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Understanding the impact of Artificial Intelligence on newsroom social culture and journalistic performative roles : a qualitative case study of AI as an emerging digital innovative technology in newsrooms

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UNDERSTANDING THE IMPACT OF ARTIFICIAL INTELLIGENCE ON NEWSROOM SOCIAL CULTURE AND JOURNALISTIC PERFORMATIVE ROLES: A QUALITATIVE CASE STUDY OF AI AS AN EMERGING DIGITAL INNOVATIVE TECHNOLOGY IN NEWSROOMS

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DEDICATION

I would like to dedicate my dissertation to my wife, Krittiya, my brother, David, and my parents, Patti and Tom. Thank you for your love and support through this journey. Dad and Dave, I am sorry you both are not here to see this in person, but we are celebrating together in spirit.

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ABSTRACT

Throughout the evolution of journalism, innovative technology has played a pivotal role in shaping the production and consumption of news. The transformative power of disruptive technology has revolutionized the journalism industry in the past by impacting the society it serves through the diffusion of innovation. Artificial Intelligence, when operationalized for use in journalism, has the propensity to be a disruptive technology, possibly transforming the industry in significant and meaningful ways.

This research investigates the impact of Artificial Intelligence as an emerging digital innovative technology on journalism and mass communication from a sociological and historical context. The aim of this study is to examine how the use of innovative AI technology may influence sociocultural perceptions and behavior in U.S. and UK-based news reporters and their semi-automated newsrooms by comparing present-day news reporters and newsrooms against the behavior of news reporters and newsrooms at the start of the last century when television and radio emerged as previous disruptive technologies.

Present-day semi-automated newsrooms employ smart technology based on Artificial Intelligence to aid in the production of news information. AI technology has been operationalized at every measurable level, from simple intelligent content

management system agents to fully-autonomous robust agents capable of producing natural human-language news reports and short articles. Pioneering news organizations that push the limits of AI operationalization capabilities have partnered with technology companies to generate lifelike digital avatars based on living human news reporters. These avatars are capable of rendering news reports that can be presented on digital video publishing platforms such as YouTube or websites owned and operated by the parent organizations.

Creating a new social role generates contention in a shared social space, leading existing occupants to consider their existing role and the opportunities or challenges posed by this new role. This phenomenon is examined using Diffusion of Innovation theory, Human-Machine Communication theory, and Actor-network theory to help understand the emergence of new social roles in shared social spaces. Such a perspective enables a more nuanced understanding of how new social roles emerge and gain influence, and how existing roles may be challenged or reinforced.

Data collected through semi-structured interviews from news reporters at a global news organization with offices in the U.S. and the UK have been analyzed using a comparative framework to study social behavior, customs, and culture evident in semi-automated newsrooms. The goal of this research is to better understand the impact that the diffusion of emerging digital innovative technology may have on the social culture of journalists and the newsroom within which they perform as newsmakers.

Understanding the Impact of Artificial Intelligence on Newsroom Social Culture and Journalistic Performative Roles: A Qualitative Case Study of AI as an Emerging Digital Innovative Technology in Newsrooms

CHAPTER ONE

Introduction

The early years of broadcast news

In a bygone era, entrusted to history, innovators paved the way for a new American society, as industrialization and technology redefined ideas of exchange, relationships, commodities, and information. In the 19th century, disruptive technologies facilitated wider access to written news by reducing the cost of printed newspapers and enabling faster acquisition of information. These developments expanded the value of news to audiences and transformed it into a commodity in the United States (Nord, 1988). The telegraph was largely responsible for an entire cultural shift in how news information was considered (Nord, 1988). It extracted communication from its geographical bindings and allowed people to transmit information immediately across vast distances. Communication was no longer tethered to transportation, as it had been previously (Carey, 1983). Thus, the language of news was altered. No longer were reports written with regional or colloquial flare and embellishments by contributors and activists (Carey, 1983). The newswire required a stricter, objective, neutral tone to convey messages across demographic partisan divides (Carey, 1983). Reporters, once relegated to "voiceless writers assigned to record proceedings…that could be more or less

automatically compiled" moved into roles of prominence in a constricting market (Nerone & Barnhurst, 2003, p. 439).

Not satisfied by extracting communication from transportation, by the start of the 20th century inventors were already attempting to extract communication from its physical tetherings to allow information to be transmitted wirelessly across airwaves. This led to the emergence of the next group of disruptive technologies, namely the radio and television, which transformed the cultural landscape of news communication in the United States. These inventions gave birth to the modern form of news communication that we know today.

The end of this narrative culminates in the contemporary newsroom of the 21st century and the currently debated, potentially disruptive and emerging technological innovation, Artificial Intelligence, in the semi-automated newsroom. However, before proceeding further, it is essential to establish the meaning of innovation and its critical role in transforming social culture. "Innovation is the process by which an idea or invention is translated into a good or service for which people will pay" (Pavlik, 2013, p. 183). Innovation can also be understood as the introduction of a novel idea or process to overcome the inefficiencies of existing practices and procedures, thereby enabling activities that were previously hindered or halted. An innovation must first be economically viable and replicable in order to be a feasible solution for a potential problem (Law, 1999). In other words, innovation meets an economic need that may or may not already exist. An innovation may also generate a need based on the discovery of a new and more economical way of providing a good or service to the customer. Studies on innovation in newsrooms indicate that at the organizational level, the desire for cost

savings through efficient production processes is a driving factor in innovation (Linden, 2017). A deeper exploration into the definition of innovation follows in the next chapter.

Twentieth century methods of journalism are a product of response to technological innovation that began in the late nineteenth century. Technological innovation drove the twentieth century journalism business model to adapt innovative technology (Nord, 1988). The greatest shift in what was described as journalism in the 20th century came from the adoption of voice and visual messaging by journalists to their audience, starting with radio (Kisseloff, 1997).

Radio

Radio broadcasting in the U.S. began atop the Garden City Bank building in San Jose, California with a man named Charles David Herrold (Greb, 1958). From 1912 to 1917 Charles Harrold made regular over-the-air voice transmissions and coined the terms broadcasting and narrowcasting to distinguish between patterns of transmission. He defined broadcasting as casting in every direction, “as seed from the hand in sowing”, whereas, a narrowcast was “a message sent from one transmitting station to one certain receiving station and intended for none other” (Greb, 1958, pp. 6–7). Herrold began sending out broadcasts in January, 1909 from the Herrold College of Engineering and Wireless and stayed on the air daily for nearly a decade, when the first world war interrupted operations (Greb, 1958).

During the war, a few organizations were allowed to keep working on radio. Westinghouse was one example. Westinghouse and their lead engineer, Dr. Frank Conrad, was issues two licenses to continue experimenting with radiophone technology through the war (Baudino & Kittross, 1977). After the war, when the country resumed

transmissions, early stations gained new call signs and newspaper publishers began to experiment with radio broadcasting (Greb, 1958; Young, 1960).

Initially split into red and blue networks, the National Broadcasting Company (NBC) began regular broadcasting in 1926, and quickly became the dominant radio network (Kisseloff, 1997). The Columbia Broadcasting System (CBS) began broadcasting the following year, in 1927 (Barnouw, 1972). Neither network would begin broadcasting news programs until the 1930s, however (Barnouw, 1972). 8MK (later known as WWJ in Detroit) was started by *the Detroit news* newspaper and they broadcast the first radio news program – reporting State, Congressional, and County primary election results – on August 31, 1920 (Young, 1960).

Through the 1930s, news operations expanded their radio presence, and dedicated journalists began to move to the new medium, creating a new form of journalism: the radio broadcast reporter. Until this time, the public had only read news stories printed in their newspapers. Wire services made news more readily available across the country, and newspaper reporters were gaining a new level of professionalism, having established themselves as a responsible civic press. With radio and radio broadcasters, news stories became news reports and provided audiences the chance to *hear* their news announcements. While journalists and newspapers were striving to establish an air of professionalism, radio and radio reporters were crafting a reputation for risk and cunning that would cultivate the romantic vision of being a journalist that Hollywood has since meticulously designed. Radio reporters were generating spectacle around their behavior to scoop news with "Stunt broadcasts – prearranged occasions, with 'firsts' as the main point" (Furnas, 1939, p. 31) piloted early radio. Stories appeared in the Sunday Evening

Post (Furnas, 1939) of radio reporters dangling from blimp baskets to untangle antenna wire, or showing up to work bruised and skull crushed nearly to death from turning the incorrect valve during a deep-water dive, reporting from the edge of erupting volcanoes so that the microphones would record the sounds of the eruption, and other daring activities generated an appeal for news storytelling that had not existed before in radio journalism.

The format and structure of what constituted a news story began to change. Radio signals were less reliable in the early years of the technology. Like the telegraph before it, lack of a reliable and consistent signal prompted news reporters to eliminate flowery language and opt instead for essential pertinent facts at the top of a story to ensure the message would be received. Telegraph messages were charged by the character, and so brevity was championed for its economical frugality. Another change in language came as an artifact of behavioral response. Soon after radio began reaching more American homes, broadcasters began to notice that listeners desired a different appeal from the news they read. The best radio commentators reinserted drama, sometimes comedy and other times soft-spoken assuredness, into their reports at the encouragement of executives (Alexander & Odell, 1940).

Television

The first serious attempt at dedicated television news broadcasts in the United States was by CBS. In 1941 WCBW, the pioneer New York CBS television station, broadcast two daily news programs every weekday (Kisseloff, 1997). The programs were short – lasting less than 15 minutes of airtime for each broadcast (Kisseloff, 1997). Only ABC, under the steerage of Robert Kintner, attempted a longer 1-hour news broadcast

early on (Kisseloff, 1997). Kintner came from newspapers, working as a D.C. correspondent covering the Treasury Department for the New York Herald Tribune before he took the role as president of ABC in 1944 (Smith, 1980). It was cancelled within a year and ABC went back to 15-minute newscasting until 1967, when they followed behind NBC and CBS's expanded 30-minute newscast model (Kisseloff, 1997). In the earliest days of television news, newsrooms were largely experimenting with new ways of adopting existing materials and methods.

When a news announcer broke into regular broadcasting to report the attack on Pearl Harbor, December 7, 1941, it was considered television's first bulletin (Conway, 2009). The war prompted broadcast studios to shutter operations, much like the first world war halted development in radio broadcasting. At the time, NBC and CBS were the two dominant national broadcast studios operating, though, earlier, in 1939, the FCC required NBC to divest its "blue" network (Swift, 1942). It took years of appeals before NBC would ultimately yield to their demands. And it required the supreme court to uphold the decision in 1943 to compel NBC to create the American Broadcast Company (ABC) from their blue network (*National Broadcasting Co., Inc. V. United States*, 1943). This move established the dominant three national networks that continue to exist today (Attallah, 1991).

Television and the 1948 presidential race birthed modern media communication and modern journalism (Carey, 1980). While World War II paused the innovation and diffusion of television, it also accelerated advancements within the technology that television innovated, namely long-distance signaling (Carey, 1980). By 1948, the three primary radio networks, NBC, CBS, and the newly created ABC, had come to dominate

television. Coverage of the 1948 Presidential race brought images and voices of the candidates to the largest audience in the history of American elections (Conway, 2007).

When television was invented, it quickly became the most powerful mass medium in the world (Conway, 2007), usurping the power of radio which was, prior to television, the most immediate widespread mass media communication method (Attallah, 1991). By 1948 CBS was airing a regular 15-minute newscast with a dedicated news anchor, Douglas Edwards. Initially called the CBS television news, the name was later changed to *Douglas Edwards and the News* and eventually became the *CBS Evening News* in 1962 when Walter Cronkite became the news anchor. When CBS chose to recognize the news anchor by showcasing his name ahead of the show's content in the title of the program, the professionalism reporters had sought for decades since the late 1800s evolved into prestige. That event ushered in the era of celebrity news anchors and with Cronkite created a centralized power dynamic that still exists in broadcast news today. Viewers began to associate the quality of news with the quality of the broadcaster speaking the news and the format and structure of the news story changed again (See: Bracken, 2006; Meltzer, 2010; Newhagen & Nass, 1989). For the remaining decades of the 20th century, television and the broadcast news report would dominate audience preference (Meltzer, 2010). Newspapers that had, at the turn of the century built industrialized monuments to the institution of journalism and become the consolidated bastion meccas serving civic and social information for the first half of the twentieth century, however, struggled with declining public trust (Bracken, 2006). Economies of scale and the perpetual thrust of technological development squeezed the pillars of journalism to seek out increasingly

innovative methods to offset declining financial support. So the push towards creative new automation solutions persisted.

The modern semi-automated newsroom

One of the earliest identified news organizations to rely on intelligent machine generated news content is an organization this research is referring to simply as The News Organization (TNO)[1]. Others soon followed and since then, Artificial Intelligence (AI) dependency in partially-automated newsrooms across the globe has proliferated at an exponential rate.

A number of news organizations have adopted AI technology to assist in generating news articles. One organization has used their AI since 2012 to assist reporters and report on company earnings. Another organization has an AI that published roughly 850 non-human news articles, covering sports and elections, in its first year of operation starting in 2016. Another news organization has partnered with an AI company that has an AI product that provides sports articles and earnings coverage, and is capable of generating stories through Natural Language Generation (NLG). In 2016, the AI product generated 1.6 billion stories for this news organization.

These companies only represent a portion of the news agencies relying on AI in some capacity to report, write, and present news stories to their audience and they do not address the "seen" news report. In a survey conducted in 2020, less than 30 percent of those who participated were aware of AI producing or being part of the process of producing news stories (Owsley & Greenwood, 2022). Readers cannot "see" the journalist who wrote the story and this, along with a lack of transparency and promotion of the technology may have played a role in the low awareness numbers. A small group

of news operations are changing that narrative by introducing synthetic AI broadcast journalists.

In late 2018, a news agency based in Asia debuted their first artificial intelligent news anchor avatar out of a joint venture between the news agency and a search engine. The companies created three synthetic AI journalists, with the first AI anchor debuting at the start of a technology conference in 2018. The following year, two additional AI avatars were introduced to report on a major political event. As of February 2020, the AI news anchors had reported roughly 3,400 news stories. Then in late 2020, a news organization in another country debuted their own AI news anchor to report on natural disasters and emergencies. The company described use of synthetic reporters to allow the news organization to report on news any time of the day or night. That same year, another news agency partnered with a technology company that focuses on AI development to create an AI broadcast sports presenter as a proof-of-concept. While revising this dissertation, a top executive at a fourth organization announced their first AI news anchor at their annual conference, showcasing the synthetic avatar's ability to report multiple news reports daily in several languages tirelessly, and a fifth has launched its synthetic AI avatar on a prominent social media platform for journalists as a test to showcase the capabilities this technology presents to news organizations.

Purpose of the study

The inclusion of synthetic AI reporters presents a new form of journalism that can be just as transformative as the introduction of radio and television in the first half of the previous century. Creating a new social role generates contention in a shared social space. Current occupants are forced to consider their existing role and what this new role

presents, whether that is an opportunity or a challenge to their existence. The primary objective of this academic research study is to conduct a comparative case-study analysis of modern-day news reporters and newsrooms that employ cutting-edge AI technology to create semi-automated newsrooms with those from the early 20th century when radio and television emerged as disruptive revolutionary technologies. The study seeks to investigate the potential impact of AI technology on sociocultural perceptions and behavior among news reporters and their semi-automated newsrooms based in the United States and the United Kingdom to gain a better understanding of where journalism is presently positioned in the diffusion of AI as an emerging innovative technology in newsrooms and news production.

Interestingly, the study of emerging innovative technology is essentially a study of history due to its ephemeral nature. Longitudinal studies of new technology inevitably become studies of the past when the technology was first introduced. That study of "what it was like when…" is less a study of the technology or the innovation itself and more a sociological study surrounding the adoption of the technology or the innovation. Studying the social helps us understand the purpose of a technology or innovation much better than if we were to study the *thing* itself. Understanding purpose or function provides insight into social construction, the meaning-making which surrounds technology and prompts innovation as it is being adopted and diffused. One of the central technologies in this research is Artificial Intelligence.

Artificial Intelligence is a field of science which has been studied for decades. As a polysemic concept, AI is a term which has been used to identify a variety of computational operation concepts at a dimensional level (Broussard et al., 2019).

Specifically in journalism, operationalization of AI in various degrees of autonomy are receiving wider scholarly attention as computational journalism (Anderson, 2013; Lindén, 2017; Waddell, 2019), algorithmic journalism (Dörr, 2016), automated journalism (Carlson, 2015; Graefe, 2016; Zheng et al., 2018), and robo-journalism (Miroshnichenko, 2018), though this not an exhaustive list. This research looks into one specific emerging digital innovative technology being operationalized in journalism: Artificially intelligent, synthetic news broadcasters operationalized to perform in the role of broadcast journalist.

In the history of journalism, innovation and innovative technology have guided how news is communicated and consumed. This research focuses on emerging digital innovative technology applied to journalism and mass communication through a sociological perspective and historical lens, asking how innovation and technology impact sociocultural perceptions in producers of news information. Driven by the question of whether innovative technologies shape the practice of journalism, or if the practice of journalism influences the adoption of innovative technologies, the research questions set forth in this research are:

RQ1: How does adoption of emerging innovative technology impact journalists and their work?

RQ2: How does the social culture of a newsroom change as a result of innovation and innovative technologies adopted in journalism?

and

RQ3: How does the social culture of a newsroom change as a result of intelligent machines moving into mediator roles in journalism?

Preview of Chapters

This dissertation includes six chapters: the introduction, literature review, methodology, findings and analysis, discussion, and conclusion with limitations and suggestions for future research. Chapter one has provided an overview of the study, including the purpose of the research as well as potential benefits of the study and identified the research questions. The introduction also touched on methodology, definitions, and offers a preview of each of the chapters.

The second chapter addresses the literature review, defining critical concepts and theoretical frameworks involved. Chapter two is divided into three sub-sections. The first sub-section introduces the theoretical perspective used to analyze social construction and critically examines where power resides in communication. Sub-section two focuses on concept definitions: artificial intelligence operationalized for journalism, human-machine communication. The third sub-section of chapter two addresses the theoretical models employed for this research: diffusion of innovation and actor-network theory.

Research methodology is the focus of chapter three. In this chapter, the research design, methodology, validation strategies, and ethical considerations are addressed. The study relies on a case-study analysis of the present emerging innovation phase of partially-automated newsrooms by examining one which has produced an Artificial Intelligence synthetic broadcast journalist to report some broadcast news stories viewed through a comparative framework against the early adoption period of television in the United States.

Chapters four and five present the findings of the study, offer an analysis, and provide discussion for the findings. The study concludes with chapter six, which provides

a summary of the research questions, limitations, and suggestions for future research based on the findings presented in the previous chapters.

CHAPTER TWO

Literature review

Dependency and determinacy are two distinct concepts that cannot be used interchangeably. It is erroneous to consider technology as the predominant factor in shaping society, culture, values, or institutions. In the realm of social construction, historians have widely discredited the philosophical doctrine of technological determinism (see: Edgerton, 1999; Kranzberg, 1986; Zelizer, 2008). Dependency on technology is, however, something worth noting since journalism as an institution has historically relied on technology to perform its function in society. This research does agree with the notion that technology does not determine the performance of journalism, in so much as to say that *not for technology, journalism would still exist*. However, it can be argued and this researcher asserts that journalism is dependent upon technology for its performative role in society and the product it produces for its civic responsibilities is partly a consequence of technology.

Kranzberg (1986) writes that "a technical device 'merely opens a door, it does not compel one to enter" (p. 545). That compulsion, then, is indicative of the innovative use of a technology that may drive social progress (Edgerton, 1999). Merriam-Webster defines *compel* as a driving force, urging irresistibility, or causative to result in doing or occurring by way of overwhelming pressure (Merriam-Webster, n.d.). That is to say dependency can be established where determination is refuted. Technology is intrinsically relied upon in the making of communication and therefore in the making and maintenance of society, however, that is not to say that society is determined by

technology. A society's dependence upon technology does not equate it to being a society which is technologically determined.

Communication is constantly engaged in seeking innovative methods to move messages more efficiently between the message maker and the message receiver. Innovation alone, however, is simply the process of making change to already established processes and procedures in the pursuit of efficiency and requires diffusion in order to effectively cause innovation to occur. Diffusion is the process by which innovation is spread through society. The theory of Diffusion of Innovation (DoI) is a useful framework for understanding the process of adoption and the factors that influence the rate of adoption of innovations. Specifically, it provides insights into why some innovations are adopted more quickly than others. Diffusion of innovation occurs at both the organizational and individual level and can be influenced by a variety of factors, including the characteristics of an innovation, the communication channels used to spread the innovation, and the social system in which the innovation is being diffused. When journalists and the journalism industry innovate more effective communication methods to get news messages to an audience, its diffusion occurs in wave-like fashion across time. We can observe these wave occurrences by widening our perspective great enough to take in the full view of a diffusion from initiation to ubiquity.

This research focuses on that area of communication that is intelligible to humans. While it is important to recognize that many forms of life in a bio-diverse ecosystem engage in communication, much of that communication not intended for human understanding. This research focuses only on that communication enacted by or engaged with and between human actors and agents and machines as agents, mediators and

intermediaries. Of the technological innovations employed to economize communication, AI is one such innovation which assists in the process of news making and journalism. Journalism can be classified as a distinctive mode of communication that has generally been known to seek out the most efficient and cost-effective ways of disseminating messages from a source to an audience that is civic-minded and socially engaged.

How are AI-driven automated machines adopted into the production process of news communication? On a linear spectrum, at the simplest end, AI is operationalized as an assistant to the journalist. At the extreme opposite end, AI is operationalized to draft and publish news articles to an audience with little to no human assistance beyond its initial programing. At this end of the spectrum, the machine moves into the mediator role – into becoming the message maker. This new digital technology forces humans to reconsider what it means to make messages and communicate. It reconstitutes the meaning of social construction when all things social are derived from communication and communication, in forming the social, traditionally was defined as humans making sense of their surroundings. In other words, building reality. Human-machine communication theory addresses this ontological shift in message and meaning.

Technology spanning all the way back to the making of paper and the printing press has served to automate this process of communication. In the twenty-first century, we see intelligent machines capable of learning, that have been built on AI, communicating directly with humans, writing news content, assisting humans with daily tasks, and providing companionship, just to name a few of the advances in AI-assisted/automated communication. This has fundamentally altered what it means to communicate when we must now factor machines into the role of mediator in

communication where they were previously relegated to a role of tool, of intermediary, used in the act of communication between two or more humans (Guzman, 2018a).

