot is quite reliant on the stories that are making news that specific day. With a smaller number of stories read into the system over a one-day test period, it is less likely that the stories will match the interests of a user. In a day where one story dominates the news cycle, study participants are bound to have one story type be more prevalent in their story lineups. If this dominant story does not match a user's declared story interests, their information needs might not be met. For example, during the test period for my pilot project, the COVID-19 pandemic was a significant news story, and articles related to it were overrepresented in the story recommendations. Over a longer test period, the natural ebbs and flows of dominant stories would be smoothed out, and I would expect that more diverse story types would be read into the news personalization system, potentially resulting in better recommendations for the study participants.

With such a short test period, it also might have been challenging for the participants to make meaningful comparisons between the two systems. On average, the participants used each system configuration for approximately 9 to 11 minutes each day, and I believe it would be difficult for the participants to make clear judgements on the validity of each system over such a short time period. The metrics provided by Google Analytics are also far more affected by changes in individual use over a short test period. For example, during the test pilot, two participants did not use the system on the second test day, resulting in less data available for analysis. The impacts of non-participation on particular days would be lessened over a longer test period.

This pilot project did not attempt to ensure a representative sample of study participants. This approach is problematic because research has shown audience acceptance of algorithmic personalization systems can depend upon factors such as age, device used and educational status (Powers, 2017; Thruman et al., 2019). Exclusively recruiting university students for my pilot project resulted in an overrepresentation of younger and well-educated participants within the user sample. A more fulsome research study based upon these methods should ensure a broader representation of potential users of news personalization systems to better determine overall audience preferences. As I did not collect the demographic information of study participants, such as gender or age, I could not determine if news personalization system use and acceptance

across these demographic categories differs among my participant group.

Despite these limitations, I believe my methodological approach is novel because it entails actual use of an open and configurable news recommendation system, coupled with simple survey results. Insight on user preference for algorithmic selection can be gleaned both from the analysis of how study participants used the system and through the surveys. The news personalization system developed as part of this project-paper and the accompanying research study, provides detailed measures on how much a person uses the system, what content they engage with and in broad strokes how and why that content was recommended to them.

Chapter 7: Conclusions

For much of its history, journalism was a significant arbiter of social information. Newspapers, magazines, television, and radio newscasts had a virtual monopoly on getting messages out to mass audiences. But the advent of the internet, alongside devices and platforms that developed on it, has altered journalism's exclusivity over information dissemination.

Online algorithms have significantly shifted journalism's gatekeeping role. News audiences now turn to social media and search platforms to discover news, journalism most often created by traditional news organizations. These platforms, driven by algorithms, personalize these content consumption experiences to individual tastes. While worries over how personalization techniques might create echo chambers and filter bubbles has been discovered to be largely unfounded, there is still significant concern over how news personalization might individualize the news experience. A collective news experience can foster a public sphere of informed discourse and tailoring news to the individual could threaten this ideal.

My research has shown that news organizations are turning to personalization for a variety of reasons. The journalism industry is facing a perilous financial future, and some news outlets like The Globe and Mail have seen news personalization as a way to gain subscribers and generate more ad revenue. Others, like The New York Times and NPR, are using algorithmic systems to highlight important journalism that might get missed by news audiences. The reasons news organizations turn to a personalization system is relatively clear, but why news audiences might prefer such systems is less obvious.

A significant motivation might be information overload. While information overload is not an issue for all internet users, it would be hard to argue that it is not challenging to sort through digital information. News personalization systems can help sift through mass amounts of journalism to ensure stories that are both editorially important and relevant to individual interests are made available to news audiences.

This project-paper has worked to create a method that would determine whether audiences prefer news personalization systems over story lineups chosen by human editors. My research has shown that a method centered around the creation of a simplified news personalization system can provide insight into news recommendation preference. My approach of combining survey results with web metric-based analysis has shown the research potential of

both my method and the news personalization system developed as part of this project.

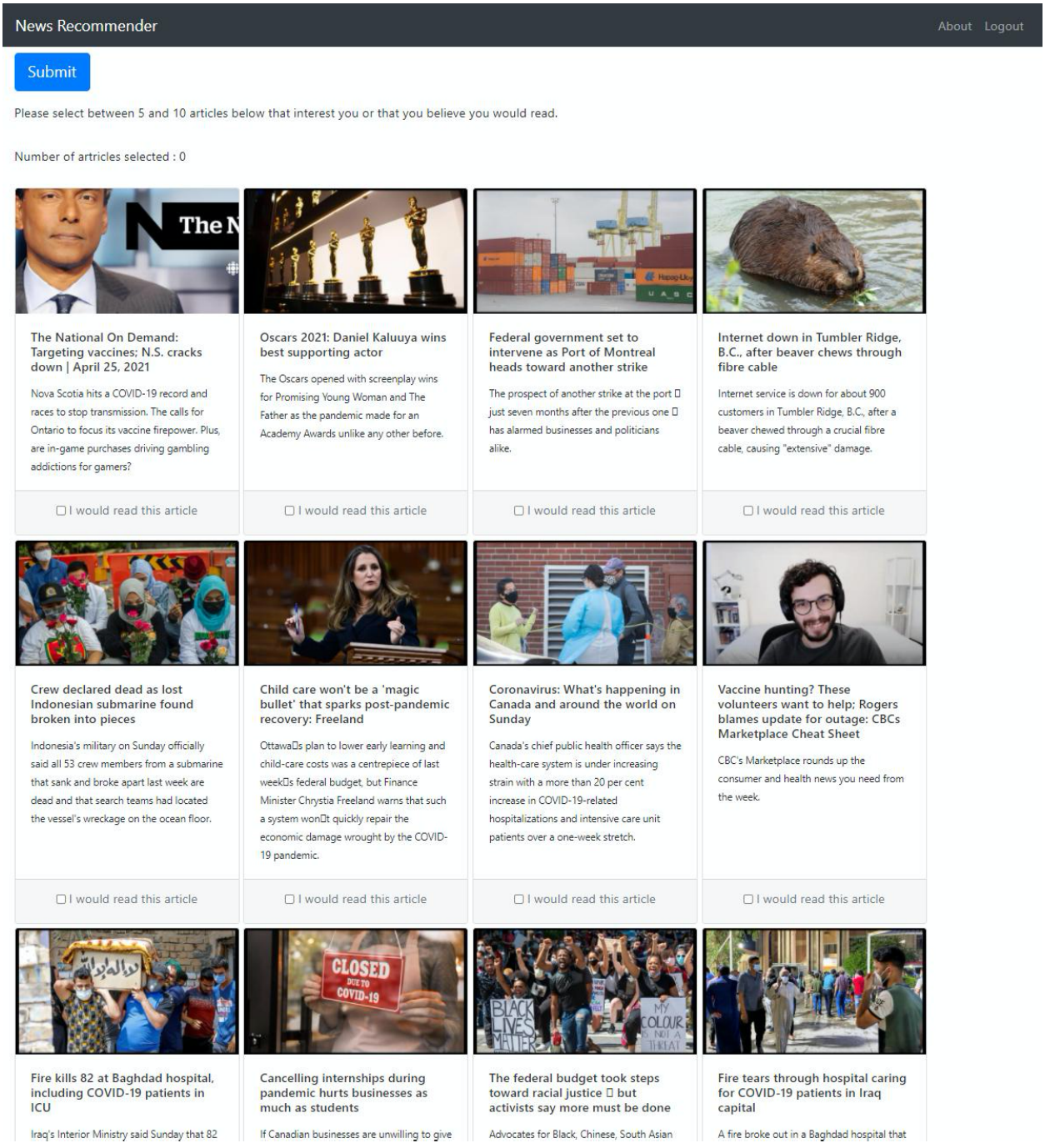
The results of this project-paper's user pilot-test have shown that at least within my non-representative user sample there is a clear preference for editor-based story lineups, but this distinction was harder to determine via analysis of the collected web metrics. The pilot test also revealed potential improvements that would strengthen my research method, including lengthening the test period time, increasing the size of the test participant group, and employing a more advanced algorithmic recommendation design.