Activity Theory perceives communication as a subject-object interaction where technology is relegated to the role of a tool, used as an intermediary for humans to communicate with other humans (Kaptelinin & Nardi, 2009). In twenty-first century journalism, communication extends beyond humans communicating with each other. Although it could be argued that the use of AI to generate news content was developed as a tool by humans to aid in human communication, AI now plays a much larger role in news communication as both the intermediary and the mediator.

Since the development of the computer, tools have begun to talk back directly (and in human intelligible language). So, while AT addresses some aspects of human mediated communication, this theory may only serve to fill some gaps left in another, more robust, theory which can be relied on to address this more complex entanglement that occurs when tools move into the mediator role. For this, Actor-network theory (ANT) is a more suitable theoretical perspective through which to look at communication through this exchange of information, the transfer of knowledge and meaning making. A deeper exploration into ANT will be discussed later in this chapter. Another theoretical framework useful to address non-human actors in communication exchange with humans is Human-machine communication. Human-machine communication allows for the movement of AI (the tool) into the role of the mediator alongside human communicators.

This research relies on each of the above mentioned theoretical frameworks, Diffusion of innovation (DOI) theory (Rogers, 2003), Actor-network theory (ANT) (Latour, 2005), and Human-machine communication (HMC) (Guzman, 2018a), as well as

some assistance from Activity Theory (AT) (Kaptelinin & Nardi, 2009) to perform analysis on this phenomenon of adopting preferred technologies to increase efficiency in the communication of news to audiences. Of the post-cognitive sociological theories, ANT provides the most fitting support to DOI for this research, and HMC addresses the emerging use of artificial intelligence in journalism. Each of these theories will be discussed in this chapter.

A. Theoretical perspective

Social theory

Because all diffusion of innovation is a study of the society, and because communication is central to the construction and maintenance of society and culture (Carey, 2009), it is important to understand the motivations and behavior of that society. Central to this concept of communication as a construction device in the building and maintenance of society are two questions: What compels a person to want to communicate news information to others, and why do people in mass become interested in learning news about a certain event or activity?

Diffusion of innovation and Actor-network theory both study the social, however they are more attuned to understanding or describing the behavior of society and the individuals within as they are connected to an activity. While ANT is a fully capable theory to study the construction of a society to describe its interconnectedness, earlier theorists help explain the social aspects in a more distinct manner. Durkheim, Weber, and Simmel contribute to understanding the makeup of our society, how it is formed and functions.

Simmel most closely reflects the philosophies embedded in ANT – that society is the construction of individuals (Simmel et al., 2009). ANT posits that networks are a multitude of actors and that a multitude of actors make up a network (Latour, 2005). Established research suggests there is no society except for the collection of individuals with shared beliefs and that a collection of individuals with shared beliefs make up the social, or society (Simmel, 1971). Individuals rely on "social types" that manifest when engaged with other individual living within the same society (Durkheim, 1933; Simmel et al., 2009).

Social type is a belief or assumption that one should inhabit while engaging with others. Examples of social types are the citizen, the husband, the father, the mother, the sister, or in relation to this research, the journalist. The more people are engaged, the more social types a person may manifest. Social types can be thought of as an individual's phantom persons. These are ghost personae that exist above the physical self and come into presence only when necessary. The social type is an idea of a personification which projects itself when a person comes in contact with another social type during a social interaction. Every social individual carries with them many social types as phantoms waiting for the proper social action or activity to manifest onto the individuals as they negotiate a social exchange. From this, Simmel (1971) describes the metropolis as the full realization of a social type and of that society. The metropolis is an entanglement of social types existing around the individuals that make up the metropolis. Anonymous individuals discretely pass among other anonymous individuals following behavior according to the social type that manifests whenever an encounter occurs. It is in the metropolis that the anonymous individual is free to develop its full potential so

long as they adhere to the norms of their respective social types. This allows the individual to dissolve into the machine of the urban metropolis. The social type is informed by and constructed via information consumed by members of society.

Individuals are shaped by the information presented in the media. Social types are manufactured and maintained by the members of a society in a self-regulating, often imperceptible, operation. The social type most closely paired with the role of the journalist is the stranger. A person who is at once outside of a community but at the same time must exhibit some degree of interest in becoming a part of the community (Wolff, 1950). When describing the journalist, that individual incorporates their various social types into being the journalist. If they deviate from the social norms of 'journalist', however, they will be castigated by the society and no longer welcome to credit themselves as the 'journalist' social type.

This review has established that individuals construct the social and that the social is constructed of individuals, however, in order to consider the social holistically, there is another established claim, that once the social is formed, this entity becomes more important than the sum of its parts (Durkheim, 1933). This macro view of society and how it is formed through social facts and social consciousness offsets the study of the individual. Expanding on the perspective that a social type exists outside of the individual, early social research perceives society as existing prior to the individuals who together form a society (Gofman, 2014). Social facts exist before the individual and through a process of socialization, new members are taught to conduct themselves according to those social facts (Gofman, 2014). Social facts compel adherence. Therefore, if a person resists, the social reacts to enforce itself. In other words, society

actively resists those who would deviate from their social norms or threaten the solidarity of the society (Durkheim, 1933).

Social fact, along with social consciousness (the whole of collective thought in a society) and the division of labor moved society from a simple mechanical solidarity, where the members of a society were ultimately interchangeable because everyone shared the same thoughts and beliefs and were largely capable of independently operating (Durkheim, 1933), to the organic solidarity of modern society, where the individual is specialized and all members are reliant on the others of their community to provide for each other (Durkheim, 1933).

As society moves from simple to complex, three distinct types of authority emerge: traditional, charismatic, and legal-rational authority (Weber & Parsons, 1997). Particularly in looking at diffusion within an organization, it is helpful to recognize the type of authority that makes up the organization. According to DOI, the charismatic organization is most likely to realize full diffusion while the legal-rational organization is least likely to succeed. This is because of diffusion's reliance on key stakeholders to promote and champion an innovation and others in the organization to follow. Charismatic authority showcases this ideal social construction, where a leading individual is followed for their charisma, beliefs, and magnetism. Conversely, in a legal-rational authority, operations are compartmentalized through bureaucracy. There is no central leader, only centralized rules by which members of the organization must follow. Decision making is slowed and decentralized. These conditions make certain forms of diffusion of innovation less likely to come to fruition.

This concept of organizational diffusion of innovation will be discussed further in the literature review. In the next section is an examination of how critical theory may play a role in the research of social construction and the impact of technologies and innovations on individuals in the performance of their work.

Critical theory

Developed out of the Frankfurt school of thought at the start of the eighteenth century as France was emerging from a feudal society into a modern technocentric society, Critical theory is used to delegitimize traditional hierarchical structures of society and to analyze and review these constructs for weaknesses as it provides a way to dismantle common conceptions of how society is structured. The breakdown of traditional, patriarchal power structures provides opportunities to flatten and democratize societies. Post-modernist and feminist theories deconstruct and delegitimize traditional separations and "othering", such as gender, race, age, and other socioeconomic forms of division.

Early social theory looked at how society was formed by individuals and how individual practice and behavior was influenced or dictated by society at a time when influential membership in society was largely left only to white men. Post-modern feminist thinking, such as what has been developed by Haraway (see: 1987, 1988; 1991) has largely done away with this thinking of society as split along fissures of gender, race, age, and other traditional inequalities. Early sociological theory attempted to describe society and its structure by the individuals making up the social. Simmel (2009) claimed there was no social, only large groups of individuals following one another. This view forms from a micro perspective of society as the makeup of its individuals and a shared

belief system. Durkheim (1933) viewed society from the macro perspective that a society was greater than the makeup of its individual parts. The shared general beliefs of a group, otherwise known as social consciousness, provided the structure of a social that was both coercive and resistant. Social beliefs compelled individuals to behave in manners appropriate to the social and if an individual attempted to deviate from those behaviors the society would resist and force the individual to correct. For example, it is believed that dedication to a religious belief system compelled individuals to adopt a particularly strong work ethic in cultures with strong Protestant influence, thus creating the working class and the bourgeoise (Weber, 2005).

Critical theory looks at how centralized social power can be dismantled and reconstructing society without the traditional hierarchal control systems is achieved. Traditional structures such as religion are deconstructed through critical theory, attempting to remove power from these strongholds. These ideas of exploring where power resides and who yields power can be viewed as the natural evolution of traditional sociological theorists' ideas about the makeup of society and the role of the individual. Critical theory could also be seen as a resistance to traditional sociological theory as a way of seeing weakness in traditional thought and providing a pathway to deconstruct prior ideological belief systems, calling out failures and shortcomings.

Critical theory allows for considering other questions, apart from the specific research questions posed, embedded within the research. Such as, how people will perceive non-human agents performing alongside them in traditionally human roles and would inclusion of non-human agents performing human tasks alter the power dynamics of social interaction. Other considerations are whether non-human actors will engage in

ritual communication and if so, how this communication will impact maintenance of the social. And finally, how would humans cope with non-human counterparts operating on the same imagined socio-environmental workspace level, and what the inclusion of a non-biological sentient being would mean for the definition of an individual and society.

Power

Early critical theory concentrated on systems of power and where power resided in the construction of society. Much of early critical theory was derived from Marx's construction of economic power and challenged those ideas. As wealth began to shift and new technologies provided for the proliferation of mass media, a rise in literacy took place and modern society began to develop. Communication and the transmission of knowledge were used to control and maintain influence over the working class by the middle class. The culture industry, made up of entertainment and mass media, provided a method of control over the working class as a vertical, unidirectional tool which could be wielded by the powerful elite and could dictate common social norms, practice and behavior for the working-class masses (Horkheimer & Adorno, 2012). The rise in literacy that led to a surge of interest in knowing what was taking place within powerful circles opened a pathway towards the theory of the public sphere as a space where rational public debate could occur among the working class (Habermas, 2012). The public sphere relied on a civic society to produce a space where universal access to information would be present (Hariman & Lucaites, 2003). Communities began to converge on public spaces to form and take part in public debate, however, an increased shift to individual privacy in the mid-1900s and a blossoming middle-class, along with mass media appeal towards

directional messaging would have a detrimental effect on the public sphere and would ultimately cause its demise (Habermas & MacCarthy, 2007).

Today, there is growing discussion around whether technologies such as the internet have removed any remains of the public sphere. This notion of the twenty-first century evolution of the public sphere morphing into a private sphere where individuals no longer seek out to hold public rational debate but instead pronounce themselves and their beliefs not as discussion but as statements from within private spaces (Papacharissi, 2008) is written on extensively by some researchers. People transmit their announcements out to the "public" from within privately controlled quasi-public spaces (Papacharissi, 2008). The internet and social media communication platforms have not fostered the same public space out of which Habermas' public sphere grew. Rather, social media platforms have created false public environments where there is a fundamental break between how the platforms describe themselves and how the people using those platforms perceive their use (Papacharissi, 2010). Platform owners describe social media as a public space where people come together in much the way that Habermas described, which was to hold rational public debate over things that are of interest to the public, however, people using social media have an imagined audience to whom they are speaking and with whom they are communicating (Habermas, 1989; Quinn & Papacharissi, 2014). In other words, when people post messages and communication to social media, they are communicating with close friends and relatives and with those who have shared or similar interests. This activity generates an echo-chamber effect for their users. Echo chambers cause the individual to receive only those messages which reaffirm

their personal beliefs rather than challenge them or offer challenging ideas and positions on topics.

This type of behavior can have a negative impact on how a society is maintained. Society is built upon a duality of structure and agency (Giddens, 1984). The structure is made up of a set of beliefs that are common to a community and those beliefs, norms, and practices make up society. They inform an individual's agency – the person's ability to act on intention. Agency is informed by structure but structure is not absolute in its control over agency (Giddens, 1984). The individual practices agency based on observation and stored knowledge of their environment. This activity, in turn, informs the structure. Ipso facto, the structure is influenced by agency. In other words, social structure is made up of and maintained by mass agency and that agency is influenced by structure (Giddens & Sutton, 2017). When people are unexposed to critical observation of their beliefs, unexposed to alternative points of view, and have their beliefs constantly reinforced through this echo-chamber effect, this can have a negative effect on the dualism inherent in the structuration of society (Giddens & Sutton, 2017).

Communication becomes instrumental as it can be seen as transmission of information in a relationship of power exchange, often in one direction from the influencer of power to the influenced group (Castells, 2007). One of the key ways that power operates in news communication is through the structures and practices of the media industry (Carey, 1987). News communication is not simply a matter of transmitting information from one party to another (Carey, 1987). Rather, it is a complex social process shaped by a variety of factors, including economic and political structures, cultural norms and values, and individual and collective behaviors (Carey, 1987). Media

organizations are typically owned and operated by large corporations, thus operating within a broader socioeconomic and political context that may (inadvertently or unintentionally) create significant influence over their editorial decisions regarding story selection and coverage. These larger social structures and business practices can limit the range of perspectives and voices that are represented in the news, and can reinforce existing power relations and inequalities despite efforts to the contrary. News is not simply a reflection of reality, but is constructed and interpreted by journalists and audiences in accordance with their own cultural biases and values (Carey, 2009).

Through communication, individuals maintain and foster society by participating in ritual communication. Ritual communication is that form of communication which reinforces shared cultural and social beliefs, norms, and practices (Carey, 2009). One area where ritual communication can be observed as an instrument of power wielded by the elite is in the form of celebrity. The term "celebrity" commonly conjures images of Hollywood actors and actresses, and the social elite (e.g., fashion icons, world-famous models, etc.). The term itself bears its origins in Latin and can be best defined as being well-known (Boorstin, 1972). We often associate celebrity with fame or being famous, though beneath the veneer of fame and fortune, celebrities are essentially people who are well-known for their well-knownness, rather than their achievements or character (Boorstin, 1972). Celebrities are the embodiment of tautology; created by simple familiarity, induced and reinforced by public means (Boorstin, 1972). They are always contemporary, created by gossip, public opinion, magazines, newspapers, and the ephemeral images of movie and television screens (Boorstin, 1972).

For the best part of the past century, celebrities have been idolized by society. Mainstream media and the celebrity role within have fostered a preferred society based on centralized ritual communication. The celebrity is a product created by mass media (Hellmueller & Aeschbacher, 2010). The most common types of celebrity created by media are entertainment figures and athletes, however, other notable areas of celebrity come from the worlds of politics, government, business, and from within media as organic media celebrities. Historically, the promotion, curation, and upkeep of celebrity status was the sole province of mass media (Hellmueller & Aeschbacher, 2010).

Over the years, especially in the years since the massive adaptation of television in every home, the culture of celebrity has become both increasingly intense and competitive (Hellmueller & Aeschbacher, 2010). As intensity for more celebrity access grew, this fueled an increase search on media's part for more sensational discursiveness (Hellmueller & Aeschbacher, 2010). Celebrity can be thought of as a transubstantiated product of cultural value (Bourdieu, 2002). Being a celebrity produces a dilemma for the mass media of how to translate the cultural contribution of the celebrity (cultural currency) into economic value (or economic capital), which is where we see the introduction of social capital (Bourdieu, 2002). Social capital is defined by Bourdieu as

> the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition… to membership in a group which provides each of its members with the backing of the collectively-owned capital (Bourdieu, 2002, p. 21).

This social capital can be converted into economic capital depending on the media's ability to mobilize a sizable network of connected relationships (Bourdieu, 2002).

One variety of celebrity types formed from within media is that group of mass media representatives who have had the spotlight of celebrity turned on them, for example celebrity news anchors. The media celebrity is often seen as a prominent pillar of power and influence. Members of the media, journalists and broadcast news reporters, who were responsible for the construction of social norms often created celebrities then became the celebrity themselves, requiring its own care, maintenance, and upkeep. Creation and care for the celebrity could often rely on spectacle to maintain presence in the minds of the audience.

What is a spectacle and how is it responsible for social normative construction and creation of the celebrity? The spectacle is a construction of mass media designed to remove the viewer from their everyday usual routine and capture their attention with media coverage of an unordinary event (R. L. Kaplan, 2012). In other words, the spectacle can be employed to maintain the celebrity created by the media.

An elaborate construction of spectacle as a concept is written by Guy Debord (2013) in 'The Society of the Spectacle'. This literature forms the basis by which many scholars enter into debate on the merits and values of the spectacle as a construction. The idea that spectacle is a construction of mass media, especially news media, serves to create a normative expectation researched by scholars ever since the concept was first introduced (Morgan & Purje, 2016).

An essential concept to consider when looking into the design of spectacle is that power is a derivative of information (Hariman & Lucaites, 2003). The media's power, particularly news media and journalism, to control the message provides the ability to define the world. Dominant groups within media, defined by gender, race, and class,

control how society communicates, interprets, and categorizes information (Lyford & Payne, 2005). "[T]he hegemonic group drives the use of official vocabularies, rhetorical devices, idioms for communicating one's needs, and the paradigms of argumentation accepted as authoritative" (Harp et al., 2014, p. 291).

Social media provides greater agency to the individual to direct their narrative, or at the very least, respond to any narrative which emerges, thus performing a loosening effect on mass media's restrictive grip of controlling the narrative, shifting where power resides. Traditionally, the control over narrative has been the domain of mass media, positioning control of power and influence over the public sphere in the hands of mass media (Arendt, 1998). In his original analysis, Debord (2013) was critical of a society that was dominated by mass media and the representation produced by the media. The relationships built around capitalism, technology, and everyday life of individuals creates an imbalance of power that resides more often in the control of a centralized pillar of mass media. The pursuit of possession manifest by mass media architecture prevents the individual from gaining a sense of self. Spectacle, therefore, 'stupefies' as a function by producing the narrative around consumptive behavior; in the case of celebrity status, the person becomes a commodity within a staged event (Debord, 2013). "Private property has made us so stupid and partial that an object is only ours when we have it" (Debord, 2013, p. 120).

In the process of constructing the celebrity through spectacle, the individual becomes separated from the community:

> The effect of spectacle is thus simultaneously the production of the many as passive observers, and the institution of the few as those "sacred" and privileged subjects able – in the double sense of "permitted" and "capable" – to accomplish what everyone else cannot. They do, while we watch them doing what they do. …

> the principle of separation has not changed: we – the ordinary – still watch them – the powerful, the celebrities – instead of communicating with one another. (Schirato & Webb, 2004, p. 413)

Debord (2013) was originally criticizing a Marxist view of the world at large, looking at society holistically through a capitalist lens. Although the original division of labor put forth by Marx with its associated class structure had shifted, the principles remained as a product of the spectacle (Debord, 2013).

The spectacle was built upon the overarching concept of relationship between media and the consumer society (Kellner, 2008). One that has meant distancing the masses from once celebrating heroism and other admirable characteristics (e.g. posessing charisma, divine favor, grace, or talent granted them by God) as the best representatives of ideal society, and replacing these social guidance with normative behavior based on echo chambers of our idealized selves. “We admire [celebrities], not because they reveal God, but because they reveal and elevate ourselves,” (Boorstin, 1972, p. 50).

One interpretation of spectacle is that of a utility that different actor groups could use to promote their interest or agenda (Kellner, 2008). A positive use of the spectacle promotes recurring phenomena that celebrate the dominant values of a society (e.g., televised broadcasts of the Oscars, Superbowl, Christmas holiday movie line-up). Kaplan (2012) identifies three aspects of Debord’s spectacle applicable to contemporary society: 1) that spectacle details “banal fantasies” which can overwhelm popular culture and distract from natural, organic culture, 2) that spectacle demonstrates the inequality of power to control and influence our world, and 3) that spectacle underscores the reliance on an ability to represent society through reproductions which create unified meaning.

Spectacle, like the celebrity, is a construct of media that, in most cases, relies on some form of technically mediated event to process for an audience, such as broadcast

media, newspapers, tabloid papers, or the internet (Hellmueller & Aeschbacher, 2010). In other words, traditional mainstream media is responsible for surrounding news events with spectacle and for making the celebrity known. Natural disasters such as hurricanes, tsunamis, wildfires, tornadoes, and others are presented as media spectacle through events such as “Breaking News” and “Disaster coverage” or by the method of delivery. Spectacle and the human celebrity are powerful constructions media can employ to garner and retain power and influence over audiences.

The next section moves from a review and analysis of theoretical perspective taken in this research to a critical examination of AI operationalized for journalism.

B. Concept definitions

Artificial Intelligence operationalized for journalism

What is the role of a journalist, the human actor/agent, functioning in a role to perform journalism? Diakopoulos (2019) defines journalism as “a practice of news information and knowledge production that is filtered through a particular value system” (p.23). The journalist observes their environment and develops new or amended knowledge for a reader or viewer. This knowledge has been conditioned through professional training, development, and practice, to be considered newsworthy. The journalist chooses how to frame a story around this knowledge, and ultimately communicates this new knowledge in news story form to inform a civic-minded audience (Diakopoulos, 2019). Miroshnichenko (2018) writes succinctly that “journalism is a creative human practice” (p. 183). Ryfe (2019) defines the role of journalism through a liberal theoretical lens as obliged to provide impartial, fact-based political news. Journalism serves democracy, central to its mandate, by ensuring those people who make

policy are held accountable to the public which they are representative of, however, journalism only functions when the other actors in a civil society function as they're intended to (Ryfe, 2019). These definitions assume journalism to be a human-centric function, though human exclusivity is not assured.

According to Diakopoulos (2019) the main limiting factor against an algorithm performing the role of a journalist is technology itself. Existing AI technology has not achieved the general ability to apply knowledge acquired by one method to an unrelated task or challenge. This refers to the highest order of operational levels of Artificial Intelligence which will be introduced in this section (A. Kaplan & Haenlein, 2019). Miroshnichenko (2018) reasons the ultimate conclusion to adding algorithms programmed to produce news content into the news stream will be to eventually replace humans all together. His defense of this hypothesis rests on the merits of economy. Miroshnichenko (2018) asserts intelligent algorithms are already well established in newsrooms, that Artificial Narrow Intelligence (ANI) is capable of producing natural human language coherently enough so as to be undetected by an average human reader, and most importantly, that the quality of natural language generation (NLG) needn't exceed human writing. An AI only needs to "write good enough (in order to be indistinguishable and to be hired)" (2018, p. 185).

Algorithms are at the heart of the conceptual labels which previous scholarship has applied. The algorithm has been referred to as itself, as well as a computation, an automation, and a robot. Diakopolous (2019) has defined the algorithm not to be the intelligence. Rather, the algorithm is at the core of a computer system, and a computer system built on intelligence is defined as Artificial Intelligence (Diakopoulos, 2019).

Therefore, it would be appropriate to say that the intelligent agent is not the algorithm, but instead, the intelligent agent is the machine built on intelligent algorithms. A human-centric analogy would be that an individual is not the mind at the center of the human brain but is inclusive of the whole human body and mind.

Artificial Intelligence can be defined by two (seemingly opposing) ideas. AI can be viewed as intelligence that imitates human intelligence/behavior and it is also seen as intelligence opposite to natural intelligence (Miroshnichenko, 2018). AI is not human (or natural) intelligence. Rather, AI is designed by humans to imitate humans in behavior and mannerisms, and AI should be capable of exceeding human behavior and intelligence beyond natural fallacy. Additionally, AI is more than a single tangible operation and journalism can be viewed as an operation historically performed by a human actor who understands how to serve that operation.

The concept of Artificial Intelligence is ancient. Research traces the earliest examples of the logic all AI is built upon back to Aristotle (Bringsjord & Govindarajulu, 2019). The earliest record of algorithmic logic appears in Aristotle's *De Motu Animalium* and his theory of syllogism (Bringsjord & Govindarajulu, 2019). This is the earliest conceptual measure of Artificial Intelligence and though he was not specifically referring to AI as we know it today, Aristotle, when he wrote the theory of syllogisms, produced the logical theory that guided the earliest forms of AI created (Bringsjord & Govindarajulu, 2019). Aristotle's syllogism is constructed of three elements in two parts – two statements that make up the premise, and one statement that serves as the conclusion (Glymour, 1992). An example of Aristotelian syllogism would appear as such: from three groups, designated as X, Y, and Z, a syllogistic statement would present that if all X are Y

and all Y are Z, then all X are Z. Early AI scientists used this theory to teach a machine what they wanted it to learn (Russell & Norvig, 2010). For those early scientists and the many who have followed, the summer conference in 1956 at Dartmouth College holds a distinctive place in the history of AI as it marked the birth of modern AI research studied today. This conference is where the term Artificial Intelligence was coined (Bringsjord & Govindarajulu, 2019; McCarthy et al., 1955).

That conference came about after the iconized Dr. Alan Turing (1950) wrote his seminal paper, *Computing Machinery and Intelligence*, in which he asked the question 'Can machines think?' and introduced the famous *Turing Test.* Passing the Turing Test became the quest by which all accomplishments made in AI were measured for years after. As the test is proposed, if an interrogator cannot distinguish beyond a 50/50 guess which of two participants in a game (hidden from the interrogator's sight) is the human and which is machine after both return a printed response to a question of the interrogator's asking then the machine is said to have won the game and thus passed the test (Turing, 1950). Modern advances in two forms of AI operationalized in journalism today, Natural Language Generation (NLG), which is an AI technology capable of rendering coherently written, natural human speech, and Generative Adversarial Networks (GAN), which is an AI technology capable of synthesizing digital images of non-existent human beings, have passed the Turing Test (Graefe et al., 2018; Lehmuskallio et al., 2018). This achievement does not imply that intelligent machines are now naturally intelligent, however. Imitation should not be confused with replication. Consider the following analogy that proves the fallacy of that belief. A person successfully imitating bird song so that a bird could not distinguish the person singing

bird song from an actual bird does not mean the person is a bird. The test was an important early goal for scientists to contemplate what it would require to build a machine capable of imitating human behavior, however researchers in the field have devoted less time to building a machine that could pass the test and more time working on understanding the principles on which such a machine would function (Russell & Norvig, 2010). While there is ample research available, the focus of this research prevents a deeper, more immersive study into the significance and merits of the Turing Test.

In the longer history of Artificial Intelligence, centuries before Turing penned his paper, Descartes also was thinking about machines embodied with artificial intelligence. In 1637 he wrote:

> If there were machines which bore a resemblance to our body and imitated our actions as far as it was morally possible to do so, we should always have two very certain tests by which to recognize that (Descartes, 1637, p. 116).

Descartes was attempting to draw a parallel between the anatomy of a biological being and that of a machine made from industry as he contemplated what separates the living, breathing, animated biological being from a non-living being. In doing so, he established one of the earliest methods for operationalizing such an artifact. Today, Artificial Intelligence is conceptually defined and empirically measurable as a computer system able to perform tasks usually requiring human intelligence (Diakopoulos, 2019). Computer systems are a part of the formal discipline of computing, defined as "the systematic study of algorithmic processes that describe and transform information" (Comer et al., 1989). Diakopoulos (2019) places the algorithm at the core of modern AI by defining the algorithm as "a series of steps" taken "to solve a particular problem or to accomplish a defined outcome". Stuart Russell and Peter Norvig (2010), in their

immersive text, *Artificial Intelligence: A modern Approach*, define AI by its dimensions and levels: thinking humanly, acting humanly, thinking rationally, and acting rationally.

Artificial intelligence can first be thought of by how it applies logic to thought process, reasoning, and behavior (Russell & Norvig, 2010). Defining AI by its thought process, Haugeland (1985) claims the intention of research in AI is to make a computer think; that the "fundamental goal of [AI] is not merely to mimic intelligence" but rather to make "*machines with minds,* in the full literal sense" (p.2). Bellman defines what it means for a computer to think as "a performance of activities that we associate with human thinking, activities such as decision making, problem solving, learning, creating, game playing, and so on" (Bellman, 1978, p. 13). Russell and Norvig (2010), referring to Charniak, & McDermott (1985) and Winston (1992), define reasoning as using computational models to study mental facilities, and computations as those "that make it possible to perceive, reason, and act" (p.2).

Dimensions of intelligence exhibited in an intelligent machine that is able to emulate human behavior are defined as: 1, making a machine "perform a function that requires intelligence if a human was to do it" (Kurzweil, 1990, as cited in Russell & Norvig, 2010, p. 2), and 2, able to "perform operations at which people perform better" (Rich & Knight, 1990, as cited in Russell & Norvig, 2010, p. 2). Ideally, intelligent machine behavior can be defined as the design of intelligent agents or "intelligent behavior in artifacts" (Nilsson, 1998, p. 1; Poole et al., 1998). Russell and Norvig (2010) separate the dimensions of their definition by two factors: "fidelity to *human* performance" and "*ideal* performance" (p.1). This circles back to a distinction made by Miroshnichenko (2018), that AI can be both the pursuit of matching machine

performance to that of human performance, matching artificial intelligent actor behavior to behavior observable in natural intelligent actors, and of excelling at performance which requires intelligence, even where the fallacies of human behavior may limit natural performance. The later of these two are explained as rational decision making which claims that an intelligent agent "is rational if it does the 'right thing,' given what it knows" (Russell & Norvig, 2010, p. 1).

Scholars have put forth a variety of conceptual terms to identify what Artificial Intelligence is to journalism: computational journalism (Anderson, 2013; Lindén, 2017; Waddell, 2019), automated journalism (Carlson, 2015; Graefe, 2016; Zheng et al., 2018), algorithmic journalism (Dörr, 2016), robo-journalism (Miroshnichenko, 2018). While each conceptual label does well to identify unique case scenarios of implementing AI into a journalism workflow, incremental advances in AI application and adaptations in practice show signs of overlap in usage of these conceptual terms.

Computational Journalism. Lindén (2017) relied on a normative approach to conceptualize computational journalism as the unification of algorithms, data, and social science to account for the function of journalism. In his concept, Lindén envisioned AI encased in robot form and algorithms programmed into the computer system would drive the robot while it performed journalistic duties without thought. Lindén (2017) added that the expected outcome for the robot is to "replicate the end results of journalism" (p.62) but does not make clear how the robot would go about accomplishing this task. Lindén does not elaborate on the role of the robot beyond performance of journalistic duty so we are left to wonder whether the robot would produce the finished written article which presents to a human reader, and/or if the robot would inhabit the physical environment of

the newsroom and move about as human journalists do, and possibly interact with human journalists in day-to-day operations. Without identifying whether the robot would move directly into the role of messenger, Lindén's heuristic view of infusing AI into a newsroom to serve the production of journalism relegates the robot role to that of a technological tool by which journalism can function.

Like Lindén, Anderson (2013) also views computational journalism as a concept housing the same three subsets: algorithm, social science, and mathematical form. However, here Anderson (2013) diverges, claiming the function of computational journalism is to "supplement the accountability function of journalism" (p. 1006). The similarities between Anderson and Lindén's work stop at the level of identifying the operations functioning under computational journalism. From here, Anderson proceeds to elaborate on the impact operationalizing computational journalism may have on a newsroom without discussing any form of interaction between human journalists and machine. By the language used, one could surmise Anderson also views the technology as an instrument to be used by the journalist in the pursuit of journalism, or Anderson is viewing journalism as an abstract concept separate from any operational definition. Only when viewing computational journalism through the lens of culture is the human journalist and any association with the technology mentioned, and only as an interaction between the human and machine generated content (Anderson, 2013). Still, by Anderson's definition, we have no clear description of how the human and machine will interact during the production of news.

In a study which asked the question whether source attribution, human vs. algorithm vs. human and algorithm, affected message credibility, Waddell (2019) made

no attempt to directly define computational journalism, however, by identifying the independent variables being operationalized, Waddell identifies the role played by AI in the production of journalism. His observations include operational distinctions of AI functioning at different levels in the performance of journalism, from simple news aggregation done by bots to semi-autonomous machine writing and human collaborative news products, to fully autonomous independently written machine content.

Automated Journalism. In a case study analysis, the term "automated journalism" was defined conceptually as the "algorithmic processes that convert data into narrative news texts with limited to no human intervention beyond the initial programming" (Carlson, 2015, p. 418). Carlson viewed this as a new distinction separate from computational journalism, observing computational journalism required a human agent to conduct journalism at least in association with the algorithm actor, or independently with the algorithm serving as an instrument by which the human agent could produce journalism. "The tools of computational journalism have technological affordances, but they are also shaped through use." (Carlson, 2015, p. 419). Zheng et al. (2018) rely on Carlson's conceptual definition in a study on cross-cultural contextual perception of automation in news. However, full autonomy is removed from the definition and the researchers add that the algorithm is responsible for generating natural language text to a news format with limited input from a human agent. The authors conflate the distinction by recognizing other scholars label the same (or similar) definition as *algorithmic journalism* (Dörr, 2016) and *robot journalism* (Miroshnichenko, 2018).

Similar to Carlson, Andreas Graefe (2016) labels AI for journalism as automated journalism, yet he makes a key distinction from Carlson in stating the algorithm operates without human involvement beyond the initial programming. Graefe is clear to point that the algorithm only works if it has access to clean, structured, reliable data. It is not made clear whether providing this data would be the provision of human actors. It is fair to assume the volume of data required for the algorithm to produce journalism would exceed the limits of what a human actor is capable of providing, and therefore would require a separate, uniquely programmed algorithmic actor to acquire and structure the data required even if that algorithm is not intelligent. Graefe defines automated journalism operationally as categorical by levels of sophistication in the programming. Graefe's operationalization range from simple coding that completes pre-designed templated stories from a database to highly sophisticated programming that is capable of insightful analysis of the data and produces non-prescribed narratives.

Algorithmic Journalism. Dörr (2016) offers a conceptual definition of algorithmic journalism as reliant on NLG, semi-automation, and characteristics of essential algorithmic processing: input, throughput, output. "Algorithmic journalism [is] defined as the (semi)-automated process of NLG by the selection of electronic data from private or public databases (input), the assignment of relevance of pre-selected or non-selected data characteristics, the processing and structuring of the relevant datasets to a semantic structure (throughput), and the publishing of the final text on an online or offline platform with a certain reach (output)" (Dörr, 2016, p. 703). He further operationalizes algorithmic journalism, providing the clearest conceptual framework by which to develop AI in its role to produce journalism to date. "It is produced inside or

outside an editorial office or environment along professional journalistic guidelines and values that meet the criteria of topicality, periodicity, publicity, and universality, and thus establishes a public sphere" (Dörr, 2016, p. 703).

Robo-Journalism. Like Lindén, Miroshnichenko (2018) assigns physical agency to the concept of AI functioning in a journalist's role by labeling the concept *robo-journalism*. Elaboration on Miroshnichenko's definition of AI has been introduced previously, however, it is important to return to his study, as he also assigns physical agency to AI by employing the *robo-journalism* label. Miroshnichenko (2018) makes an assertion that automated journalism does not always function on AI, but that narrow AI is an essential element for robots.

Conceptual definition. To best link the concepts *Artificial Intelligence* and *Journalism*, an examination of where they intersect may provide the most insightful pathway. AI and journalism intersect at the communication level. More specifically, they intersect at the journalist's communication – communication between journalist and news source, communication amongst journalists in the construction of news, and communication between journalist and their audience.

Journalism, and more broadly mass communication, has been the exclusive enterprise of humanity until now (Guzman, 2018b; Lewis et al., 2019). However, exclusivity of human-to-human communication gives way to non-human-human communication exchange via intelligent non-human agents. AI enabled machines were first added as a convenience to human journalists to make the process of journalism more efficient. This level of reliance on intelligent technology employs an assistant in conducting the daily production of news by operationalizing intelligent algorithms.

Eventually the goal of news-producing intelligent algorithms is to produce journalism without human assistance beyond initial programming (Miroshnichenko, 2018). If artificial general intelligence is realized, human programming may not even be required. That would give artificial intelligent agents full true autonomy in the production of journalism. Even within the confines of ANI, a synthetic journalist could be conceptually defined as an Artificial Intelligence functioning as an agent in journalism as an intelligent machine capable of imitating human journalistic intelligence, values, thinking, and/or behavior at a high level of fidelity with no human involvement required beyond initial programming.

> Diakopoulos identifies journalistic values as being
>
> > concerned with truth and verification, loyalty to the public, and independence and autonomy from those they cover, as well as being produced with an eye toward building community and fostering deliberative conversation (Diakopoulos, 2019, p. 22).

Synthetic thinking is the ability of the machine to make decisions, solve problems, learn, and create, as (or better than) a human would (Bellman, 1978). Scholars argue whether programing values and ideologies of journalism and moral behavior into an intelligent algorithm can be the same as natural mores and values, though Turing (1950) suggests that designing the highest level of fidelity AI can attain is not demonstrably different from nature. In other words, imperceivable imitation of nature is nature.

With a conceptual definition in place, the task of identifying how AI could be operationalized as an agent in journalism can be addressed. An extensive body of literature on the topic already exists, and this research has identified repeating patterns in how AI has been operationalized in the past.

Operational Definition. Descartes (1637) provides an initial point for looking at how to operationalize an intelligent machine by communication first and action second. Any machine which bore a likeness to humans physically or in action should not have the capacity to speak or use any form of sign or signal beyond its programming, whereas a human would be capable of arranging speech or signs to respond to anything presented in their surrounding environment. Regarding the second measure, any action prompted by knowledge should be an impossible task for a machine for the same reason that it cannot know how to respond through communication to all manner of inquiry or statements presented to it (Descartes, 1637). Descartes' operational model bears striking resemblance to what Alan Turing would later formalize into the imitation game. This level of operationalization offers a model for how to measure fidelity. However, it does not assist with how to operationalize AI more specifically as an agent in journalism. It will be important to identify how AI is operationalized at a higher, more abstract, level before any observational measurement of AI in its role in journalism can be made.

Artificial Intelligence, at the highest distinction can be measured by distinguishing its strength to operate intelligently across three levels: narrow, general, and super (A. Kaplan & Haenlein, 2019). Artificial Narrow Intelligence is the weakest level of AI. It is below human level intelligence and contains all known AI systems in operation today (A. Kaplan & Haenlein, 2019). ANI is considered weaker than human intelligence because, unlike humans, an ANI system cannot borrow intelligence or knowledge from memories or experiences outside of its programmed operation (A. Kaplan & Haenlein, 2019). Within its programmed operationalization, an ANI will outperform a human assigned the same task, though an ANI is incapable of adaptation

beyond its specific program (A. Kaplan & Haenlein, 2019). The next higher level of AI is Artificial General Intelligence (AGI). This is the level of intelligence Haugeland (1985) envisioned in his definition of AI as a machine with a mind. At this level, the intelligence matches human-level intelligence. An AGI would be capable of autonomously applying intelligence and knowledge from several areas to accomplish an operationalization (A. Kaplan & Haenlein, 2019). It could learn how to solve a task or challenge through unsupervised learning, then apply this new knowledge to another, unrelated task or challenge (A. Kaplan & Haenlein, 2019). The highest level of AI theorized is Artificial Super Intelligence (ASI). At this level, the AI achieves consciousness and self-awareness. Its intelligence could apply to all areas and solve any task or challenge it is presented with, and is capable of outperforming humans in all areas (A. Kaplan & Haenlein, 2019). Neither AGI nor ASI currently exist in the observable world. AGI has not yet been achieved operationally and ASI is only theoretical at the moment. ANI is the only known observable AI.

By knowing that an ANI's ability to apply intelligence to a problem is limited to a single area, ANI can be recognized by applying a simple syllogistic test. Requesting a known AI agent to perform one task and measure it's ability to satisfy the requested skill it was programmed to perform, followed by a request of the AI to perform an unrelated task, or solve an unassociated problem will expose an observable ANI if it fails to perform the second request or challenge since an ANI will not be able to accomplish the second request or challenge. Knowing the three highest abstract levels of operationalizing AI as L_1ANI, L_2AGI, and L_3ASI, allows the focus of operational definitions to be turned to ANI and how it is operationalized for the specific purpose of journalism.

Chaffee (1991) established that an operational definition attempts to identify everyday usage of the concept by applying labels and that the operational definition may change dependent on the study to which the concept is being applied. Labels aid in developing a better understanding of a phenomenon, however, conflicting labels may complicate progress and hinder development towards unifying theory. "If a concept is to be useful to others, it must be understood by others" (McLeod & Pan, 2004, p. 19). Here, a conceptual definition of AI for the purpose of journalism has been established so while no one operational approach is assuredly the most appropriate, it may be reasonable to assume this operational definition will satisfy the concept at a reduced risk of controversy.

For consistency, this research begins on the premises set forth by Waddell (2019) and Graefe (2016) who have applied operational measures consistent with observations of how AI is currently operationalized in news organizations to three levels of operationalization, all of which fall under level L_1ANI: L_{1a} – Intelligent assistant and content management system, L_{1b} – Semi-autonomous intelligent agent, and L_{1c} – Autonomous intelligent agent. At L_{1a}, AI performs as an intelligent instrument to aid the human journalist in the role of producing journalism by producing relevant resources needed by the human journalist to produce news content, does not produce final written or visual content, and has no exposure to audience (Waddell, 2019). At L_{1b}, AI performs in partnership with human agent[s] to produce news content for an audience (Waddell, 2019). At this level, the intelligent agent can receive supervised learning by observing patterns of behavior in the human journalist, and the content produced is presented to an audience. At L_{1c}, AI performs sole authorship of news content with no human

involvement past the initial programming (Waddell, 2019). At this level, the intelligent agent performs in the same (or exceeds) capacity of a human journalist.

When operationalizing a NLG at L_{1b} and L_{1c}, two within-levels of sophistication that have been defined by Graefe (2016) can be applied. L_{1bi} and L_{1ci} AI is limited to retrieve data from a source database and apply it to a pre-designed template. L_{1bii} and L_{1cii} AI is capable of analyzing source data for deeper insight to create narrative without the aid of prewritten templates.

This operational definition of Artificial Intelligence applied to journalism begins with identifying three distinct levels of AI as it exists from the field of origin: artificial narrow intelligence, artificial general intelligence, and artificial super intelligence. Of these three, only ANI has been realized and is capable of being observed in operation. AGI and ASI remain theoretical levels that scientists are working to achieve operationalization. Next, artificial intelligence applied to journalism was defined by three levels of operationalization that can presently be observed, of which only L_{1b} and L_{1c} would affirm AI as an agent in journalism. L_{1a} operationalization observed would not qualify an AI as an agent in journalism for the purpose of this research. Although, L_{1a} operationalization does not discredit this operationalization of AI within the field of journalism and is currently the dominant form of ANI operationalized in journalism, only L_{1b} and L_{1c} would produce an agent acting independent or semi-autonomously from other human journalists to produce news information which a human audience would receive.

Human-machine communication

Humans have been communicating with non-humans for centuries. We speak with animals, shout at tools, talk to the earth, even yell at the sky and attempt negotiations

with deities. One significant change that has occurred exists in the development of the computer. With the advent of the computer, tools have begun to talk back directly and in human intelligible language. Human-machine communication provides a theoretical framework for discussing how intelligent machines can move into the role of mediator and communicate with humans in what was traditionally a human-to-human communication process.

Interaction with intelligent machines has been established in human-computer interaction (HCI) and human-robot interaction (HRI) study, and continued study into both should be considered. These two areas of research limit human-machine agent exchange to resigning the machine to the role of the channel or medium by which human exchange is possible (Guzman, 2018b). Guzman contends Human-machine communication (HMC), as an area of research, takes HCI, HRI, and human-agent interaction (HAI) into its fold and as a concept attempts to understand "creation of meaning among humans and machines" (p.1). In HMC, intelligent agents move from being solely a communication channel or medium into the role of communicator. In doing so, the traditional model of the human journalist dependent upon machine, in this case an intelligent algorithm, to aid in the practice of journalism shifts to a mode of redundancy, where the human journalist is no longer necessary and the intelligent algorithm, now agent, can produce journalism directly to an audience. This transition of moving AI directly into the role of communicator means more than controlling the transmission of information from source to recipient, however. Becoming the communicator establishes a relationship with the recipient of that message (Guzman, 2018b).

HMC provides us an ontology to perceive the machine as a mediator. HMC moves the machine into the role of the mediator and treats communication between human and machine as though it were no different from a human-to-human exchange. The difference in HMC is that now we must consider the possibility that the machine could possess agenda as much as it may have agency (Guzman, 2018b). In other words, the machine would have goals and purpose for engaging in the communication with humans as much as humans have agenda and goals and purpose for communicating with a machine. This challenges traditional social frameworks for thinking about how the social is formed and how culture is formed. Research suggests that media audiences construct their social reality through media interactions, based on lived experiences of race, class, and gender (Kellner, 2003). Haraway (1991) also acknowledges the role of gender in shaping social frameworks. However, other research has identified the influence of digital online communication as perpetuating the concept of communication with oneself or mass self-communication, consequently causing individuals to create meaning through a distortion of what is perceived as social (Castells, 2007). Including machines in the mediator role of communication represents a reflexive expansion in defining the notion of social construction. Social construction in contemporary society is now constructed through various mediations that individuals utilize to position themselves within social relations, rather than being dependent on traditional national social norms or underlying presuppositions that govern all social relationships (Couldry, 2014). HMC addresses this new shift to include intelligent machines in cultural and social meaning making and suggests an urgency to make this distinction early in the adoption of

intelligent agents into the production of journalism, whether they be (semi)autonomous agents, intelligent tools, or something in between.