My short-term goals for the research outputs of this project-paper are to make the news personalization system into an open-source research tool that is easily configurable and adaptable by other communications and journalism scholars. Before starting this project-paper, I struggled to find an existing open-source tool that would allow for the studying of news personalization systems, so I created one myself. Once this system is further developed, I would like to focus further on how the design characteristics of a news personalization would affect the acceptance of its use. As my review of news personalization research revealed, there is nothing inherent about recommendation system design that indicates they cannot be created in a way that fosters transparency, user agency, and present audiences with a diversity of articles that might challenge their viewpoints.

I believe news organizations will increasingly turn to algorithmic systems to share their journalism, and it is hoped that this research will help ensure that news personalization design choices will be guided by the needs and wishes of news audiences.

Appendices

Appendix I: Story Selection Page



Appendix II: Sample story lineup

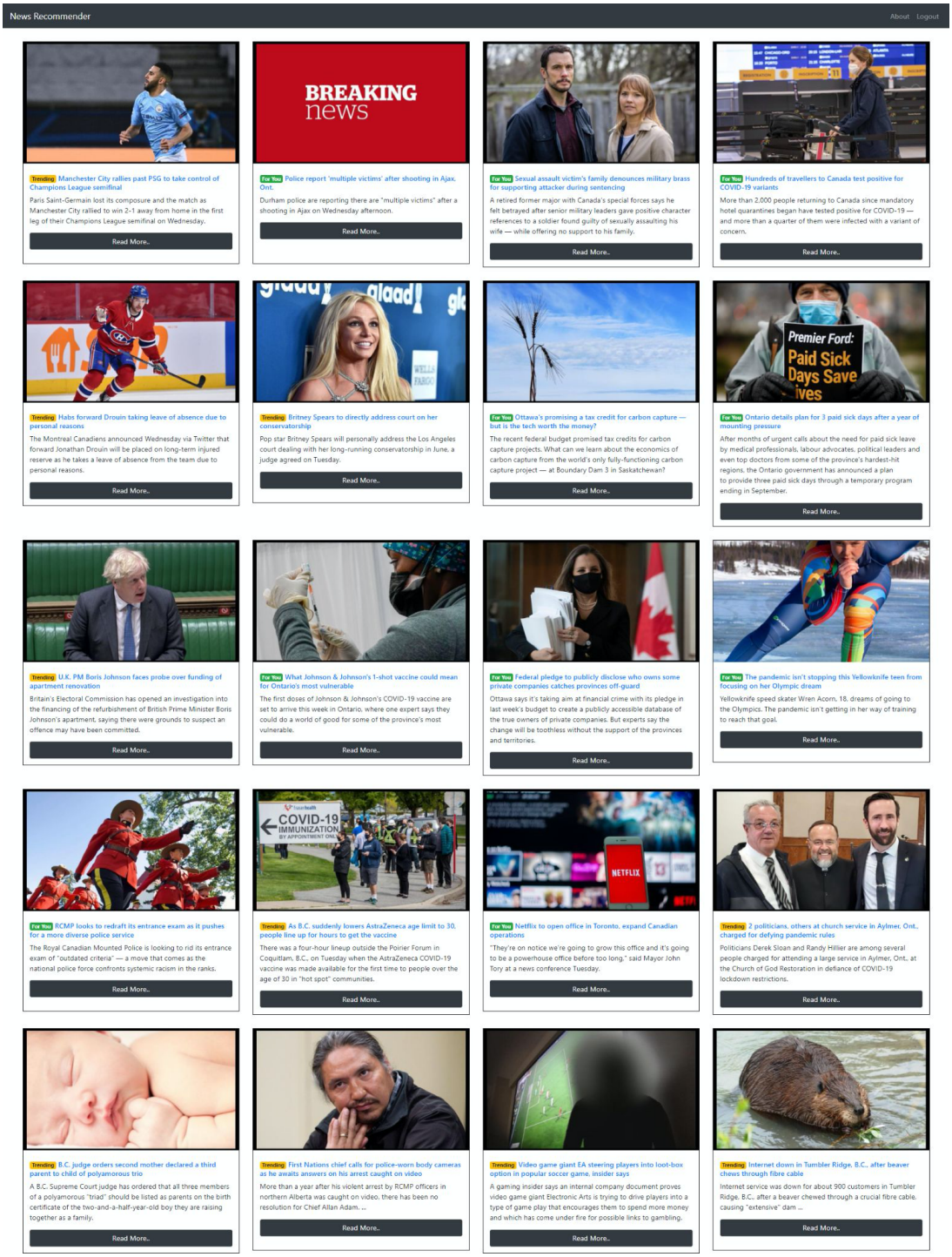
User selected articles of interest:

EU suing AstraZeneca over delayed COVID-19 deliveries
Should Alberta reconsider COVID-19 vaccine prioritization? It's complicated, expert says
Hamilton man in his 60s hospitalized after rare blood clotting from AstraZeneca vaccine
Chemawawin Cree Nation reports 1st COVID-19 death as outbreak continues
Health Canada to start real-time review of Medicago COVID-19 vaccine

Article title	Source of Recommendation
Alberta to send Janssen vaccine shipment to Banff and Wood Buffalo, health minister says	User interests - body text
Coronavirus: What's happening in Canada and around the world Thursday	User interests - body text
With camps, summer programs awaiting the go-ahead, what are kids in for this summer?	User interests - section
Federal pledge to publicly disclose who owns some private companies catches provinces off-guard	User interests - section
The pandemic isn’t stopping this Yellowknife teen from focusing on her Olympic dream	User interests - section
Winnipeg mother urges public to follow health orders after she and her newborn son contract COVID-19	User interests - section
COVID deaths of 2 young First Nations people in Manitoba a reminder of gaps in system	User interests - section
Hamilton is back to pursuing the 2030 Commonwealth Games, Victoria interested in 2026	User interests - section
'Bad things happening' in Ontario real estate market as homebuyer complaints surge	User interests - section
The National On Demand: Ont. sick leave plan; Hayley Wickenheiser’s next goal	User interests - section
Biden, the anti-Reagan: His speech to Congress calls for era of more government	Google Trends

Manchester City rallies past PSG to take control of Champions League semifinal	Google Trends
Habs forward Drouin taking leave of absence due to personal reasons	Google Trends
B.C. judge orders second mother declared a third parent to child of polyamorous trio	Google Trends
As B.C. suddenly lowers AstraZeneca age limit to 30, people line up for hours to get the vaccine	Reddit
U.K. PM Boris Johnson faces probe over funding of apartment renovation	Reddit
2 politicians, others at church service in Aylmer, Ont., charged for defying pandemic rules	Reddit
All 9 Halton Catholic high schools show support for LGBT students after board says no to Pride flag	Reddit
KPMG disputes leaked emails linking firm to offshore companies suspected in massive Ponzi scheme	Reddit
'Complete devastation': Renowned polar bear biologist mourned after Nunavut helicopter crash	User interests - body text (value less than 0.3)

Appendix III: Algorithmic Story Lineup



Appendix IV: Article Page

News Recommender About Logout

As B.C. suddenly lowers AstraZeneca age limit to 30, people line up for hours to get the vaccine

By: CBC News - April 27, 2021

A four-hour lineup snaked outside the Poirier Forum in Coquitlam, B.C., on Tuesday, when the AstraZeneca COVID-19 vaccine was made available for the first time to people over the age of 30 in "hot spot" communities.