Guzman (2018b) claims communication research is research into who we are as individuals in relation to others and about the reality we create, and this switch from a human-first journalist distinction to human and non-human journalist distinction alters the relationship between human and machine from a process "to the creation of meaning between human and machine" (p.3). Modern online mass communication often obscures source assignment by the construction of the user-interface (UI), user-experience (UX), or simply the device itself (Sundar, 2008). Source identification becomes irrelevant and source assignment is relegated to the message recipient's psychological assignment of authorship (Sundar, 2008). From another perspective, advances in AI technology render the machine as appearing aware during interaction with a human, which can be disruptive when communication between human and machine has been considered a transmission of information rather than an exchange of information (Guzman, 2018b). Within the concept of HMC, communication between human and machine adhere to the same standards as human-to-human communication, which can be viewed as an "exchange of information toward some desired effect" (Guzman, 2018b, p. 6). By entering the role of communicator, placed into the role of the journalist, an intelligent machine inherits an obligation to provide information of value according to the principles of journalism the same as if a human journalist were to do it. However, the culture may not be ready to assign such responsibilities onto a machine. AI is deeply entwined with technology and technology is overwhelmingly recognized as a tool (Guzman, 2018b).

In the next section, the research conversation moves from a critical look at AI operationalized for journalism to a look into the primary theoretical models which provide the essential framework for looking at the impact of AI as an emerging technological innovation on the journalist and the social culture of the newsroom in which they produce and present news information to an audience.

C. Theoretical Model

Diffusion of innovation (DOI) theory and Actor-network theory (ANT) provide the foundational structure of this research along with support from Human-machine Communication theory (HMC) and Activity theory (AT). DOI informs the direction of knowledge flow through the diffusion process, identifies significant actors in the process, and helps to explain likely outcomes. ANT is a post-cognitive sociological theory that is exceptionally well suited to describe the process of communication transmission along network pathways by spotting controversy, conflict, and friction entrances into the social translation (or knowledge exchange) process. ANT already symmetrically includes non-human and human actors as having agency, however, HMC elevates this inclusion by recognizing particular non-human actors as having goals as well as agential intention. In the next sections, Diffusion of Innovation theory and Actor-network theory will be discussed more in depth.

Diffusion of Innovation

Both ANT and DOI can be considered social construction theories. Both theories look at the construction of social engagement through entanglement around a centering phenomenon – DOI focusing on innovation and ANT focusing on controversy. DOI applies social assurances and assumptions in an effort to universalize diffusion patterns

so as to generalize its results in order to establish some degree of predictability whether an innovation may or may not succeed (Rogers, 2003). For example, higher levels of accessibility and compatibility often led to assured diffusion of an innovation, whereas low levels of compatibility alone were enough to cripple adoption and fail at diffusion (Rogers, 2003). In other words, greater access to an innovation led to a likely successful diffusion, however, if an innovation was not largely more efficient than previously installed routines, people were less likely to adopt the innovation regardless of accessibility.

Diffusion of innovation theory was first developed in the 1970s and many scholars have since enhanced the theory through a variety of studies. This research relies on a synthesis of established definitions for innovation and diffusion along with an expanding vocabulary that help define the expanding aspects of this theory. Innovation was first defined by Rogers (2003) as the perception of an idea, practice, or object as new by the adopting unit (individual or otherwise) and diffusion as members of a social system processing this innovation by way of communication through relevant channels. Put another way, diffusion of innovation is a type of communication through pathways between members of a social system. The extent to which an innovation becomes adopted relies on the effective movement of knowledge between the involved social members, which we can think of as social agents or actors. Prior to diffusion, an innovation must pass through dissemination. Dissemination is described as the *activity* that precedes diffusion as a *process* and involves actions by actors partial to the success of an innovation identify and inform audiences likely to promote social activation (Dearing & Cox, 2018). This research assumes dissemination activity to be part of the diffusion

process, exhibiting prominently during the knowledge phase although existing reflexively throughout the diffusion process, according to the researcher's interpretation of DOT original theory.

Originally, DOI theory was developed around the individual, however, organizational innovation was later examined and adopted into the theory, expanding the list of unique types of innovation. Technical innovations refer to "products, services, and production process technology" (Damanpour, 1991, p. 560). These innovations involve functional work activity associated with products and processes (Damanpour, 1991). Administrative innovation are indirectly related to technical innovative spaces and involve structure and administration processes at the organizational level (Damanpour, 1991). Product innovations are "new products or services introduced to meet an external user or market need," (Damanpour, 1991, p. 561) while process innovations are "new elements introduced into an organization's production or service operation," (Damanpour, 1991, p. 561). Additionally, a distinction exists between radical and incremental innovation. Radical innovations represent clear departures from existing practice, while incremental innovations result in little departure from existing practice (Damanpour, 1991). In the case of this research, the implementation of AI in newsroom production workflows can be seen as an example of incremental innovation, as the news industry's primary objective is to provide its audience with relevant and significant information, and any technological advances incorporated into this process should continue to uphold this central mission. However, the ultimate goal of automation is to automate. Historically, news has been disseminated through human communication. The introduction of machines to assume the role of communicating information, instead of serving as a tool

for human communication, suggests that this innovation could also be interpreted as a radical departure from conventional practices. In other words, the perception of any innovation will likely vary depending on the perspective of the stakeholders involved, such as practitioners or administrators.

The innovation process can be broken down into five discrete stages: agenda-setting, matching, redefining/restructuring, clarifying, and routinizing (Rogers, 2003). In specific context, such as information technology, researchers have reinterpreted the process stages and added a sixth to include: initiation, adoption, adaptation, acceptance, routinization, and infusion (Zhai et al., 2018). The changes applied indicate an iterative adjustment from Rogers' original five stages rather than a complete restructuring of the events. Across contextual reassignment, these stages in the innovation adoption process specific strategies that are perceived as linear and sequential, however, some researchers have suggested the process may likely be a more iterative and recursive process (Zhai et al., 2018). When observing organizational diffusion of innovation, time of adoption becomes a primary dependent variable (Dearing & Cox, 2018). One thing researchers agree on, though are unable to answer, is that value is not equally distributed across the stages. The rate at which an innovation will spread through a population and the time it takes for adoption to occur varies across stages and time (Rogers, 2003).

The diffusion process often begins at the fringes of a relational network and moves inward to central authority figures then potentially outward to the full group. Innovation begins with those explorers who will experiment with the innovation. Between the center of a network and its periphery are the others; who will follow by watching opinion leaders behavior and listening to their advice (Dearing & Cox, 2018).

Seeking advice or modeling behavior on opinion leaders has been described as a "heuristic that often reflects an emotional desire for status and that allows the decision maker to save time while reducing uncertainty," (Dearing & Cox, 2018, p. 185). This can be described as a form of social reward. The pursuit of social rewards motivates the adoption of new products, with those in superordinate social positions seeking new products to establish and communicate social differentiation (Fisher & Price, 1992). This theory suggests that early adoption behavior has social or communicational value when it is socially visible and associated with a superordinate group (Fisher & Price, 1992; Simmel, 1957).

It is important to recognize two factors when describing diffusion of innovation. First is that an innovation needn't be new by a definition of time, as in being the latest. Innovation is "simply that which is perceived to be new – not necessarily better – by potential adopters," (Dearing & Cox, 2018, p. 184). Secondly, diffusion is not synonymous with replace. In many instances, diffusion of an innovation has not replaced the preexisting technology or method. The computer and digital word processor have not replaced pen and paper and writing did not replace spoken communication. Digital photography has not made film photography disappear any more than photography made painting obsolete, and motion picture did not replace still photography.

Diffusion of innovation can be broken down into four stages: knowledge, accessibility, compatibility, adoption. In the knowledge phase, an individual becomes aware of an innovation. Accessibility describes the level of ease by which an individual can access the innovation. If an innovation is unavailable (e.g., limited market access) diffusion will likely fail. Compatibility addresses how easily an innovation works to

solve a deficiency in performance. An innovation which easily molds itself into an individual's established routine is more likely to be widely adopted than a process which requires individuals to learn new skills or form new habits. The last stage of diffusion is adoption. Adoption of an innovation is divided into four general distinctions: early adopters, initial adopters, latent adopters, and laggards. Early adopters take on the most risk. Interest in the creative solution outweighs later considerations of accessibility and compatibility. Laggards take on nearly zero risk after issues of accessibility (e.g., market saturation) and compatibility (e.g., stable versions) have largely been resolved. Initial and latent adopters exist along the spectrum in between these two extremes.

Within organizations, additional actors are involved in the diffusion process, though the process itself can be largely upscaled to observe adoption behavior at both individual and organizational levels similarly. Within organizations, two additional actors are essential to the diffusion process – the promoter and the champion. The promotor initiates adoption of an innovation and prioritizes bringing accessibility and compatibility down to acceptable levels for the widest possible population of the organization to begin adoption. The champion of an innovation is the early adopter who showcases the benefits of an innovation for others in the organization to emulate.

Another way to view this network of actors operating towards adoption is to say that innovation does not occur in a vacuum. Beyond that, mega-events are useful to the diffusion of innovation process because of the affordances they convey. Mega-events provide a closed system with heightened global attention and sensitivity. They can serve as an accelerator for diffusion of innovation to pass through its stages from initiation through adaptation, though the typically short lifespan of a mega-event does not provide

enough time for the later stages of diffusion to develop in a single mega-event instance. A mega-event can attract a global audience, stimulate interest by prospective investors, provision infrastructure necessary to facilitate optimal performance, and improve on capacities that an innovation may accommodate (Ferrari & Guala, 2017). For example, World War II and the Korean War were central moments in the adoption process of 35mm camera technology (Creech, 2017). Two activities intensified interest in the technology; high demand for images from the warfront by audiences and US military logistical structures provision for the rapid delivery of images made by reporters embedded with deployed troops (Creech, 2017).

In the case of innovative urban development, mega-events have been known to provide accelerated opportunity for urban transformation processes because they provide the motivation which propels creative, ambitious renewal projects along with access to expansive public and private funds (Ferrari & Guala, 2017). In addition to providing opportunities for cities to innovate their infrastructure and governance, mega-events such as the Olympic Games have been found to have a positive impact on a host nation's exports. This phenomenon has been referred to as "the Olympic Effect" (Rose & Spiegel, 2011). Rio de Janeiro became an exemplar city of how mega-events can be used as a central hub to promote the diffusion of innovation process in the 00s, resulting in the transformation of a declining city with poor infrastructure investment and economic downturn into a beacon example of smart-city innovation and renewed positive city governance, after hosting the Pan-American Games in 2007, Rio+20 in 2012, FIFA World Cup in 2014 and the Summer Olympic Games in 2016 (Paschoal & Wegrich, 2019).

As Paschoal and Wegrich (2019) outline, in 2008 Eduardo Paes was elected to be the city's mayor by running on a platform of major city redevelopment and investment strategies. His city management strategies were hailed internationally as innovative governance that provided opportunities for the city to shed its negative past. Paes championed three significant innovations through the use of mega-events planned for the city: the Rio Operations Center, a Unified Service Hotline, and the Social Participation Laboratory. The results had profound effects on city governing and created widespread institutional change in Rio.

To champion these innovations, Paes strategically placed allegiant supporters of his plan to implement his design. A coalition of loyalists in support of innovation reduces opposition and resistance. This type of mediating actor is directly reflected in Rogers (2003) diffusion of innovation theory as change agents (or opinion leaders) in social systems and champions in organizations. A change agent is motivated to positively influence decision making during the diffusion of innovation process in favor of the change agency (Rogers, 2003). Within an organization, this change agent is known as the champion of an innovation (Rogers, 2003). It is possible, through the lens of Actor-network theory, to treat the whole of an organization as the champion of an innovation due to Latour's flattening of any hierarchy within an organization. This flattening would treat the organization as a single node within a network (Latour, 2005).

Beyond support from ardent supporters, promoting innovation is necessary to recruit widespread adoption (Rogers, 2003). Support, defense, and promotion are necessary to initiate adoption of an innovation. Paes allotted large sums of money to pay for advertisement and advertisement space at key media channels to gain support, or at

least complacency (Paschoal & Wegrich, 2019). Maintenance of these pillars is essential to ensuring an innovation moves from adoption to routinization. Paes applied the same strategies he employed in the initial steps of diffusion to maintain control over his agenda through the routinization phase (Paschoal & Wegrich, 2019).

One of the primary goals of DOI theory is to standardize behavior patterns and improve the adoption of new ideas and practices in order to increase efficiency and effectiveness. Diffusion of innovation seeks to universalize patterns of behavior during the adoption of new ideas and new ways to more effectively operate (Rogers, 2003). There are predictors that could aid in knowing whether an innovation was likely or not to be diffused throughout a society. For example, there are early and late stages in those diffusion process stages introduced earlier: knowledge, accessibility, compatibility, and adoption. The extent to which an innovation was widely known about leads to an increase in positive adoption, as well as, whether an innovation was accessible. While accessibility is a key factor that influences the adoption of an innovation, compatibility also plays an important role. An innovation is more likely to be adopted if it offers clear advantages over the existing method. If the innovation is not significantly more efficient than the current routine, people are less likely to adopt it, even if it is easily accessible.

Diffusion. This research, then, may define diffusion as the process by which an innovation is perceived through time. “Diffusion involves an innovation that is communicated through certain channels over time among the members of a social system,” (Dearing & Cox, 2018, pp. 183–184). Diffusion can be thought of as the communication which takes place among relevant members of a social system through relevant channels over a period of time (Rogers, 2003). Assessment of an adopted

innovation's value is reflected through this diffusion process. Failure in the diffusion process leads to the failure of adopting an innovation. Failure to innovate ultimately results in loss of value to the individual or other unit seeking to adopt innovation. The risk of this provides reason for better understanding the DOI process and how innovation plays a pivotal role in social/group sustainability, progress, and overall survivability.

Innovation. To innovate is not beholden to one specific type of innovation, nor is innovation naturally required to be an improvement upon prior methods. Innovation is more focused on creative solutions to greater efficiency and may develop in many forms. Innovation takes place when new values are ascribed to an idea, practice, or object by an individual or larger units of adoption (Rogers, 2003). Every definition of progress from social to economic generally includes an awareness that innovation is essential to sustainability. Another way to express this is to say that to innovate is to survive. The degree to which an organization is perceived as innovative correlates to a perception of their effectiveness to grow.

In the next section, the second primary social construction theory is introduced and shows the relationship that forms between these two theories to construct the social theoretical framework upon which this research is based.

Actor-network theory

The intricate incorporation of information and communication technology into our daily lives makes Actor-Network Theory (ANT) a fitting theoretical perspective to analyze the interaction and exchange between human social systems and machine technical systems (Klein et al., 2020). Actor-network theory purposefully discards social assumptions and looks at activity and action through the lens of the actor performing in

order to better describe what is taking place (Latour, 2005). Where DOI would generalize the fallibility of a diffusion based on the inefficiency of an innovation to satisfy the social, ANT will look more closely at the individual choosing one activity over another in order to avoid conflict. That is to say that ANT, through its slow and cumbersome methodology, is great at describing activity and action in an actor-network, however it is incapable of explaining "why" the activity or action occurs. Together, these two theories, DOI with its universality approach and ANT with its granular description approach, complement one another to address diffusion of innovation more attentively.

The diffusion process is referred to as "translation" in Actor-network theory. Translation is the movement of a thing between connected actors transporting, or transforming, the thing which is being moved (Latour, 2005). This does not immediately imply causality the same way as Rogers talks of directional flow of innovation outward from the innovator in a linear or sequential manner, although this becomes an important point of association. Alone, translation and tracing the translation across these pathways, is not proof itself of causality. Instead, the transportation of a thing between connections simply brings about the coexistence of two or more mediators that have now formed a relationship around what is being transported. However, a social still does not exist. ANT relies on defining social by its etymological origins "socius: 'someone following someone else'" (Latour, 2005, p. 108). In this description of coexistence there is no following taking place. There is an exception in the translation process, however, that introduces the idea that mediators may be placed in strategic positions intended to induce causality by predictable, or routine, patterns, in which case causality may be determined

(Latour, 2005). Going back to Latour's understanding of the social, with this exception is it possible to see the social more clearly now as forming from causality.

As Rogers identified, innovation is a process that moves through a population. A population without some valued intention is less likely to coalesce around a new idea. Without intention, movement between mediators by itself is not enough to form a social, a social realm, or even social ties. There only exists the possibility of forming a social through traceable associations between mediators (Latour, 2005). When that possibility is realized through causational relations, the motivation necessary to produce the social realm necessary for Rogers' innovation to be considered by its social members is established. Except, ANT supposes a symmetrical network of equivalent agents, which left alone, poses a threat to causality. This symmetry of equivalent agents removes privilege from human actors, makes agency of the material world visible, and places human and non-human actors on equal footing in a flattened landscape (Kaptelinin & Nardi, 2009). While necessary to reveal bidirectional exchange dependence between human and non-human actors, this loss of causality removes the motivational factor, which must be reasserted in order for diffusion to occur.

In studying the failed innovation of producing ethanol from wood, Miettinen (1999), reinserts intentional causality into the translation process of ANTs symmetrical conceptualization by infusing dialectical cultural-historical activity theory (AT) with ANT for richer analysis. The artifact-mediated structure of human activity constructed in AT reasserts relevance of human actors with causational intent, otherwise referred to as motive. Miettinen (1999) asserts ANT, on its own, displays significant shortcomings when applied to the innovation process. Inside a heterogeneous network, ANT avoids

establishing any criteria by which to define the nature and scope of actors involved, marginalizes contributions made by non-critical actor-members, and most importantly does not provide an explanation for human intentionality (Miettinen, 1999). When the innovation process can be studied as a "network of activity systems" (p. 183), those actors otherwise marginalized (non-human entities, designers, users) are able to be included in the analysis through their historical contribution and relevance within an activity system (Miettinen, 1999). This inclusion reasserts intentional causation, an integral element of diffusion and the innovation process, by giving special treatment to certain actors. These special interest actors in ANT are identified as "macro-actors", which are considered social entities that have "interests" which can reveal them as "agents in their own right" (Kaptelinin & Nardi, 2009, p. 246).

Diffusion of innovation consists of multiple actors involved in a variety of different activities, each entering and exiting at differing times, however, all entangled in the diffusion process. It is important to look at each actor involved in the exchange to describe the relationship that is formed (Latour, 2005). This can only describe, however, as ANT does not assume to explain, however it is through this process that macro-actors may be identified acting in the network.

Latour (2005) also defines network as a concept and not a thing to be observed. "[Network] is a tool to help describe something, not what is being described" (Latour, 2005, p. 131). In this case, network is used to "designate flows of translations" (Latour, 2005, p. 132). The network in actor-network allows us to trace the relationships that congeal and dissolve around a central node (Latour, 2005). In other words, observing the

network in actor-network allows for viewing translations, assertions, and clarifications in an exchange or communication.

Diffusion of innovation is described as a method of communication with a purpose (Rogers, 2003). Latour's definition of network provides a way, through the ANT lens to study this communication/exchange process occurring between actors while they are involved in the diffusion of innovation process.

Unlike Activity theory's asymmetrical view of humans and artifacts, ANT flattens the world with a symmetrical assertion that both humans and non-humans possess agency and intention. Latour (2005) intended to showcase the potential agency of non-human actors or actants in the process of social translation. For example, a hammer alone may appear not to possess agency or a goal, however, when acted upon by a carpenter building a house (when the hammer is picked up and held to drive a nail into a wood frame), the hammer becomes the manifestation of its intended construction – to hammer. The craftsman who designed the hammer is recalled and manifest in that act of the carpenter hammering the nail. In this way, ANT claims all actors, both human and non-human, when in action or performing an activity, become the realization and coalescence of every other actor and actant connected to those involved in the exchange.

The analogy of an ant in its colony is one way of understanding Actor-network theory that the founder of the theory has even relied on. The ant is a special character. It goes about its day following the other ants in their daily routines – foraging for food, excavating, collecting construction materials, and assembling constructions, all for the colony. The extent to which an individual ant is aware of the vast colony it exists within and aids in its construction and maintenance is irrelevant. To zoom in and watch the

individual ant in its daily labors says little of the vast construction a multitude of ants is capable of constructing. Expand out far enough and an elaborately constructed labyrinth of tunnels, alcoves, and food pits can be observed. An observer could ask; is the individual ant one discrete part of a colony, or is a colony of ants the collection of many individual ants?

Actor-network theory posits that society can be understood as a complex network of actors, much like the intricate behavior of ants within a colony that can be observed by researchers. Researchers can observe the social world holistically, as one vast interconnected network forming a unity and they can examine the actions of individuals from their perspective, which, when compounded, make up the social fabric. Actors and actants, individual human and non-human characters and material artifacts, co-construct social reality across a vast landscape of interconnectedness. The combination of close inspection and broad examination strengthens the potential for insightful discoveries.

Actors and actants behave similarly to quantum particles when studying social translation, the formation of the social, and the maintenance of a constructed social. Observed discreetly, the individual actor manifests as the human or non-human actor. However, when activity is observed, the action of the actor collapses the individual into a wave form of effect in a network of interconnectivity. The individual ceases to be an individual and in its place becomes a node of interconnectedness touching many other nodes across the network. For example, a clothed person can be more precicely described as an individual that is wearing shoes, bottoms, and a top. To look at the activity of what it took for the individual to wear those clothes becomes a mesh of activity involving a retailer, a supplier, a shipper, a producer, a harvester, a grower, a store, an employee, a

stocker, a utility provider, and more. The expanded network of actors and actants touched by the individual's activity is exponential.

That actors are identified as human and non-humans is essential to understanding ANT from other post-cognitive social theories, such as Activity theory (AT) and phenomenology theory. These other theories perceive the social as constructed of human actors who utilize non-human objects as tools to form communication between humans. ANT does not distinguish human from non-human as subjects from objects. Both are symmetrically bound up in the entanglement of social engagement. Together, forming the social through a series of social transactions, or networking.

ANT compliments DOI because it allows for the study of how the social manifests by spotting controversy within the network. To better comprehend the sociotechnical world, where interaction extends beyond human-to-human exchange and includes non-human actors that may trigger controversy, it is imperative to explore these interactions for deeper understanding and to learn ways by which to stabilize such interactions (Latour, 2005). Since all social is a construction of communication pathways – meaning making – communication without controversy is essentially invisible. Communication without controversy, or frictionless communication, is the intended form of communication and therefore goes with little to no notice under normal conditions. When communication – transmission of meaning – is halted or stalled, controversy emerges at a point of friction and observations of how the actors close the controversy in order to proceed can be conducted. This is known as mapping conflict or cartography of controversy (Venturini, 2009).

Controversy. Conducting research on controversy in innovation that occurs during the diffusion process is critical for gaining a deeper understanding of how emerging digital innovative technologies are contested and shaped by various actors and other influences. In their research, Klein et al. (2020) define controversy as "events in which an issue or an innovation is subject to interrogation and dispute, when the actors involved with it disagree," (p. 3). This definition highlights the dynamic nature of controversy, which can arise during the introduction and implementation of innovative technologies and involve a variety of actors with different interests, goals, and perspectives. Other academic researchers have explored controversy through various lenses and scopes.

A study conducted by Colbjørnsen (2014) analyzed controversy surrounding the introduction of a new media device by examining the key actors involved during the introduction of new media devices, specifically focusing on the interaction between bloggers, commenters, and media innovations in the marketplace. Panourgias (2015) studied controversy and how controversy transforms relationships over time by analyzing the key controversies regarding the development of a cross-border settlement system in the context of the integration of capital markets. Kolloch and Dellermann's (2018) research findings from a study of controversy in the context of innovation ecosystems in the energy industry indicate that in the era of the Internet of Things (IoT), "innovation ecosystems" (p.1) emerge in response to the disruption of traditional innovation processes. In their research, Eaton et al. (2015) studied controversy by exploring the evolution of boundary resources within Apple's iOS service system. Their research explored the issue of distributed power discrepancies among actors contributing to an

innovative product. They showed that discrepancies can cause tensions when conflicting contributions are made by actors sharing the same transmission channels and platforms. Klein et al. (2020) examined the process by which controversy arises in a digital innovation platform during the introduction phase of its lifecycle.

Other research explores the inherent characteristics of digital platforms to develop a model of how controversy arises in these environments. Two recent studies have conducted an investigation on the development of enterprise systems and multidimensional digital platform enterprises, with a specific emphasis on the formation of relationships across platforms and among actors during innovation processes (See: Sedera et al., 2016; Yablonsky, 2018). Huang et al. (2020) conducted a recent study on how digital platforms scale during the innovation process. The research traced three contingent mechanisms that underpin rapid scaling with an aim to explain these mechanisms through an agency perspective as to how they interact in the rapid scaling of digital ventures.

These studies demonstrate that controversy can occur in various contexts and can arise from discrepancies in power, conflicting contributions, and relationships among actors during the innovation process. Additionally, the research highlights the variability of where controversy can occur in social networks and during the diffusion of innovation.

Venturini (2009) describes five key characteristics of controversies. First, controversies involve a wide range of actors, including not only humans but also natural and technological elements. Second, controversies display the dynamic nature of social interactions, as alliances and unities can suddenly break apart. Third, controversies resist reduction and oversimplification. Fourth, controversies are debated and involve

questioning of previously accepted ideas. Finally, controversies often involve conflicts and clashes between different worlds.

Klein et al. (2020) propose that in the face of controversy, actors engage in "problematization" and rely on an actor-network to find a solution. This process is referred to as being "attracted to the process of *translation*" (Klein et al., 2020, p. 3), where *translation* is a transformative process that moves meaning from its original context to a new context in order to create new meaning. There are four stages of sociotechnical network formation that occurs around controversy, as outlined by Callon (1984): problematization, interessement, enrollment, and mobilization. Problematization involves the actor establishing their identity as an essential part of the network. Interessement involves actions to validate the identities of other involved entities. Enrollment involves defining roles and relationships for other entities to accept, through discussion, persuasion, negotiation, transaction, seduction, or force. Mobilization involves aligning interests, goals, and identity to form a sociotechnical network by displacing opposing entities. When a disagreement or dispute arises and passes through all four stages of translation, the resulting controversy eventually subsides and stability is restored to the project (Callon, 1984). In certain instances, agreement or consensus cannot be attained, and the controversy remains unresolved. This outcome suggests that the misalignment has not been rectified and that the controversy will reappear in the future. The introduction of a destabilizing component or a change to the current misalignment could cause the reoccurrence of the controversy. If this occurs, the full process of translation must start again. This could lead to a more intense and challenging

controversy to address, making the process of reaching a resolution even more difficult (Venturini, 2009).

The present research aims to identify events that are considered as conflicts or controversies as experiencing *friction*. Controversy refers to a disagreement or dispute over a particular issue. Controversy can arise from differences in opinion, values, beliefs, or interests. However, controversy carries an implied message that actors experiencing controversy would necessarily be engaged in vocalizing or otherwise calling attention to differences in opposing behaviors in order to resolve the controversy or conflict. That is to say that controversy may imply stoppage until the controversy or conflict is removed, which is not always the case.

Friction commonly refers to resistance between two physical surfaces, however, in social contexts, *friction* may also refer to tension that arises from differences in opinion, values, or behaviors (see: Innis, 1972; Kellner, 2003; Papacharissi, 2002). *Friction* may then refer to interpersonal conflict, though it is important to be mindful of the language used in context to describe such interactions. While it is possible the term may describe social interactions to suggest that conflict is an inevitable or inherent as part of human relationships, this is not inherently true. *Friction* can be both beneficial and detrimental, depending on the context. For example, friction between car tires and the road is necessary for the car to move forward (benefit), but too much friction can cause the tires to wear out quickly (conflict). In other words, friction applied in the proper amount results in positive momentum while too much (or too little) friction risks binding, slippage, or failure.

The examples of scholarship discussed here aim to represent the various aspects of controversy, conflict, and friction that have been examined, including the methods used to address these issues, the actors involved, and their evolution over time.

In instances where a dispute or disagreement arises, the origins of friction can often be attributed to a misalignment between the human-to-human actors or the human-to-non-human actors, caused by differing opinions, conflicts of interest, misunderstandings of identity, or a lack of shared goals (Klein et al., 2020). Understanding the causes of the misalignment is important in identifying potential sources of friction. Often, negotiation is necessary to restore stability to the network (Venturini, 2009). Controversy emerges any time a misalignment exists between actors (Venturini, 2009). As mentioned earlier, stability within sociotechnical networks is provisional. This means that stability is subject to change with the introduction of new elements to the social order. In addition to new elements, existing sociotechnical elements that have been operating in a stable environment may themselves become misaligned or cause misalignments due to adjustments, alterations, or other changes to their presence. These misalignments can cause friction and must be addressed in order to restore stability to the network. Any complex element introduced or come upon in a society, whose operational function, or value, is not explicitly clear, or can be made sense of with minimal effort can spur controversy (Latour, 2005; Venturini, 2009). In other words, friction may exist anywhere function or operation can be questioned.

Google Glass is an example of a failed innovation that exhibited controversy and friction during the diffusion process. In 2012, Google Glass was launched for consumer use, but it encountered problems generating positive public response due to a

misalignment between Google's intended messaging and the public's reception of the technology. As a result, the product did not achieve diffusion as intended. During the diffusion process, the media (recognized as a macro-actor) failed to provide the necessary positive support required when engaged in dissemination activity. This caused a controversy that may have significantly contributed to the innovation's failed diffusion by creating a misalignment between the innovators and the intended audience.

Google Glass is one of the digital innovation products categorized as Augmented Reality Smartglass (ARSG). It is an optical display worn on the head that enables the wearer to access online information and communicate through a wireless internet connection. In August 2011, Google submitted a patent application for its Glass product, and by December of the same year, rumors about the product began to surface in mainstream and social media (Bilton, 2011; Olsson et al., 2011). Google Glass was not the first product in the (ARSG) market, however. Other companies, such as Microsoft, Sony, and Magic Leap, were also developing ARSG devices around the same time and others have since entered production. The ARSG itself represents the prominent non-human actor in this controversy.

The controversy involved various human actors with different identities and roles, such as Google employees, government regulators, NGO representatives, non-native software developers, IT workers and experts, news providers (journalists, reporters, bloggers), business consultants, researchers, artists, members of media (celebrities, fashion figures), physicians, computer hackers, and the general public. Some of these actors were more prominently featured in visual texts than others. Specifically, venture capitalists, regulators, consultants, researchers, and computer hackers were rarely, if ever,

seen in visual discourse. Conversely, other groups of human actors were more visibly represented. Venture capitalists could be considered non-human actors due to their relationship within the innovation ecosystem and the stock markets (Klein et al., 2020). Principle non-human actors identified were: the native operating systems (OS) of both the ARSG device and the wirelessly tethered smartphone required to perform certain operations; native applications developed for both devices; non-native (third-party) applications developed by non-Google developers; opposing OS developers (such as Apple with iOS) whose platforms allow and prevent different applications from running on their systems; as well as "ordinary" objects such as prescription lens glasses, clothing and apparel, and surveillance systems (closed-circuit television cameras and recording devices).

The first time the public caught a glimpse of the actual Google Glass device was a year after patent applications had been filed. Prior to this, earlier publications discussing Glass had only been speculations and rumors about the device's features before it was formally announced. On two occasions before the official announcement, the New York Times published articles meant to illustrate how these new "secret" projects were going to upset the contemporary conveniences of smart device technology (Bilton, 2011, 2012). In 2011 and early 2012, the New York Times published articles speculating on the secret projects underway at Google and Apple. These articles featured images of an iPhone being operated by hand as if it were a game console controller displaying the home screen with rows of icons, and a graphical illustration overlay of an iPhone being held to compose a photograph of the Golden Gate Bridge.

Then, on April 4, 2012, Google released their first public video of Glass, giving the public their first real look into the project beyond speculative written reports (Google, 2012). The device itself was not shown in the short first-person video, but it emphasized the capabilities and intended role of the device in everyday life. According to analysis, the video was meant to start a conversation about Glass's purpose for private end users, with Google hoping that Glass would provide access to information and connect people "without shifting their attention away from real life" (Klein et al., 2020, p. 6). However, the 2-minute-30-second video showed the interface popping up with notifications or being activated by the user 18 times, without addressing crucial gaps in subsequent interactions that would require the user to engage with a smartphone device and respond to those prompts and notifications. This difference between the description and performance display highlights at least one area where there was a misalignment between actors. Two months after the public video release, Sergey Brin demonstrated Glass with a group of adventure-type characters on stage at the Google I/O developer conference (Google Developers, 2012). Google was showcasing its ideal types for enrollment and seeking to recruit more non-native developer actors for the product. However, when the media reported on the I/O 2012 event, the lead photo chosen to run with the Verge article was a mid-blink and mid-speech image of Sergey Brin, co-founder of Google, wearing the Glass device on stage with the device casting a heavy shadow over the right side of his face against a blank background in a black long-sleeve athletic top (Savov, 2017). All of the demonstration spectacle was absent from this image.

Following the debacle over press coverage of the developer conference, in September, Google showcased Glass at Diane Von Furstenberg (DVF) New York Fashion

Week by having all the models wear the device and livestream the event from a first-person perspective. The New York Daily News was the first news outlet to feature images of the device in multiple colors, as seen on the runway models (Duerson, 2012). In these photos, the models appeared as statuesque figures of fashion, despite the headpiece covering one eye. The lead image, featuring Furstenberg and Brin both wearing Glass, revealed tension as Furstenberg appeared to give Brin a look of genuine disdain, well paired with Brin's gawking expression. It seemed that Google was trying to recruit actors from the fashion world and build a celebrity base, but the actions of the New York Daily News suggested that disagreement already existed.

Over the course of a year, Google Glass went from an innovative project to being heavily criticized and questioned, with many actors distancing themselves from the project and even outright contesting its usefulness. Controversy emerged as human actors interacted with non-human actors. The media discourse surrounding Glass suggests a misalignment during the interessement and enrollment phase of the process, with mass media presenting the product in an unflattering way.

Digital innovation projects can sometimes appear as "solutions in search of a problem" (Klein et al., 2020, p. 10). They are presented as solutions to problems that do not necessarily exist. Google Glass was marketed as a solution to the problem of constantly being distracted by handheld smart devices. Google claimed that people did not want to constantly check their phones and that Glass would allow them to access information and communicate with others without having to look down. However, there was a misalignment between the message and the visual text of the promotional video. Misalignment opens the possibility for controversy to emerge(Venturini, 2009). Many of

the operations that Google claimed could be performed using Glass still required tethering to a handheld device. This misalignment and the flaws in the message contributed to the emergence of controversy surrounding the product. The images featured by the mass media to portray Glass as a product indicate these key stakeholders did not have a consistent message and that inconsistency created a conflict during the insessment/enrollment process, thus preventing positive mobilization.

Technology is woven into the core fabrics of society, creating a sociotechnical environment which includes interaction between both human and non-human actors (Latour, 2005). This chapter has established that the challenge of determining the success of introducing a novel product or project into society is intensified by the need to comprehend and predict the behavior, beliefs, objectives, and social interactions of human actors. Present forms of intelligent technology also will require understanding how humans coexist and interact with non-human actors, as well as other human-actors reliant on the assistance of non-human actors as intermediaries.

Google Glass has been described as an emerging digital platform innovation. Emerging digital platform innovations are the result of a complex process that involves multifaceted orchestration requiring the collaboration of various actors across multiple layers of technologies; each of which are responsible for developing and maintaining a vast networked ecosystem that supports the functioning of these digital platforms (Klein et al., 2020). Networked interactions among actors are capable of producing unpredictable interdependencies which may present conflict and controversy within the greater ecosystem (Klein et al., 2020). This unpredictability makes informing a proper definition of an innovation a challenge to key stakeholders during the process. In

situations where problems arise, finding a solution may not be immediately feasible, resulting in the possibility of delays, dissatisfaction, or even project or product dissolution (Dougherty & Dunne, 2012). In the absence of established standards and predefined solutions, potential problems during the introduction of a new emerging digital innovation project or product are unable to be swiftly addressed, resulting in friction when complications arise, potentially jeopardizing the success and longevity of the project or product (Klein et al., 2020).

The concepts reviewed in this chapter cover several key areas. First, the importance of communication in constructing and maintaining society and culture. The contributions of early scholars help us to understand social structures, social types, social fact, and social consciousness. This point sets the foundation for understanding the evolution of social structures and the power dynamics that exist within them. Second, that critical theory aims to delegitimize traditional hierarchical structures of society. Through analysis and review, these constructs examine power structures for weaknesses, and attempt to reconstruct society without traditional hierarchical control systems. The critical theory perspective helps in understanding the limitations of existing hierarchical structures and encourages the development of new structures that allow for more equitable and democratic participation. Third, that the rise of the culture industry, internet and social media became the demise of the public sphere by their impact on power dynamics and social interaction. The impact of the internet and social media on power dynamics and social interaction, and the creation and care of celebrities, often relying on spectacle, led to a crippling of the public sphere. This point is important because it highlights the role of media in shaping cultural narratives and influencing public opinion.

These concepts open pathways to explore additional questions such as how power dynamics in social structures impact the adoption of new digital technologies in newsrooms and what new social structures could be developed to allow for more equitable and democratic participation in newsrooms. Fourth, human-machine communication poses challenges to traditional social frameworks that HMC theory helps us navigate. This point is significant as emerging digital technologies are rapidly changing the way people interact with each other and with machines. Understanding how these technologies impact social structures and communication is crucial for adapting to these changes. Finally, the fifth point discussed is the diffusion of innovation theory, how Actor-network theory contributes ways of examining social engagement, and the stages involved in the adoption of an innovation, including technical, administrative, product, and process innovations. This point helps in understanding the process of innovation adoption, and the challenges associated with implementing new technologies in newsrooms. The concepts discussed in this chapter are interconnected and form the basis for understanding the impact of emerging digital technologies on society and culture. This chapter provides a comprehensive overview of the key concepts and points related to emerging digital innovative technology in newsrooms which are necessary for addressing the research questions in the Findings and Analysis chapter. This review has sought to highlight the importance of communication in constructing and maintaining social structures, power dynamics, critical theory perspectives, and the impact of the internet and social media on power dynamics and social interaction. These concepts provide the basis for exploring how the adoption of emerging innovative technology impacts journalists and their work, how the social culture of a newsroom changes as a

result of innovation, and how intelligent machines impact social culture when moving into mediator roles in journalism. Additionally, the review has provided insight into the challenges associated with implementing new technologies in newsrooms and the process of innovation adoption. The next chapter will employ these concepts to analyze the data collected from in-depth interviews with reporters who currently work in a semi-automated newsroom that utilizes AI technology to address the research questions, aiming to offer a more comprehensive understanding of the impact of emerging digital technology on society and culture in newsrooms.

CHAPTER THREE

Methodology

This chapter explains the research design developed for this dissertation. Historical-sociological analysis (HSA) provides the underlying framework upon which this research has been conducted. More commonly referred to as historical sociology, HSA has no single coherent methodology or set of guidelines by which to conduct its research (Leavy, 2014). The name of the analytical framework utilized in this study may cause confusion as it implies a focus on historical analysis, although the model encompasses a broader scope. As noted by Leavy, the degree to which historical elements are necessary for meaningful comparison is an ongoing topic of discussion among sociologists. This affords a researcher the opportunity to negotiate analysis by relying on various epistemological presuppositions. For this study, the researcher relies on three foundational assumptions. One, that human knowledge is based in the practical needs of preservation and provision (Coleman, 2002). Two, attempting to understand social reality requires an interpretivistic perspective to make sense of qualitative data (Ann, 2017) despite recognizing that objective truth may exist where practical interests do not manipulate or influence knowingness (Coleman, 2002). Three, that journalism largely continues to be a human-based endeavor.

This study utilizes a qualitative research approach and employs a case study methodology with a paired comparison process analysis to provide historical contextualization for the present-day case study under examination. The paired comparative approach has been "widely employed but hardly theorized" (Leavy, 2014, p.

58), and is ideally suited for process analysis. Paired comparison is a technique which can be used in historical-sociological analysis to compare and contrast two similar cases with slight differences in order to gain a deeper understanding of a particular phenomenon or social structure. Process analysis focuses on understanding how a particular process works and can be used to examine any area of interest, such as organizational change, technology implementation, or decision-making (Leavy, 2014). The goal is to gain a detailed understanding of how a process works, with the aim of identifying gaps which could potentially lead to exploitation, opportunities for improvement, or identifying worst practices. Paired comparison case studies involve selecting two cases that are similar in many respects but differ in one or more key aspects, and then analyzing the similarities and differences between them that occur over a period of time. The case study approach "deals directly with the individual case in its actual context," and creates value by "generat[ing] knowledge of the particular (to be) used for theoretical elaboration or analytic generalization" (Yin, 2016, p. 68). Case study analysis can be used to study a wide range of phenomena, including but not limited to individuals, organizations, events, processes, programs, policies, and systems. It can be particularly useful in examining complex and multifaceted issues and understanding the interplay between different factors in a specific context. Utilization of two comparable cases from different time periods effectively establishes historical context for either one or both of the cases.

In keeping with the research's purpose and the historical-sociological analysis paradigm, a paired comparative study is utilized to investigate the effects of newsroom automation utilizing synthetic AI news avatars. The study specifically operationalizes these avatars to assume the duties of a broadcast reporter and automate some aspects of a

news operation, which are then contrasted with the previous use of human broadcast reporters during the rise of broadcast television news as a disruptive technological innovation, to offer historical contextualization. This methodology enables the researcher to explore how these emerging roles influence the social culture of the newsroom.

Semi-structured, in-depth interviews were conducted with members of a news organization identified as having experimented with such emerging innovative technology by the researcher. The interview method is widely regarded as one of the most effective approaches to qualitative research (McCracken, 1998). The in-depth interview enables this researcher the opportunity to better understand how emerging innovative technology impacts the social culture of the modern, partially automated newsroom. Although the researcher does not claim that the presented research will become a fundamental contribution to our understanding of journalism and society, prior scholars have asserted that qualitative interviews have led to significant discoveries in social science, and that they provide descriptions of phenomena that could not be learned through any other method (Weiss, 1994). “Explanations of…empirical phenomena must start with an investigation into the meanings that people give to particular forms of social action and the social worlds and cultural forms these actions help to constitute” (Ann, 2017, p. 2).

The historical component of this study entails an analytical review of existing secondary literature documenting the technological innovations adopted by newspaper reporters and newsrooms in the years leading up to and during the emergence of radio and television as competing disruptive technologies.

Research Design

Designing for qualitative interviews to collect data was parceled into three discrete phases: establishing recruitment procedures, gathering data for analysis, and analyzing the data. Each phase could be subdivided further into more discrete steps and following Weiss's (1994) articulation of Miles and Huberman's advice that analysis should begin the moment data starts to be collected, phase 2 and 3 (gathering data and initiating analysis) were performed concurrently. IRB approval was a critical early step in the initial phase of the research design. As part of the process, the researcher ensured that all ethical considerations were thoroughly addressed and all necessary approvals were obtained before proceeding with participant recruitment. Prior to collecting data, a recruitment protocol and guidebook for interviewing was established. To ensure consistency and thoroughness in the research process, it is recommended to draft a guidebook, regardless of the research team's size or whether the research is conducted individually or in teams with separate individuals conducting interviews.

Recruitment

A recruitment protocol was established for the study, using templated recruitment messages for email communication. A written consent form was drafted and administered to participants via a Qualtrics survey through an embedded hyperlink in the recruitment email message. Upon the successful completion of a survey – filling in each form field and clicking to submit the survey – a notification was sent to the researcher via email. The survey asked participants to agree to participate, provide their name, and include

their contact email. Once a participant confirmed their agreement, the researcher could send them a link to an automatic scheduler that provided available time slots in 1-hour increments to schedule their interview appointment. Participants could choose a suitable time for the interview to take place, and upon confirmation, a unique Zoom conference ID was generated and sent to the participant's email. The researcher was notified when a participant booked an interview and the Zoom appointment was automatically added to the researcher's Zoom calendar.

To test the effectiveness of this protocol, the researcher conducted a pilot recruitment procedure with a volunteer prior to a formal launch. After the successful completion of the pilot recruitment program, recruitment messages were sent to potential participants to invite them to participate in the study.

Participant recruitment began by identifying potential participants using a *critical case* information-oriented selection (IOS) process. Critical case IOS sampling is best employed to maximize the effective data gathered in a brief period of time (Brinkmann, 2013). IOS sampling method allows the researcher to look for participants in an interview study who represent *extreme cases*, *maximum variation cases*, *critical cases*, or *paradigmatic cases* (Brinkmann, 2013). By using critical case IOS sampling, the research can benefit from the ability to make deductions and falsifications (Brinkmann, 2013). For example, journalists function within a framework of expectations. If journalists who operate with AI identify a change in their functionality/patterns of operation, it may be reasonable to believe all journalists who would operate with AI in a similar manner will identify a change in their functionality/patterns of operation. The purpose of IOS is efficiency; to increase the efficacy of information from the single case or small sample

(Brinkmann, 2013). Applying IOS theory with Glaser and Strauss' (1967) concept of saturation guided this researcher's baseline for a minimal effective sample group. According to the concept of saturation, when conducting qualitative research studies, a researcher will ultimately arrive at a point when no new data can be found to develop the research properties further (Glaser & Strauss, 1967). Paired with efficiency through the informed-oriented selection process, data collection could be satisfied once a confirming number of participants begin to yield similar accounts of activity based on response to the interview questions. This does not imply that full saturation has been or can be achieved. Achieving full saturation may not be feasible, and this should not be interpreted as a failure of the research methodology. Glaser and Strauss' concept of grounded theory implies a perpetual, infinite ability to collect new data, however, in the interest of publishing results from studies, the two theorized a saturation point at which results from continued data collection would exceed past a point of diminished return, at which time it would be beneficial to the scholarship to publish results (Glaser & Strauss, 1967). To answer the question of how many participants should make up a sample for qualitative research, one must examine the method by which data is going to be collected for analysis. McCracken (1998) suggests "less is more" (p. 17) when it comes to in-depth interviews and found that in most cases, a single-digit sample size is sufficient to gain a thorough understanding.