Alexis Hidlebaugh learned about the Coquitlam clinic in a text from her landlord and rushed to the Poirier Forum with her husband, Mark Bahnman.

"We checked the website to make sure it was 30-plus and we weren't overstepping if we came," Hidlebaugh told CBC News.

"We figured, worst-case scenario, a nurse could turn us away."

Hidlebaugh and Bahnman are both in their 30s.

Before Tuesday, the youngest people eligible for the vaccine had been those born in 1981, with the exception of Indigenous people, who are eligible at age 18.

Last week, Canada's National Advisory Committee on Immunization recommended that the vaccine may be offered to people 30 and up who don't want to wait for an approved mRNA vaccine, and if certain other conditions are met.

Those conditions include a benefit-risk analysis, informed consent, and that there would be a substantial delay to receive an mRNA vaccine.

Bahnman said he thought getting the shot as soon as it became available was an important step toward herd immunity.

"It's the longest line I've been in in a long time, but I think it's for something that's worth it," he said.

Fraser Health announced the drop-in clinic shortly after noon, along with another at the Cloverdale Recreation Centre in Surrey, saying the shots were meant for residents of high-transmission neighbourhoods in the region.

However, no one who spoke with CBC News in Coquitlam on Tuesday was turned away because they live in another community.

CBC photographer Ben Nelms was on scene at around 10 a.m., when there were just a few dozen people in line. But as people learned the age limit had been lowered to 30, they began calling friends and family, causing the lineup to stretch on for hours.

Gulzar Hassan isn't able to stand for long, but said the people next to her in line agreed to hold her spot so she could rest on a bench whenever one was close by.

"God bless them, I'm really happy for that," she said. "They just offered, without me even asking."

30-plus program will be expanded to pharmacies

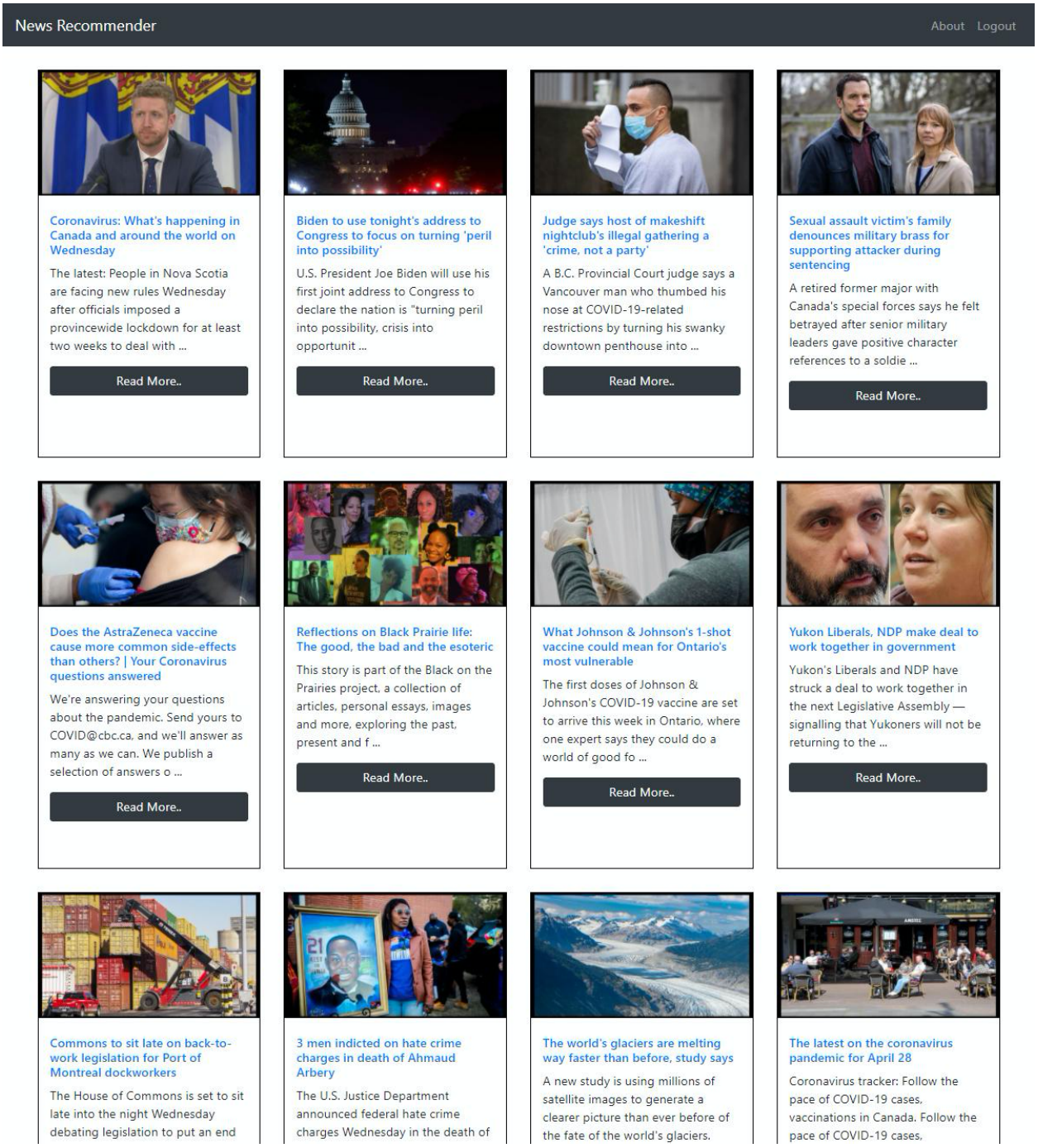
In their daily COVID-19 update Tuesday afternoon, Provincial Health Officer Dr. Bonnie Henry and Health Minister Adrian Dix confirmed that the province's AstraZeneca program has expanded to include people as young as 30.