Potential participants were identified as people employed by TNO as journalists, reporters, news editors, or anyone who had a role in the production of news and resided in the United States and/or the United Kingdom or worked from a bureau located in the United States or the United Kingdom, including journalists, broadcast journalists,

photojournalists, data journalists, print and/or broadcast news reporters, news editors, newsroom production assistants, newsroom production crew and/or operators, and others. TNO is considered a critical case for this research as it aligns with the IOS sampling strategy used in the study. The organization satisfies all criteria outlined in the literature for critical case IOS methodology. As stated in the introduction, TNO was the first news organization to utilize AI as a news mediator, constructing brief news reports from structured data. TNO prides itself on being a pioneer of innovative news publishing practices and has also engaged in public-facing research and development of digital AI news broadcasters. Based on the criteria of operating a semi-automated newsroom structured on AI assistive technology, being a recognized leader in innovation in the news industry, and having operationalized a digital AI news avatar for broadcast news reporting, TNO emerged as the most suitable case study for examining the phenomenon of newsroom automation through a critical case IOS sampling strategy.

Contacting potential participants for recruitment required searching the internet for publicly available staff directory listings and constructing contact information based on the likelihood of staff personnel using the most common email formatting known to be used at TNO (e.g., [first name].[last name]@[tno].com). Once a database of potential participants was established, recruitment messages were sent out via email. Subsequent recruitment messages were sent on three following occasions at a weekly, then bi-weekly interval in an attempt to recruit more participation. Response to recruitment messages increased after each subsequent message and peaked after the second subsequent message.

The total population of potential participants included 676 people identified as living and/or working for TNO in either the U.S. or the U.K. at the time of contact. Of the 676 possible participants contacted, 140 returned error messages, which this research has determined may have been caused by the person no longer being employed by TNO.[2] The researcher received 47 out-of-office reply notifications from participants, confirming the delivery of messages to the intended recipients. Of the total potential participants contacted, 25 declined to participate.

Interviews were conducted with seven participants in total; four men and three women. Six of the participants were located in the United States and one worked from an office based in the United Kingdom. The study participants' length of employment at TNO varied from under a year to 30 years. The sample of journalists included in this study displayed a range of occupational experience, varying from three to 40 years. This commitment to service in the journalism industry along with significant careers at TNO provided rich insight into the evolution of innovations and innovative technologies utilized at the news organization. The initial interviews averaged 64 minutes, and followed by an accuracy-check follow-up interview for verification purposes. This method follows McCracken's (1998) first principle of qualitative research that working with a few people for a longer period of time and with greater attention is more important than working superficially with a larger number of people. Gaining access to cultural insight and how one culture perceives and shapes their world comes from deep exploration rather than topical surveying methods (McCracken, 1998). "[T]he goal is not to achieve a singularly accurate, objective snapshot of the world, but to develop an

explanation of how people socially…construct and understand the worlds in which they are embedded and the logics they use to navigate those worlds" (Ann, 2017, p. 74).

Recruitment and interviewing was conducted over a period of 10 weeks from January, 2023 through April, 2023. The research design intentionally incorporated a brief and intensive recruitment and engagement period with participants. This research was not intended to be conducted as a longitudinal study extending over a lengthy period of time. Rather, by condensing the period of time spent engaged with participants to a hyper-focused window, the researcher was able to capture an instant moment of time in which each participant would be expressing their observations of behavior in themselves and in their newsroom shared by time. This approach to data collection is supported by Carey's interpretation of the relationship between communication and culture; that maintenance of society is measured in time, not space (Nord, 1988). The research gathered from these interviews is not intended to be generalizable. Instead, these interviews provide insight into the social-behavioral norms of journalists by viewing a snippet of time during a rapidly evolving environment. As McCracken describes it, where quantitative research is designed to survey the extent to which something is present, qualitative research mines intensively for depth into a thing that occurs.

Interviewing

The intention of interview-based research is to directly retrieve data from sources identified as relevant to the study. Within a qualitative research approach, the interview seeks to understand phenomena from the perspective of participants engaged with the studied phenomenon or phenomena. It hopes to understand the activity, thoughts, and behavior of a person or people engaged with events being researched (Brinkmann, 2013).

Unstructured interviews are commonly used in the initial phase of a research program during a pilot study. Unstructured interviews allow for exploration of avenues into a research study either by learning more about the community of people involved, and who may be suitable contacts for more structured, in-depth interviews, or by gaining better sense of how to formulate interview questions for the more structured semi- or fully structured interviews. This research was constrained by limited access to potential pilot study participants, leading the researcher to rely on inductive reasoning to develop interview questions informed by prior research and scholarship exploring the intersection of innovation and newsroom culture. See the Appendix for the list of semi-structured interview questions. For question 6, participants were read a definition of innovation used in this research, that innovation is the act of making changes to established processes/procedures to increase efficiency or improve economic viability, especially by introducing new products, methods, or ideas.

Interviews were conducted remotely via the online video conferencing application Zoom. Teleconferencing, including Zoom, which has gained popularity during the Covid-19 pandemic, has become a prevalent mode of communication across societies. Zoom, as a teleconferencing application, provides a number of advantages to the researcher. Accessibility, recording and automatic transcription service, co-presence and interactivity are at the top of that list (Wahl-Jorgensen, 2021).

Although once considered the gold-standard in qualitative interviewing, the in-person interview, thanks to technological advances in video conferencing abilities, can no longer be seen as assuredly better than video tele-conferencing interviews. The use of remote conferencing has enabled researchers to attain the same qualities that were

previously exclusive to in-person interviews. In addition to convenience, remote conferencing also offers added benefits. The researcher is able to access all verbal and non-verbal cues from the participant as well as record, transcribe, and reflexively revisit the interview for verification of analysis once the interview has concluded.

Reflexivity refers to the process of reflecting on one's own experiences and biases in relation to the research being conducted (Ann, 2017). In the context of research interviews conducted via teleconferencing, having access to revisit the original interview data rather than reliant on memory recall and written notes can be particularly valuable because it allows the researcher to closely and continuously reexamine the participant's verbal and nonverbal cues to gain a deeper understanding of their responses and to identify any potential biases or assumptions that may influence the analysis. By closely examining the interview data, the researcher can gain insight into the ways in which their own experiences and biases may have influenced their analysis, and can work to mitigate these potential biases in order to arrive at a more accurate and nuanced understanding of the research participants' experiences (Ann, 2017).

Apart from improving the veracity of a research interview, access to individuals in geographically remote or distance locations becomes possible using over-the-internet video teleconferencing. Health, safety, and security for the researcher and participant increase thanks to remote access. In research conducted using clinical interviews, researchers found that recorded interviews provided greater insight in examining paralinguistic communication, proxemics, timing, and context (Gubrium et al., 2012). Finally, researchers have found that the psychological effects of participants being able to participate from within their preferred settings (i.e., in their home, at an outdoor

environment, from their office) increased the likelihood the participant would feel more at ease and therefore more willing to share intimate details and information during the interview (Wahl-Jorgensen, 2021).

Data processing and analysis

Recruitment information described the interview time as lasting approximately 45 minutes, though interviews were scheduled in 1-hour increments and interviewees were advised the interview may conclude earlier or could extend past one hour depending on the interview. After obtaining verbal consent, the interview was recorded and transcribed using Zoom, and securely saved to the researcher's designated electronic file storage directory using a multi-step process to prepare the data for analysis. Firstly, all interview data, including video recordings and .vtt transcription text files, were downloaded from Zoom servers to the researcher's computer. A compressed archive file of the interview data was then created and renamed using the participant ID number, before being transferred to a master backup folder on the researcher's cloud-based encrypted data directory for safekeeping. The master archive was established as a backup protocol to protect against loss or damage of the working data information. Next, a new folder was created with the matching participant ID in the researcher's cloud-based encrypted data directory to be used as a working folder for analysis of the data. The downloaded interview data was then transferred to this folder.

Once in place in the working directory, the transcript file was opened in Apple TextEdit, an OS-based text editing program, to clean up the data. Specifically, all of the lines of text associated with each speaker were identified and consolidated to create a continuous block of text for each individual. Extraneous timestamps that appeared in the

middle of a speaker's block of text were deleted, and only one timestamp was left at the start of each speaker's block of text to indicate the beginning of their speaking turn. After consolidating the text by speaker, the next step was to line edit the text to make it more readable as a written narrative. The spoken word in English is often inconsistent with readability standards humans have come to expect in written prose. This editing involved creating a copy of the transcript file and renaming it by adding -edit to the existing file name. In the -edit transcript, the text was edited for any errors in grammar, spelling, or punctuation. Additionally, the text was edited for clarity, coherence, and flow. This involved rephrasing sentences and paragraphs, removing extraneous information (such as thought pauses, e.g., the use of "right" and "you know" as rhetorical confirmation statements), and adding transitional phrases (inside brackets) to connect ideas in accordance with the APA 7 style guidelines. The purpose of adding the edited transcript was to create a written narrative that accurately represents the interview data in a clear and concise way, while also being easy to read and understand. Once the line editing was complete, both transcripts were ready for analysis and interpretation. The last step of the data preparation process involved importing the cleaned-up transcript, the edited transcript, and their associated video to Atlas.ti for coding and analysis. Atlas.ti is a QDA software program used for qualitative data analysis.

Atlas.ti is one QDA software program available to researchers for better research management. Qualitative Data Analysis tools assist researchers by aiding in the organization and management of qualitative data, making it easier to identify patterns and themes in the data (Mann, 2016). This research benefited by relying on data analysis tools specific to Atlas.ti to code and analyze the interview data. Atlas.ti is specially designed to

work with multimedia data such as video and transcripts. Atlas.ti also incorporates machine learning to provide context and sentiment analysis along with inductive coding.

A "retroductive" (Emerson et al., 2011, p. 173) analysis of the transcripts began as processing was conducted, following established suggested research strategies, which allowed for an efficient way to process the data. Researchers have concluded that the process of analysis is intertwined with all phases of the research enterprise, from making observations to developing explicit theoretical propositions (Emerson et al., 2011). Thus, qualitative research becomes a dynamic and iterative process of analysis that is informed by both inductive and deductive reasoning. Analysis of the data followed a multi-tiered coding approach that the researcher derived from ethnographic field note analysis practices – *open coding, focused coding, code memos, and integrative memos* (Emerson et al., 2011). Coding of the data is necessary to link interview data to the concepts raised in this research (Weiss, 1994). In total, this research employed four coding sets on the interview data: open coding, focused coding, sentiment coding, and deductive coding.

The coding process involved four phases, building on the coding strategy used in prior research (see: Ferrucci, 2018). The initial approach involved three stages of inductive coding. This was supplemented by an additional step of deductive coding applied to the data. The initial phase of the analysis was conducted through open coding of the unedited participant responses while notetaking in memos. Open coding began during the initial review and reading of transcript data. Open coding, otherwise referred to as inductive coding, is described as identifying and formulating "any and all ideas, themes, or issues they suggest, no matter how varied and disparate" (Emerson et al., 2011, p. 376). The open codes were then reviewed to identify redundancies and areas

where the codes did not provide discrete evidence. In the second phase, the initial set of open codes underwent refinement, resulting in a more focused set of codes. Focused coding involves identifying and categorizing the most significant and recurring themes and concepts in the data (Emerson et al., 2011). The process involved selecting the most relevant codes, occasionally merging redundant codes, and refining them to create a more precise and focused set of codes. Subsequently, a second round of focused coding was conducted on the edited transcripts in a controlled paired group setting. A third set of sentiment coding was performed on the edited transcripts once focused coding was completed. Sentiment coding is another type of qualitative research analysis that involves identifying and categorizing the emotional tone or sentiment expressed in text data, often using machine learning or other intelligent machine algorithms (Annett & Kondrak, 2008). For example, identifying whether a spoken expression conveys positive, negative, or neutral emotional tone. Coding qualitative data for sentiment helps to determine how individuals feel about a particular topic or issue and provides valuable insights into how individuals perceive and react to certain topics or issues (Annett & Kondrak, 2008). In phase four, a top-down deductive coding structure was designed to address each research question and principal concept from the literature review. This structure was used to perform a fourth round of coding on the data. By using a combination of these approaches, the researcher was able to capture both the emergent themes that arose from the data and the pre-existing theoretical frameworks. This approach allowed for a comprehensive analysis of the participant data and ensured that the research questions were adequately addressed.

To further explore the inductive codes that emerged within these codes, a co-occurrence analysis was performed. This involved examining the frequency and patterns of the inductive codes that appeared in conjunction with the deductive codes. The results of the analysis were used to deepen the understanding of the relationships and connections between the different codes and sub-codes. Analyzing co-occurrences in coded quotations can provide valuable insights into the complex relationships between different themes and topics that emerge during the coding process (Scharp, 2021). Co-occurrence analysis is also referred to by some researchers as "simultaneous coding" (Scharp, 2021, p. 548). It can reveal patterns and trends that may not be immediately apparent from individual codes alone, and can provide a more nuanced understanding of the data (Saldaña, 2009). Examining the co-occurrences of codes also helps identify potential gaps or areas of overlap in coding strategies to make refinements. Conducting a co-occurrence analysis on the data in this study provided valuable insights into the extent to which participants' responses to interview questions aligned with the research inquiries, as well as their sentiment when discussing each of the topics.

To ensure the reliability and validity of the coding process, a codebook was formulated to guide the analysis. Even in research involving a sole researcher, developing a codebook to guide coding and analysis helps to ensure consistency and reliability of the coding. This research was conducted by a sole researcher and thanks to the size of the data collected, training additional coders to assist in coding the transcript data was unnecessary. Some researchers advise against having anyone other than the principle investigator to code transcripts for in-depth interview analysis, as it may create an undesirable degree of separation between the researcher and the data (Mann, 2016). Since

no additional coders were trained for coding the data, calculating intercoder reliability was not required. In place of additional human coders, this research relied on coding programing designed into Atlas.ti to check for coding reliability. QDA programs are designed to support researchers in managing and analyzing qualitative data. One of the key benefits of using a QDA software program, such as Atlas.ti, is the assistance it provides in achieving coding validity. A secondary coding of the data was performed in the QDA, using the software's AI automation programming. The researcher was then able to conduct a simple comparative analysis of the two inductive code lists: one created by the researcher and the other by the QDA's generative AI program. The process served to determine the relative consistency between the two lists and provide suggestions for code refinement based on some of the AI-generated codes. The codebook was then developed based on a review of existing literature and addressed both inductive and deductive coding approaches.

Validation Strategy

Ensuring data validity is critical for the success of any research study, particularly in interview-based research. Several methods can be employed to enhance validity in interview-based research. One way is by conducting interviews with multiple unique sources. This approach increases the likelihood of obtaining diverse perspectives and reduces the risk of relying on a single source (Ann, 2017). The more participants interviewed, the higher the validity of the data collected. Additionally, triangulation, member-checking interviews, and reflexivity can be employed as validation strategies to further enhance the validity of the data.

As previously mentioned in this chapter, it is important to note that once data saturation is achieved, gathering additional information may not necessarily provide additional value to the research. While validity may continue to increase, it may reach a point where it no longer serves the research objectives. In accordance with the principle of "less is more," this study placed its emphasis on conducting in-depth interviews with a select few participants. This approach allowed for a more comprehensive analysis of the present case in comparison to similar historical patterns of innovation, resulting in richer data.

Another method to ensure validity is through external confirmation by comparing the interview data with historical or published data related to the researched phenomenon. This validity practice is known as triangulation. Triangulation, or the collection of multiple forms of measurement (Leavy, 2014) offers a standard method of validity many qualitative studies incorporate. The strength of triangulation as a validation strategy lies in the level of convergence evident in data collected from different sources (Yin, 2016). The comparison of participant responses in interviews against previously researched data that documents the phenomenon under study enables the researcher to validate the responses. In this study, triangulation was achieved through the use of multiple primary and secondary data sources, including interviews, documents, and external scholarly research articles.

A second form of verification used in this research relied on direct engagement with the interview participants. Interview-based research is research dependent on human memory and human memory has been established to require special attention to ensure accuracy with the data collected (Leavy, 2014). The strength of a qualitative research is

directly associated with the degree of member involvement, therefore, member validation is another useful form of validation that can, at the same time, test claims made by the research though possible new evidence (Leavy, 2014). Researchers identify this strategy as member-checking. Member-checking interviews involve returning to participants to verify and confirm the accuracy of the collected data. This strategy ensures that the researcher's interpretation of the data aligns with the participants' experiences and perceptions (Mann, 2016). In this research, the validity of data was ensured by performing member-checking at three stages. In the first stage, the researcher relied on asking subsequent interviewees questions that would verify the accuracy of things said in other interviews. This process ensured accuracy of the data interpretation and whether the research findings reflected by the participant's experiences and perspectives were upheld by others or were unique to the individual. The second stage required the researcher and participant to meet for a second interview after the researcher had time to perform an initial review and synthesis of the interview data. This second interview was carried out shortly after the initial interview in order to ensure the participant would be able to recall as much information as possible from the initial interview. This follow-up interview was referred to with the participants as an accuracy check, a term which journalists themselves commonly employ in their own reporting strategies. During this interview, participants were asked to verify and/or clarify ambiguities discovered in the transcripts and to elaborate on specific points made that the researcher felt was critical to the analysis. The third stage of member-checking involved asking some of the participants to read the researcher's findings and analysis of the interview data to provide feedback on the accuracy and completeness of the data.

Although triangulation and member validation are crucial measures to ensure the validity of research data, the analysis by the researcher also plays an important role. Therefore, reflexivity should be considered an essential validation tool in research. In his research, Yin (2016) discusses the value of reflexivity as a validation and ethical strategy for qualitative research. He states that reflexivity provides avenues for the researcher to identify and address potential risks in a research design. That reflexivity is the process of reflecting on the researcher's own experiences, values, and biases that may have influenced the research process and findings. And he suggests this strategy is particularly important in interview-based research, as the researcher's personal biases and experiences can impact the data collection and interpretation process. In this research, reflexivity was achieved through the use of reflexive journaling by way of research memos written within the QDA program which could later be coded for further analysis. These memos documented the researcher's thoughts, experiences, and reflections throughout the research process.

Ethical considerations

This research has employed pseudonyms in place of actual names of organizations and participants interviewed to protect privacy. The news organization referred to previously will continue to be referred to only as *The News Organization* or *TNO* throughout this dissertation. Scholars employ such measures of anonymity for a variety of ethical considerations. One such consideration suggests assurances for the participant; that what they say will not be traceable to them and therefore this reduces risk of negative reaction by peers or authorities (Gubrium et al., 2012). This assurance increases the likelihood a participant will be more forthcoming and willing to share greater intimate

revelations during the interview (Gubrium et al., 2012). These interviews provide qualitative research studies rich depth, dense information, and useful understanding of complexities otherwise unavailable by other data-collecting methods (Weiss, 1994). Participants have been assigned gender-neutral names and the researcher will rely on non-gendered pronouns “they” and “them” when referencing participants. In order to create a list of gender-neutral names for the study, a comprehensive search was conducted for names that are commonly perceived as gender-neutral. Multiple sources were consulted, including online name databases and resources. The resulting list was then reviewed and refined by the researcher to ensure that all names were appropriate for the study’s purposes.

Research seeking epistemic social truth must recognize the risk for social bias to exist to some degree in all knowledge claims (Leavy, 2014). Ethical considerations for the participant/researcher relationship must be carefully considered in the findings as well as the research design. Accounting for differences in gender, age, race, socioeconomic positions, etc., must be factored into the analysis. This research specifically addresses the value, and the imposed risks, of elite interviewing. That is, interviewing members of society with elite status, such as presidents, CEOs, high-ranking military officers, celebrities, and billionaires. This researcher categorizes this caste of journalists as being members of a social elite because of their unique access to information and association with other members of elite social class mentioned prior. Journalists have long been described as the watchdogs of society who must put themselves in direct contact with elite members of society in order to hold them accountable. That responsibility ipso facto holds them accountable to the audience they endear themselves toward. The extreme

deficit between social status of the interviewer and the interviewee will host significant obstacles that must be addressed in order to gain the most insight from such valuable data.

Because the product cannot be separated from the process, this research strives to produce findings in a nonexploitive method. Extensive measures have been established to reduce the level of researcher contamination in the interview process, however, all communication necessary in the process of this research must carry some level of interaction between the researcher and those who participate. Circling back to reflexivity as a validation tool, it will be necessary for the researcher to perform self-reflective exercises in order to identify and account for the researcher's own related experiences and perspective. One of the great values of qualitative interview-based research is its constructivist and reflexive design. That is, its ability to be rebuilt throughout the research process. There is no such thing as a failed interview, only opportunities to reflect and recalibrate the questions (Mann, 2016).

CHAPTER FOUR

Findings And Analysis

The coding analysis of the data performed in Atlas.ti revealed that while technology and Artificial Intelligence were prominent themes, the most recurrent theme was the story. Everything done is in service to the story.

Research Question 1: Perceptions of technology adoption

At the outset of the interviews, participants were asked a seemingly innocuous question. Participants were asked to talk about if and how technology changed or impacted the way they conducted their journalism. Reactions to this question ranged from *inert and answer* to *visibly stunned and asking for clarification*. All justifiable reactions to what could be interpreted as an exceedingly broad first question depending on a person's understanding of technology. Depending on how the question is interpreted, it may ask about using advanced AI systems in experiments or simply using the stapler on one's desk. The purpose of the question was to begin with a broad scope in order to understand how reporters define technology and how its use influences their performance.

Daylyn, the youngest participant, began with mentioning collaborative technologies such as Microsoft Teams and Slack by Salesforce, and quickly transitioned to AI technology, stating that while certain technological innovations are advantageous, others can potentially hinder the performance of journalists. "I think that we're really fascinated by the ways that we can use technology to make our jobs easier but also how it kind of gets in the way of the job sometimes as well," Daylyn said. One of the ways in

which AI technology becomes prohibitive in the newsroom is through constant updates and the UI/UX (user interface and user experience).

> Some of those [content management systems] are constantly being updated because we can do things better or more efficiently, and then, for some [other news] outlets, they don't update them because sometimes that leads to even more complications. Sometimes, if you have more options, it actually makes it more confusing. … [T]hings like that are constantly updating. You might see one day like, "Oh, you get an email. We have updates to the CMS. Here's all that explained and how you can use it,"

Daylyn explains, referring to her experience since starting at TNO and at a previous news organization prior to starting at TNO.

AI is not a ubiquitous technology in 2023 and reporters with many years in service to journalism often began answering this question by prefacing that they began reporting prior to the emergence of Internet communication in newsrooms, use of landline telephones, and that journalism (for some of them) began with much more "shoe leather" reporting. Taylin described their start in journalism and the role technology played as such:

> When I began my career, there really wasn't an internet, and very quickly, it became a dominant force not just in how we report stories but in changing the whole revenue structure of the media world. So, there was a time when I had to use a paper roadmap to get around and a phone book to find who to call, and that rapidly changed to the digital world. Today, everything is at my fingertips, and I can email, tweet, or connect with someone on LinkedIn that before would have been completely inaccessible.

Landry also described life as a journalist in the pre-internet era, mentioning phone calls and meeting people in person as opposed to email, Twitter DMs, or other social media communication tactics:

> Looking over my 40-year career… it started out as phone and in-person activity reporting. Those were the two ways to gather information. … I was involved in kind of an early automation project, trying to automate some coverage of corporate earnings and so forth [in the late eighties, early nineties]. But then the internet came and … I was kind of an early adopter or experimenter with using

> the internet for remote news gathering. I guess the next big innovation was email and the arrival of the internet in the mid-nineties.

Halston, who got their start in journalism in the late 1980s, also talked about conducting journalism in the pre-internet era:

> The first few years of my journalist career were pre-Internet. Doing research meant going to the library, for example. I would still hand in manuscripts typed in hard copy using markers and physically cut and paste my stuff. Obviously, the development of Google as a search engine was dramatic, and everything, email... it took a while before we started using the internet as a safe and legit research…with all the caveats that everything that you find, you have to still screen and check and verify. But I remember in the early 90s, in our newsroom, there was a separate standalone terminal with internet on it.

Several journalists consistently emphasized the significance of storytelling skills in journalism, despite the evolution of technology and its impact on the research, editing, and presentation of stories. Wilder emphasized their need to come up with different ways to tell the same story, while Landry highlighted the significance of precision journalism, which involves analyzing data and numbers instead of relying on opinions. Here, Wilder describes the result of attending a workshop on data journalism in 2013 to learn a specialized computing language to enhance their storytelling abilities:

> I learned a bit of Python. It is a very different way of thinking about reporting. I am not an expert in that stuff. I know there are people who are specialists in data journalism, and that's what they do all the time. But it has informed the way I think about stories. When I'm coming up with story ideas, I think, "Is there a data element here? Is there a way that we can get at this using these tools?" None of those tools are particularly new. Spreadsheets have been around for decades, and database software longer than that. But it was something I learned in the middle of my career that changed the way I go about reporting.

Landry, on the other hand, learned the value of data journalism while studying in graduate school:

> [I]n college and grad school at the University of Minnesota, one of their focuses was precision journalism, which involved using numbers and analyzing data instead of relying on opinions to base a story on.

Emerson notes that technology has made ambitious projects more feasible, but also highlights the potential for bias in the stories that are covered. They reflected on a time

when technology largely impacted how they went about doing the reporting. Roughly 10 years ago, while working at a competing news organization, they took on a story investigating Medicare billing and they described the account as such:

> It ended up being a database that ballooned into several terabytes. I couldn't have contemplated digesting and having ways to extract meaningful information from billions of rows of records. But the hardware and the software had evolved to the point where I could practically go in and do that. After that, the idea of such an expansive and extensive request for data didn't faze me anymore. … I was no longer intimidated by hundreds of gigabytes of data. That was just something I could do in an afternoon and be done and move on to the next one. I think to some extent technology works that way. You're not quite sure what you can do until you stumble into something, and you realize that you've achieved something you never had done before.

One consequence Emerson identifies from that ease of digitized data is a bias towards electronically stored information:

> We live in a world where we don't have [clip] libraries anymore. When I started, if you wanted to do research on previous stories, you had to go and find an envelope in the "morgue," where clips were put together, and you'd spread them out on the table. Now, everything is digitized. Of course, that means there's a bias towards what has been digitized. So your perspective, I think, is somewhat distorted.

Another development some interviewees discussed was the use of visual elements as becoming increasingly important, with technology playing a key role in verifying and incorporating these elements into news stories. Taylin and Halston both emphasized the increasing importance of visually led stories, with videos or pictures sometimes taking center stage and text playing a secondary role. In the interview, Taylin describes how a change in client interests led to an inversion of story structure:

> In the past, we would write a tech story, and the photo or video would play second and third fiddle to that tech story; that was the jam. In recent years, we've turned that upside down in some cases, where the photo or video is the star of the show, and I'm basically writing an extended caption or a little script to go with the video because the clients want the visual, and the text is secondary.

Taylin goes on to mention TNO recognized this trend and created an entire team dedicated to verifying user-generated content (UGC) videos and incorporating them into stories:

> We have now hired a whole team dedicated to UGC, who verify videos for us. These people are experts in detecting fake videos, as well as old videos that people are trying to pass off as new. They can also confirm the geo-tags to verify the location and date of the video. As a result, we can now authenticate videos and use them in our stories.

Halston notes their use of technology to suggest topic codes during editing, describing how this assistive technology became transformative for their reporting:

> A few years ago, when I edited a story, it was also my job to code it properly so machines could find it. Now, the editing system scans the text of the story and suggests topic codes, but it can still get it wrong, so you need to check it.

The concept of automating certain aspects or the entirety of news publishing is often contended to be based on the expectation that this will relieve reporters from the menial tasks of publishing, allowing them to dedicate more time to the critical aspects of developing creative and engaging news content. However, as Halston points out, the technology that has been in operation to this point is not infallible, that it may generate errors, and create new critical oversight responsibilities for the reporter:

> Some of the process is being automated, but still, the margin of error is high, even though machines are flying planes. Essentially, even the automated processes are shadowed by reporters who do the same work because there is a potential for errors. For example, the stats office may move a column from one month to another, or someone may mistakenly put a comma instead of a dot. There is a sense [at TNO] that this is not something you can let go when you really want to do it well.

This situation tethers the reporter to the care and maintenance of the machine that was installed to provide freedom from mechanical oversight. Fact-checking, accuracy checks, and ensuring the information is error-free have always been a part of the publishing process. However, previously, that responsibility was assigned to the editor's desk. With

automation of the task of generating codes based on article content, the responsibility of verification moves to the reporter.

Overall, while technology is seen as an important tool in journalism, it is not seen as a replacement for the fundamental skills of storytelling and precision journalism. As Emerson describes it:

> We're counting, we're adding, we're subtracting. I mean, even when we do high-level mathematics, ultimately, that gets translated into English. You're saying how often something happens, how aberrant is it? How precious is it? Whatever it is … you're not doing much different than you've always done. But the tools to get there and the volume of information that you can analyze to get to that point are substantially different.

Daylyn, describes the association between new innovative technologies and approaches to newsgathering and long-established journalistic principles as such:

> The general mindset for [TNO] is that we're always looking for different ways for innovation, and depending on what team you're on, that may look different. … [T]here's the across-the-board CMS[3] [content management system] that everyone is using, … and it is only to increase innovation, improve efficiency, and enable faster story delivery. … Even from the equipment that we use, we assess what we need to do our job more efficiently. … because it really is how we can do our jobs the best way possible and achieve the main impact, which is to get the story out to people, to our clients as sufficiently as possible.

However, there is also recognition of the potential for technology to introduce bias or negatively impact reporting, highlighting the ongoing need for journalists to carefully select data and maintain a critical eye towards the impact of technology on their work. As Daylyn describes the constant struggle in the interview:

> It can feel like a losing battle because, you know, when you have people using technology to spread false information or fake news, it seems like it's picked up so fast. And before you know it, especially on Twitter, [this] thing is retweeted, that thing is retweeted. And then when we come out with our stories, those things become controversial or it turns into more of an argument. So it really can be frustrating to see the negative impact of technology.

In every instance of the reporter talking about technology involved in their role as a journalist, they mention – directly or indirectly – the role of specialty training. The

implementation of automation technology or outsourcing has prompted journalists to pursue advanced professional development opportunities such as additional graduate education, continued professional development courses, or both to remain competitive at their organization and within the field of journalism. Some claim they felt it was necessary to catch up to their peers in the newsroom while others sought to distance themselves from the rest, making themselves more valuable in the eyes of management. Dylyn found it was necessary to get additional training just to feel equal to their peers performatively:

> I found myself learning a little bit of coding, which I was like, "What?!" I'm not a technical or mathematical person. … [W]hen I first started learning the CMS I was using, that was [coding]. Using coding was pretty standard for them. So it was really them telling me, "okay, this is what we expect when you're putting a story out. This is what we need." And so it was me learning what they had already put into the system, making sure I could do the work efficiently.

Landry views professional development as a way to enhance the reporter's viability:

> I would connect continuing education with career ambition. Those who were trying to build a career would pursue it, whereas those who had reached a certain level or were more complacent would not.

Dylyn did not major in journalism, however, even if they had, the computing skills necessary to become a viable journalist would likely not have been part of any core curriculum education in journalism. As Emerson describes the state of education for journalists, there may not be enough emphasis on learning these specialized skills:

> Journalists, as a whole, are not very numerate. You don't go into the business of journalism if you enjoy accounting. You don't generally go into journalism if you are a programmer or a data analyst… journalism is a business of the arts. It's a business of writing, reporting, human relations, and the perception of it is that. I had been under the delusion earlier in my career that over time journalists would evolve. Perhaps that was not quite fair of me. But, I assumed that most everybody would become proficient in spreadsheets, for example. I think there is some limited adoption of some of the data analysts' techniques that we use, but it's really limited. … I work with other journalists, and I share even a simple spreadsheet with them, and they struggle to filter and sort.

Research Question 2: Perceptions of social culture in newsrooms

A common theme identified among the participants focused on the role of technology in newsroom socialization, including its impact on practices, behavior, and performance. More specifically, the participants highlighted the enabling role of technology in facilitating remote work and global collaboration, making communication and virtual meetings more accessible. Emerson had this to say about working on collaborative projects with other reporters in different time zones:

> I do work with other journalists around the world, and so, we're connected electronically... I've been working with a team, two of whom work in London, one works in Istanbul, some of them have been working in Poland, and it's seamless. I might as well be sitting next to them, and granted they take it that way, too, and I'm constantly getting fucking messages at 4 o'clock in the morning, and given that I sleep so poorly, I often respond to them. So … this is not fancy technology. It's mechanical technology. It allows us to simply communicate … as if we're in the same room... so the adoption and the application of those mechanical technologies is really important.

When discussing the recent transition to remote work due to the Covid pandemic and health and safety regulations, Wilder discusses virtual conferencing and remote connectivity as an established operational practice within the news organization:

> I found it was no problem at all to collaborate using tools like Zoom, even before it became mainstream. Often, when working on an enterprise story, I would get assigned an editor who is in Los Angeles or New York, or somewhere else. That remote thing was already happening because we're not the Washington Post where everyone works in the Washington newsroom. That had been happening before, but it was fairly seamless. I just set up a home office, and they gave me an extra monitor, which allowed me to do my job effectively.

Taylin also discussed how remote work during the years of the pandemic impacted newsroom culture:

> It's very hard to have relationships and collegiality when everyone is 100% remote and typing text messages to one another. So a lot of what we did during the pandemic is use Teams to have open calls. This is where everyone in the chat room dials in on their laptop, and you have instant voice communication. A lot of us did that to replace typing. Typing is great, but it takes a while, and if I have to

> shout, "Hold that story!" I really need that to be faster than I can type. It also allowed us to hang out in a virtual way that we didn't expect would be so fun.

That level of interconnectedness in the new reality of remote operations led to some unforeseen positive cross-cultural development as well, as Taylin went on to say:

> The other thing it allowed us to do is to get to know our colleagues in Europe and Asia. When the time zones overlapped, they would join our calls, and we would get to hang out with them as well. [We could] hear our British colleagues talk about having to step away to make tea, and it became very easy to share pictures of your kids and pets. It's a different kind of intimacy than you get face to face. … we were surprised that we could achieve that level of connection without being physically together.

There were also concerns expressed about the potential for technology, specifically AI, to replace human journalists, and participants described how newsrooms are exploring ways to use AI while maintaining accuracy and quality. From the interviews, reporters' anxieties about their job security are more likely to stem from the potential displacement of their less-specialized colleagues by machines, rather than from their own specialized professional skills, as Wilder explains:

> I would say it doesn't impact my role as much as it does some of my colleagues. As a wire service, speed is really important. When there's a big news thing happening, we'll put out a news flash, a little headline, and then you fill it. However, I don't see that as a threat because I think [a generative AI] would have a hard time [reporting] for a more complex story like Joe Biden saying he's not going to run for re-election. At that point, you have to pull in all sorts of contexts and call people up for reactions.

Daylyn concisely outlines the concerns in the form of three succinct questions:

> I think that as we see more artificial intelligence … across jobs in general, [as] we see more AI coming out, it has to be something that we're always thinking of because the question comes, "Well, can AI replace me? What if it can? What can it do better than I can?"

The potential for job displacement is not restricted to the domain of intelligent machine automation alone. To reduce labor costs associated with low-skill, repetitive reporting tasks, TNO established bureaus in low-wage countries for outsourcing purposes. As Wilder describes the situation:

> Some of my colleagues are anxious about having their jobs replaced by people who can do the work cheaper on the other side of the globe. … You will often notice that there are stories, not just basic ones, but pretty complicated, thoughtful stories being written … often on financial topics. So, I think they have worked out the kinks, and that is a pretty integral part of what they do now.

As previously stated, the unreliability of intelligent machine technology makes it impractical for a large news organization like TNO to depend entirely on automation processes to create mainly foreseeable news reports. Halston describes this dilemma during the interview:

> Technology is at the level where it provides some help, but it doesn't give us that much more freedom or allow us to focus on the most interesting and ambitious tasks. It's still more of a crutch that we use here and there. For example, market reporting ... Many reporters and editors are involved in this process every day, and it requires a fair amount of routine, meticulous, and grudge work to put it all together. … We've been experimenting with [AI automation] tools within our own editing system that can do some of that work, but we've encountered certain issues repeatedly. … Some other news organizations might just go ahead and roll with it, believing it will get better, but we have such high standards that we take every detail seriously. We're not willing to take that kind of risk as long as we set these high standards for ourselves.

While Halton expressed doubts about AI's capacity to liberate journalists from mundane tasks, other participants disagreed and viewed AI automation as a means to achieve such freedom despite the technology's limitations. Taylin describes the operationalization of AI automation as such:

> Years ago, we started using automation whenever possible … . We have a lot of reports on various markets that might say the price of cotton did this today or North Sea crude did this. We were able to have the machines grab the price from our vast database and generate a story that a human would then go through, double-check, and edit. … When we were able to automate the report, it freed humans to write far more interesting stories. Because it was a very routine automated task and it was best suited to having it automated. So that allowed the reporter, instead of spending an hour doing this, to now be able to spend that hour talking to sources, making a trip somewhere to gather information. … [T]echnology did not reduce our headcount because there was a limited amount [of reporting] that sort of automation can do. It only works for very routine, predictable things.

The interviewees have pointed out that technology has enhanced the process of information gathering and source outreach, however, the need for human journalists to convey stories beyond what AI automation makes possible remains crucial, underlining assurances of a continued culture of autonomy and innovation in the newsroom. Taylin went on to say:

> Most of what we do is far from predictable in the news business. So 95% could not be automated, and probably it was even higher than that, like 98% couldn't be automated.

Daylyn further elaborates on the concept that news reporting is inherently unpredictable and relies on human contextualization, a task that current AI systems are incapable of performing:

> As long as we realize that AI can't actually step onto a location and do the interviews, do the fact-checking … and do the things that require a human experience, the actual visceral sensory experience, … that's what we do. We send our journalists to the locations to see with their own eyes, to talk to people, to get things that you wouldn't be able to get through AI, and I think that's where that concern kind of goes away.

In contrast, Landry holds a more cautious perspective regarding the latest developments in generative language AI:

> Aside from the fact that I felt a little more job security for a while, I still see that goal as being the driving force in the news industry, to take as much conveying of information out of human hands and automating the process.

In the interviews, they point out that the culture of the newsroom has changed, with independence and experimentation hindered by a lack of socialization practices in newsrooms today, as well as a bias towards digitized communication. This is how Landry describes the present-day newsroom experience:

> Newsrooms used to be pretty clamorous places, and now they're more like a monastery, or they're very quiet. 20 years ago, people did most of their work on the telephone. … There was a rancor [sic] and people shouting across the room to get information from a colleague. Now people are quietly at their desks. They're dealing with their sources on email, Twitter, or text, and they're dealing with each other on their internal version of Slack. There's very little verbal communication

> or audible verbal communication, and I think people are operating more in silos as journalists. The COVID epidemic and the perfection of remote working technology has led to more journalists working from home than before. That collegiality and presence are gone … .

Halston emphasizes that journalists have shifted from conducting in-person interviews to relying on social media channels for distance communication with sources, highlighting the changing social culture of journalism:

> I know reporters … from India who have built relationships with sources in certain industries by using Twitter as an entry point. They follow each other, like journalists following sources, and build a relationship that way, then do all the interactions via messaging. In the past, you would have to spend a couple of nights having drinks with people and schmoozing.

Remote work has become an established practice within news organizations, facilitated by technology like Zoom and Microsoft Teams. The pandemic has accelerated this trend, with remote conferencing and collaboration tools like Microsoft Teams becoming the norm for news organizations. While remote work has helped with global collaboration, it has also led to concerns about job displacement and the potential for AI to replace human journalists. While AI automated technology is improving and provides some help, it doesn't offer enough freedom or allow journalists to focus on the most ambitious tasks. As a result, TNO exercises caution to deploy full-scale reliance on AI automation processes to generate foreseeable news reports. To meet the demand for continuous market reports and updates while simultaneously developing more reliable technology, TNO has outsourced the bulk of their low-skill reporting tasks to workers in low-wage earning countries, creating a precursor to machine automation with human automation. This creates a situation where low-wage countries become hubs for outsourcing repetitive tasks. Despite these concerns, the sociocultural development of the newsroom appears to remain intact, albeit transformed. Remote work has fostered cross-cultural development and a different kind of intimacy among journalists in different time zones. These findings

reveal that technology is revolutionizing the way journalists work, collaborate, and produce news.

Research Question 3: Perceptions of intelligent machines in journalism

Based on the interview findings, it appears that journalists primarily view AI technology as an intermediary tool that serves a supportive function, enabling greater efficiency and/or enhancing communication and journalistic performance. While there are exceptions, journalists in this study do not generally regard AI as an independent mediator that they would collaborate with. Firstly, AI is viewed as a tool to help journalists work more efficiently and effectively, especially for mundane tasks such as fact-checking and data analysis. It can also be used to generate short, breaking news stories, freeing up journalists to focus on other areas of their work. Emerson uses third-party and open-source AI generative tools during the initial phase of their story development:

> What I find useful when I use tools like machine learning and artificial intelligence is that they remind me of the scope of the subject. We can become hyper-focused, especially on deadline, and I find that I am reminded sometimes that the scope of the subject is wider than perhaps I had thought, and occasionally, it gives me pause to change my reporting angle. This is a new experience for me, but I find it useful as an intellectual exercise to sometimes ask, "Am I missing anything?" Is my perspective a little myopic, perhaps, and do I need to consider other factors? That's useful.

Daylyn and Wilder talk about the value of using AI-based reporting tools such as transcription services which operate using AI technology, such as Otter AI, Rev, and Happy Scribe. Wilder commented on the general use of AI-based assistive tools and specifically on the use of Otter AI to assist with transcription services during interviews:

> I think the reporters are more freed up to do more in-depth, thoughtful work called "enterprise" work. That has been the case for me. It's taken away a fair amount of the drudgery and hasn't replaced it perfectly, but good enough. In recent years, I have started to use the Otter automatic recording and transcription

> software, which is fantastic. It used to be that one would have to use a handheld digital recorder and then transcribe it. So, this has been a real improvement.

Daylyn also uses AI-based transcription services to support their reporting:

> Doing transcriptions, it's great [to automate with AI]. It's a great tool to have because it saves us time, it gives us efficiency. So we use transcription services …, sometimes it's Otter AI, but … for myself, I use Rev and Happy Scribe, and that definitely helps … getting quotations, doing interviews, things like that. … [O]ne of the things that we are also curious about learning more about, but maybe not necessarily using, is … the way that it can help us, maybe with smaller tasks like getting different information or fact-checking.

As Wilder describes, these performative roles of AI may even suggest entering a moderator role of communication between machines, using human-language text but skipping past the machine-to-human communication exchange:

> They have tools now to automatically scan those press releases and pull out things like earnings per share and that sort of stuff. Then that story would go out as a series of headlines. "Company X reports fourth-quarter earnings." "Earnings per share are 'bleh'." You don't have to write a full story for that because the only information you need are those numbers, and investors can say, "Oh, those are great returns. I'm going to buy their stock or whatever." … That stuff might even be machine-readable. So, Company X puts out its earnings. Our robots translate that into a format that then the trading robots can read and say, "Oh, buy or sell."

Halston confirmed this scenario:

> We're at a stage where a lot of those economic indicators are essentially machines producing news for other machines. So you have an automated process where [an information feed is] linked to … the Federal Reserve or a Labor department. They feed that information into those systems. Then there's an algorithm that puts it out in the form of a news alert. But in the dealing room of a big bank, it's not traders who are watching this screen anymore and pushing the buy or sell button, but it's an algorithm that responds to this and does the trading automatically. So this is something that technology has already created.

Emerson describes a possible future scenario when an AI could entirely replace the human task of physical movement for data collection that produces a staple news coverage or could provide the basis for further human journalist involvement:

> It was certainly the original ambition, I suspect. Quite frankly, when I started, the idea of going to a school board meeting was not on the list of things I wanted to do, but I had to do it to figure things out. It will take time, I think, for models like this to work out and find equilibrium between the two. But basically, that's it. Do you want to sit in a school board meeting for four hours while everyone drones on

> about nothing, [or] have a machine extract those pertinent 45 seconds of quotes and new information, and tie them with statistics they have been ingesting over the last year about school attendance and enrollment, and whatever it might be? [T]hen you've got an editor… that looks at it and says, "This is good. We don't need to do anything else." Or "Wow, that's really interesting. I wonder what that means for blank." … This may be part of a bigger story. If you have a network of news organizations or newspapers tied together in one organization, they feed what one another finds, and they find trends that you're missing. I think that's a tremendous opportunity, especially on the local level.