They said for now, younger people living in communities that have been identified as "hot spots" for transmission will have access to the vaccine through community clinics run by the health authorities.

"As we receive enough AstraZeneca to add appointments at pharmacies, it will be made available to anyone in the province aged 30 and older," Henry and Dix said in a written statement.

B.C.'s main age-based vaccine rollout, which uses the vaccines produced by Pfizer and Moderna in publicly run clinics across the province, is currently booking shots for people aged 59 and up.

Appendix V: Editor Chosen Story Lineup



Appendix VI: Survey 1

Post Phase 1 - Survey

As part of this research project you are being asked to voluntarily complete this online survey. It involves questions about whether this online news portal meets your news consumption needs and should take about 5 minutes to complete.

In order for all of your answers to be collected, you must go to the end of the survey and click the 'submit survey' button. This will demonstrate your full consent to participate.

WHAT ARE THE POTENTIAL RISKS TO YOU

Some of the survey questions may make you uncomfortable or upset, or you may simply wish not to answer some questions. You are free to decline to answer any questions you do not wish to answer, or to stop participating at any time by closing your browser. If you close your browser before getting to the end of the survey, and do not confirm your consent to participate at the end of the survey by clicking the 'submit survey' button, your information collected up to that point will not be used.

YOUR IDENTITY WILL BE ANONYMOUS

The survey is anonymous and as such I will not be collecting information that will easily identify you, such as your name or other unique identifiers.

You will need to login into your Ryerson account to submit this form, but your identification information is not saved as part of the data collected as part of this survey.

Although your Internet Protocol (IP) address can be tracked through the survey platform, I, or any member of the research team, will not be collecting this information. Your IP address may be observed only to ensure that one individual is not completing the survey multiple times

HOW YOUR INFORMATION WILL BE PROTECTED AND STORED

Your answers to these questions will be stored in a Google Drive account only accessible to the investigators of this project. No personal information will be stored in this database. To further protect your information, data stored by the researcher will be password protected. Only the researcher/s named in this study will have access to the data collected. Any future publications will include collective information (i.e., aggregate data). Your individual responses (i.e., raw data) will not be shared with anyone outside of the research team. When the research is completed, the researcher/s will be deleted once this project is completed.

YOUR RIGHTS AS A RESEARCH PARTICIPANT

Participation in research is completely voluntary and you can withdraw your consent at any point up to clicking the 'submit survey' button at the end of the survey. However, because the survey is anonymous, once you click the 'submit survey' button at the end of the survey, we will not be able to determine which survey answers belong to you, and so we cannot withdraw your information from our study once you click on the 'submit survey' button. Please note that

by clicking the 'submit survey' button at the end of the study you are providing your consent for participation. By consenting to participate you are not waiving any of your legal rights as a research participant.

1. Did the stories presented match your personal interests?

Mark only one oval.

	0	1	2	3	4	5	
Did not match	◯	◯	◯	◯	◯	◯	Matched

2. Did you find that you were presented a diversity of story topics?

Mark only one oval.

	0	1	2	3	4	5	
Not Diverse	◯	◯	◯	◯	◯	◯	Very diverse

3. Did you feel that this story lineup presented a complete picture of what was going on in the world?

Mark only one oval.

	0	1	2	3	4	5	
Incomplete Picture	◯	◯	◯	◯	◯	◯	Complete picture

4. Did you find the system showed stories you wouldn't typically read?

Mark only one oval.

◯ Yes
◯ No

Appendix VII: Survey 2

Post Phase 2 - Survey

As part of this research project you are being asked to voluntarily complete this online survey. It involves questions about whether this online news portal meets your news consumption needs and should take about 5 minutes to complete.

In order for all of your answers to be collected, you must go to the end of the survey and click the 'submit survey' button. This will demonstrate your full consent to participate.

WHAT ARE THE POTENTIAL RISKS TO YOU

Some of the survey questions may make you uncomfortable or upset, or you may simply wish not to answer some questions. You are free to decline to answer any questions you do not wish to answer, or to stop participating at any time by closing your browser. If you close your browser before getting to the end of the survey, and do not confirm your consent to participate at the end of the survey by clicking the 'submit survey' button, your information collected up to that point will not be used.

YOUR IDENTITY WILL BE ANONYMOUS

The survey is anonymous and as such I will not be collecting information that will easily identify you, such as your name or other unique identifiers.

You will need to login into your Ryerson account to submit this form, but your identification information is not saved as part of the data collected as part of this survey.

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HOW YOUR INFORMATION WILL BE PROTECTED AND STORED

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YOUR RIGHTS AS A RESEARCH PARTICIPANT

Participation in research is completely voluntary and you can withdraw your consent at any point up to clicking the 'submit survey' button at the end of the survey. However, because the survey is anonymous, once you click the 'submit survey' button at the end of the survey, we will not be able to determine which survey answers belong to you, and so we cannot withdraw your information from our study once you click on the 'submit survey' button. Please note that

by clicking the 'submit survey' button at the end of the study you are providing your consent for participation. By consenting to participate you are not waiving any of your legal rights as a research participant.

1. Did the stories presented match your personal interests?

Mark only one oval.

	0	1	2	3	4	5	
Did not match	◯	◯	◯	◯	◯	◯	Matched

2. Did you find that you were presented a diversity of story topics?

Mark only one oval.

	0	1	2	3	4	5	
Not Diverse	◯	◯	◯	◯	◯	◯	Very diverse

3. Did you feel that this story lineup presented a complete picture of what was going on in the world?

Mark only one oval.

	0	1	2	3	4	5	
Incomplete Picture	◯	◯	◯	◯	◯	◯	Complete picture

4. Did you find the system showed stories you wouldn't typically read?

Mark only one oval.

◯ Yes
◯ No

5. Reflecting back on each phase, which story lineup did you prefer?

Mark only one oval.

- ◯ Phase 1 - Algorithmic
- ◯ Phase 2 - Editor chosen

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