Secondly, participants expressed concerns over the potential impact of AI-generated content on the quality and standards of journalism. Halston is concerned that audiences are being conditioned to expect less sophisticated news content before AI technology becomes normalized in news reporting. This may result in a compromise between technological development and audience complacency, settling for news content that is merely "good enough" rather than aiming for perfection:

> I can see and read material that is clearly generated automatically… and for me, it's appalling. It's a far cry from what I would expect for something to be informative and accurate, with a lot of errors. My concern is not that AI will replace what I do anytime soon, but that people will get used to more and more of that content produced that way and accept lower standards. … I suspect that more and more people will not be able to see that difference.

Emerson, however, sees this problem of poorer reporting quality already present in the large business operation decisions that have resulted in big news organizations purchasing up smaller, local news operations and believes AI automated reporting may provide the solution:

> Let's take, for example, sports. The New York Times and the Athletic effectively are challenging the local models of sports coverage. And I think there are some unfortunate elements of that. You're not getting local coverage of your local sports, you're getting national coverage of local sports. … in the process, they are crushing local news. [T]he local news organization, a medium-sized newspaper, can't afford to put 5 reporters on beat coverage anymore. They got one [sports reporter]…and maybe that one reporter has to cover 3 sports… How do you cover those things properly? … If the game stories were taken care of for you … it's liberating, and those … sports reporters, now can write about the human aspect of the stories, the controversies that are raging with a team … the things that are less quantifiable … that require shoe leather reporting that could never be done by

> computers or at least it would be difficult to do with AI without the input of humans.

While AI can be a helpful tool, it cannot replace human editors, and maintaining editorial standards and quality control is vital. Daylyn expresses this sentiment with an understanding of ultimate culpability:

> If we haven't done our due diligence and it's still [regarding stories covering] people, then it's still on us. We can't point to an AI and say, "Oh, well, that's the blame."

Wilder said this about editorial responsibilities while trialing autonomous reporting, echoing some of Halston's concern:

> Technology in general, when it starts out, is often good enough. … They get better as years go by. We're seeing that with these AI chatbots right now. They're interesting, but their flaws are apparent. People tend to adopt them anyhow, and then they get better. Overall, [our] use of these technologies has been pretty good. [We] haven't used it to replace reporters wholesale. C-Net had its robots write stories automatically, and then that turned out to be a bad idea, and they stopped.

Emerson held an optimistic view of including AI to improve editorial standards:

> I think that machine learning and artificial intelligence are going to change some aspects, at least of beat reporting, and perhaps add a level of empiricism that didn't exist or doesn't exist now, or hasn't existed in the recent past. And I'm not sure that's a bad thing.

The interviewees also suggest using AI to identify trends and dismiss ideas as potential projects. AI can be used to see if there has already been extensive coverage of a particular subject, helping journalists avoid wasting time on subjects that have already been extensively covered. Emerson adds this about their use of generative AI to find new stories:

> I have actually found it more as a tool to dismiss ideas as potential projects rather than expand on them because I come to realize there's been a lot of coverage on this already, and it's been sophisticated because I can see this and that, and so on. I have several ideas and I have used AI and asked the question: "What are the issues related to this subject?", "Is this happening?", or "Why is this happening?" Those types of questions.

As suggested previously in this chapter, outsourcing reporting tasks that require little skill but demand immense production labor is a method employed by TNO while attempting

to develop more reliable machine automation systems to handle these tasks. As machine systems improve, tasks that were previously performed by human reporters are gradually being subsumed into AI-based automated reports. Initially, AI is being utilized in market reporting and sports coverage, where statistics play a crucial role. As Halston describes it:

> If anything, I would say that even before [generative AI] became a thing, we outsourced the basic [sports] results coverage. Reporters used to put together tables of soccer league's results, but this has been done by an outside company for years, and now it's already been automated.

Emerson offers a prediction based on the trajectory of generative AI reporting at TNO:

> I could imagine a situation where 90% of sports coverage is written by AI. The game is over, the stats are in, who the winner is, who performs certain tasks in a particularly dramatic way to win or lose. I guarantee that within a couple of years, almost all sports coverage will be written by AI, and it will be almost instantaneous. The moment the game is over, boom! You've got complete summaries of the matches, or what other games, or what have you. And then it's transcripts of various interviews after the game.

Furthermore, Emerson elaborates on a possible future where AI can be utilized in local news coverage to ingest publicly available data, output standard news reports, and the journalist can choose when to write about what AI uncovers. This is the only place in the interviews in which the full value of cooperative agency between human and machine mediators is described:

> I can imagine a smart business plan that would say, "Okay, let's start covering local news." So you digest all transcripts and local databases and feed them into a system that then writes timely pieces based on what happens. And all of a sudden, I don't have to have a human being covering all these events. I've got a machine that is vacuuming up huge volumes of publicly available data that otherwise is being ignored right now. Then your staff doesn't have to be as big. The staff you have now, that you're desperately trying to stay ahead of the curve, can be used to choose their moments when they want to write about what the AI uncovers. Now the journalists are writing not the pedestrian, but the important and they're engaged in partnership with these tools. And perhaps that combination of a relatively small staff dedicated to writing and expanding on what has been uncovered by artificial intelligence is a business model that can sustain itself.

The findings indicate that AI, both in general and with specific reference to AI smart technology, is presently more often viewed as a useful tool for journalists rather than a cooperative colleague. Most of the reporters spoke about the

importance of maintaining principle frameworks that have long been established as journalistic norms and that it is essential to maintain editorial standards and quality control in journalism. The interviewees believe that AI can be used to help journalists work more efficiently, but it cannot replace human experience in journalism. Lastly, AI can also be seen as a potential threat to low-skill requirement jobs in journalism, and that it is vital to ensure that the public is aware of the importance of human involvement in the editing and production process.

Automation is being introduced to make newsrooms more efficient by increasing the volume of news produced. This has resulted in journalists increasingly depending on colleagues with specialist programming skills or developing those programming skills in continued professional development courses and workshops. Collaborative data journalism projects show that sharing knowledge, tricks, and work practices is a core value of computational journalism. There is consensus among interviewees that basic news stories could be written by computers, and that this is probably the most banal commodity for journalism. This raises questions about whether journalists can remain artisans in an era of industrialization and what institutional constraints there are on automated journalism. The concern regarding the impact of AI on job security in the journalism profession is less pronounced among journalists with specialized professional skills, but more among those with less specialized roles who may be at a higher risk of displacement by machines.

CHAPTER FIVE

Comparative Analysis

The digital synthetic AI news avatar exists at the extreme edge of AI operationalization being explored by news organizations. This research has discovered only five organizations exploring its usage since 2018, one of which has not moved past the proof-of-concept phase and the two most recent examples were only announced days before submitting this dissertation for final review. Other operationalizations of AI in newsrooms are much more common, approaching a level of ubiquity in some organizations. Research into TNO's history of research and development of AI technology is supported by the claims made by participants in this study. The company utilizes AI in everything from their proprietary intelligent CMS to the observed automation of brief news reports on markets and has been doing so longer than any other news organization in operation.

Conducting a study on adoption during the initial stages of the diffusion process can provide invaluable insights into the ways in which organizations and individuals navigate towards complete adoption. A comparative analysis of the current diffusion process of emerging innovative technology against similar events in history may offer valuable insights into the present-day diffusion process. This research set out to investigate the impact of a specific AI operationalization, the digital synthetic AI avatar reporter, on journalists and newsrooms in the present time by comparing it to the emergence of radio and television as disruptive technologies for journalism in the 20th century. Through in-depth interviews with reporters at an organization dedicated to

advancing intelligent automation technology in their organization, the study has revealed that while the semi-automated newsroom and reporters are aware of this level of AI technology, they still operate more similarly to the period before broadcast news reporting became commonplace. This period was characterized by newsrooms developing automation strategies to move news production through an industrial phase in the late 1800s to the earliest days of the professional modern 20th century model of journalism.

Nerone and Barnhurst (2003) distinguish two key moments of division taking place during the 1800s that drove innovation in newsrooms: the separation of mechanical from editorial work and the separation of the business office from the newsroom. Findings from this research suggest the current newsroom environment exemplifies a similar division between technical and editorial functions, which becomes evident when we broaden our scope to encompass the wider global operation. This operation involves delegating those mundane, low-skilled, and largely predictable reporting tasks to lower-wage earning countries, while established bureaus in major western cities like New York and London produce more complex and consequential reports.

Although the interpenetration of mechanical and editorial work continued into the 20th century, editors in the 1800s often came from the ranks of practical printers (Nerone & Barnhurst, 2003). Memoirs and obituaries of nineteenth-century newsworkers often reference early training in typesetting, indicating that the mechanical part of the craft remained entwined with editorial work (Nerone & Barnhurst, 2003). The previous chapter shows that journalists who have careers spanning across the transition into digital newsrooms experienced what can be described as a 20th century adaptation of mechanical

reporting: physical libraries and news-clip archives, rolodexes and telephone calls, meetings in taverns with sources and smoke-filled cacophonous newsrooms. They were trained in reporting skills, including interviewing sources and writing in the inverted pyramid news style. As they adapted to new innovations, such as using the internet as a research tool, social media as a contact and communication platform, and utilizing spreadsheets, coding, and data mining as investigative methods, they have also developed new skills.

Technological innovations introduced at the end of the nineteenth century, such as the typewriter and advances in telephony communication, had similar transformative effects on journalists of the time. The typewriter anchored editorial workers to a fixed table space and the telephone allowed reporters to roam the city freely and phone in facts to "re-write men", thus characterizing the newsroom of the industrial newspaper (Nerone & Barnhurst, 2003). According to scholarly research on the impact of the typewriter on newsrooms, the emerging newsroom was characterized as such:

> The hot, yellow, malodorous gas lights have given way in the composing room to the cool, brilliant arc light or the mellow radiance of incandescent electric lamp. In the majority of the great newspaper offices the smear of ink and Faber has disappeared, and in their place has come the clean, musically-clicking typewriter. No more sputtering pens, no more breaking of points or sharpening of pencils, (Jensen, 1988, p. 259)

Landry shared similar sentiment in their comments about the modern semi-automated newsroom, describing the space as a monastery as opposed to a cacophonous swirling of bustling reporters, with journalists engrossed in electronic communication, siloed in their social media chambers.

Nerone and Barnhurst's (2003) research highlights the industrial nature of newsrooms, drawing parallels between newsrooms and textile sweatshops, where

typewriters replaced sewing machines. These technological innovations and organizational changes shaped the nature of newswork and demonstrate the evolution of the newsroom from a printer's paper at the start of the 19th century to the emergence of the modern newsroom entering the 20th century. The typewriter was seen as both implosive and explosive, combining speech, writing, composition, and publication into a single process while also standardizing spelling and grammar (Jensen, 1988). The industrial newspaper which emerged from these changes in the latter half of the 19th century, reconfigured itself as a civic institution and organized its content into departments, pages, and sections, inviting readers to browse through it (Nerone & Barnhurst, 2003). Thus, establishing the earliest framework for the ad-driven commodification of news that still exists today.

The practice of outsourcing to meet low-skill, high-output reporting demands by news organizations dates back at least to the 1800s and can be viewed as a precursor to the present-day endeavor of newsrooms to develop AI automation. The typewriter was deployed as part of a more general process of newsroom mechanization, initially presented to the business world as a means to entrepreneurial independence for women (Jensen, 1988). The novel *The Odd Women* by Gissing, published in 1893, focused on the premise that women would acquire their own machines, learn how to type independently, and offer their transcription services to clients in need of quick and precise manuscript transcription (Jensen, 1988). That vision of the 20th century office portrayed women-owned typewriter offices that provided transcription services for businesses in need of converting the scribble text of businessmen’s handwritten letters, notes, and manuscripts (Jensen, 1988). Newsrooms, however, ushered past outsourcing and instead the adoption

of typewriters into newsrooms also saw a surge of women enter journalism as women reporters working alongside their male counterparts, much like the participants in this study refer to their organization's creation of new news bureaus in lower-wage earning countries to offset the demand for rapid production of simple routine market reports and work alongside their colleagues in other offices.

"With the adoption of the machines came the women trained to operate them," (Jensen, 1988, p. 257). Along with the new journalist came new skill requirements as editors expected the women they hired to already have command over the technology. Historical research on the period quotes from Shuman:

> "The machine is rapidly coming into general use in newspaper offices and the time has already come when the reporter who can manipulate the typewriter has a decided advantage in securing a position," (Jensen, 1988, p. 259).

Mari (2018) makes two discoveries about developing new skills during this period: One, that the speed and creativity with which a reporter (or anyone) adopts a technology can lead to them having more independence or control over how they use it, and two, that the ability to control work processes through the use of technology is an important aspect of what it means to be a professional journalist (or any professional in any given field). A striking similarity was found in the interviews for this research. Reporters are returning to the classroom and attending workshops for professional development in order to increase their viability in the new newsroom. This researcher's findings show that journalists joining companies like TNO, which depend on AI assistive technology, undergo more than a year of training to operate these exclusive systems. As these systems become more widely adopted, it is logical to assume organizations will expect new workers to already have some level of training or skill to cooperate with these AI-based machines to reduce the pressures of the onboarding process. This would suggest that a journalist's comfort

with technology and ability to use it can impact their level of skill and the types of skills they possess. As technology advances and changes, journalists may need to learn new skills, expand their existing skill set, or potentially lose previously necessary skills as they become automated or obsolete (Mari, 2018).

Technological skills and proficiency to operate new technology are not the only transformations that take place when new technology is introduced into a work process. Jensen's (1988) research suggested that the typewriter created and sustained particular patterns of practices and codified particular social roles. The typewriter also challenged traditional gendered social types and disrupted the social order of the time. In the newsroom, the typewriter set the reporter apart as a true writer, distinct from being a mere transcriber (Jensen, 1988). In that research, she suggested that the typewriter was adopted when social conditions allowed it to make sense as a new technology, and it deepened and extended patterns that were already developing in the social formation, particularly in journalism (Jensen, 1988).

One such social role that evolved out of this time was the romantic image of the journalist. Jensen (1988) describes this role as an urban insider, intimately familiar with the bustling rhythms and hidden dangers of city life. She quotes from Talcott Williams, director of the School of Journalism at Columbia University in 1912, that the reporter possesses an innate sense for the trail of news and the pulse of the people. In this romantic portrayal of the reporter, he is often accompanied by a battered portable typewriter, which serves as his trusted companion in the quest for breaking news. He is a writer who is able to see an event and quickly create a concise, dramatic account of it, pounding out the story with his index fingers in a messy, error-prone but efficient style.

He does not concern himself with the mechanical or feminine details of his typewriter's upkeep. And above all, he is fiercely devoted to the craft of journalism and the pursuit of a great story. In this depiction of the 20th century reporter, Jensen relies heavily on the male/female dichotomy that existed at the start of the century. The gendered dichotomy within newspaper reporting was evident through the physical segregation of hard news reports in a specific section typically assigned to male reporters, while a separate section dedicated to lifestyle pieces was typically relegated to female reporters. Competing technologies outside of the newspaper also contributed to the codification of social roles in journalism. By 1902 radio had already caught the attention of news operations (Barnouw, 1972). Many of the early antics of news radio reporters could be ascribed to this depiction of the risk-taking reporter that would get the story at all cost. While comparatively tame by accounts of deep-sea divers and reporting from volcanoes, some of the exploratory behavior of the reporters interviewed continues to perpetuate this concept of the journalist as the lone explorer.

The emergence of new technology and rival media, such as radio, necessitated the acquisition of new skills. Participants described similar experiences in the modern newsroom. Emerson described a noticeable knowledge gap between those journalists trained on commonly associated reporting skills and the few who could negotiate spreadsheets to uncover stories in data. Long into their career, Wilder attended workshops to acquire skills in coding Python scripts, which enabled them to conduct data mining effectively and achieve a skill level that allowed them to remain competitive with colleagues who were required to have coding proficiency.

As the radio era ushered in a culture of timeliness, newspapers and journalism followed suit. The focus on breaking news intensified, with newspapers vying to outdo each other by providing hourly updates and leveraging any news breaks for competitive advantage (Mari, 2018). As the broadcast era brought about a faster pace in journalism, the telephone emerged as a new technology in the newspaper newsroom, following the telegraph and typewriter, to enable news reporters to stay competitive. The telephone transformed the newsroom in several ways. It became as common a tool as the typewriter for reporters by the 1920s (Mari, 2018). The emphasis on mobility and timeliness in newsroom culture made the adoption of phones and cars a logical next step in the progressive development of the 20th century modern newsroom (Mari, 2018). Their adoption accelerated the divergence between the remote process of gathering news and the in-office process of writing, editing, and publishing the story. The phone and the car amplified the agency of news workers, giving them increasing autonomy to do their jobs and coordinate better with colleagues much the same way as today's journalists rely on Twitter or other social media channels to increase their agency, enhance sociocultural development transnationally with colleagues, and communicate with sources around the world.

The culture of timeliness that emerged from adopting telephones into the newsroom and news practice, however, disrupted traditional newsroom routines and power dynamics, creating tension among some workers who were unsure of or uncomfortable with the new technology (Mari, 2018). While telephones allowed for the sharing of news events more easily, some reporters and editors complained that they were changing journalistic standards, and not always for the better (Mari, 2018). Technology

that was used to create and modify work routines in the newsroom during the twentieth century resulted in specific divisions of labor, which may not have always be advantageous to journalists (Mari, 2018). As new technology permeated the newsroom, lines between those who gathered news and those who edited and published strengthened. This created disadvantages for reporters who were seen as more replaceable and lacked the skills needed to operate news-gathering technology (Mari, 2018). This suggests the role technology has played in shaping newsroom labor practices has the potential to produce unintended consequences for journalists who lack the technical skills to operate the technology or are relegated to replaceable roles. Emerson shares concerns with how large news conglomerates utilize outsourcing as a method of labor relocation, which they assess has had a negative impact on local news reporting. This is particularly worrying when considering the possibility of an increasingly automated newsroom that relies on AI technology. Emerson's assessment of current conditions is similar to the discomfort found in historical research from the 1920s. While experimenting with the latest generative AI technology as an assistant device to explore potential new stories has been enjoyable for Emerson at an individual level, at the organizational level, they warn there is a risk of increased centralized control over news operations by large conglomerates that could reduce the quality of local news and displace more journalists in the process.

Other behavioral patten changes that arose from the introduction of the telephone into journalistic practice are being repeated today. Face-to-face interviewing and observation still held primacy of place in journalistic practice, though Mari's (2018) research revealed that in the 1920s reporters and sources were beginning to find the convenience and relatively non-confrontational anonymity of the telephone to be

preferred. In an article published in 1923 in the *New York Times*, "Newspapers Get Bigger 'Beat's Over Telephone", the reporter wrote:

> A telephone interview makes it easier to confine a man to the subject you want him to talk on. We have found that a big man is better pleased to talk to reporters over the telephone than face to face in his office. (Mari, 2018, p. 1374).

Historical research has found that reporters in the early 20th century feared the end of face-to-face interviews, lost to a preference for telephone communication. However, this apprehension was mainly proven baseless during the course of the 20th century, as face-to-face interaction persisted as the favored communication method between journalists and their sources well into the 2000s. That same concern over the loss of traditional reporting methods was expressed in some interviews where participants described observing behavioral changes among their colleagues' preference for modern alternative communication methods such as email, social media (particularly Twitter), and even, ironically, telephone, instead of face-to-face exchange. This concern that new technology is causing a change in behavioral patterns is similar to the concerns held a century ago when new technology caused some changes in behavior but ultimately did not alter the principal practice.

The global networked newsroom today represents the culmination of innovative technology and techniques that have incrementally developed over the past century. The newsroom continues to operate on a mindset of speed and agility, enabling reporters to reach the location of a news event and communicate that information back to a central regional office, which then transmits the story to clients. The participants all referred to their organization's transition to Microsoft Teams just prior to the pandemic for faster, more efficient global linking of news offices and how this new connection enables them

to keep up with client demands for rapid 24-hour access to news reports and developments.

Nerone and Barnhurst's (2003) research has established the newsroom as being the imagined heart of operations in the newspaper industry, despite the emergence of various technologies that reduced the need for this physical space. The telephone reinforced the hierarchy of power in the newsroom between the reporter, the city editor, and the managing editor, but it also allowed the reporter to cover more ground and be more independent, while editors could both control and better coordinate coverage of unplanned events (Mari, 2018). The telephone was both a tethering and a liberating force (Mari, 2018). While 21st-century communication technology might create an illusion of breaking these tethered bonds, enabling greater freedom for the modern journalist to roam and report from far-off remote locations, the reality is that major corporate operations, particularly in the U.S., employ modern tracking technology that anchors reporters to their newsrooms more thoroughly through productivity monitoring, teleconferencing for team meetings, and online collaboration boards. The participants discussed organizational protocols enacted during the pandemic which required regular virtual office meetings with regional offices and weekly global meetings, as everyone worked remotely for two years. With the organization resuming in-person office activity, reporters are now expected to maintain a physical presence in the office at least two days each week, in addition to maintaining an established online Teams presence. While telephones provided news workers at the turn of the last century with a visible tether to the newsroom, modern reporters are now tethered to news organizations through these less obvious means of wireless internet technology, cloud services, and portable laptops.

Through a comparison of practices during these two distinct periods of journalistic activity, this study demonstrates the possible convergence of two distinct news actors into a single news agent. This agent is capable of visiting news events and providing a finished report from the field while being monitored by departments responsible for tracking employee performance.

The implementation of novel technologies aimed at streamlining practices and enhancing efficiency results in two discernible outcomes. The first is an inevitable reduction of workers in the space that exits these tasks to automation strategies despite any assurances to the contrary. The widespread adoption of automatic telegraph machines by the 1920s resulted in a significant reduction in the number of employed telegraph operators, with major companies such as Western Union and the Associated Press cutting their workforces from 35,000 to 10,000 and 1200 to 600, respectively, between 1913 and 1928 (Mari, 2018). At that time, there was a looming issue of job displacement, however, trade publications maintained a hopeful outlook on the future of journalism, predicting the implementation of new tools would aid in the work of typesetters (Mari, 2018). This same sentiment was echoed by the majority of participants – that outsourcing and automation would free up reporters to spend more time on developing more important news stories. Participants claim that there has been no significant reduction in report staff or changes to their workforce numbers in their offices currently. However, in a research report done in 2017, researchers showed that surveys conducted in 2015 demonstrated that the number of full-time journalists employed by mainstream general-interest news media had decreased significantly from approximately 122,000 in 1992 to around 83,000 in 2013 (Linden, 2017). Data from the Bureau of Labor Statistics revealed that in 2014,

54,400 individuals held positions as “Reporters, Correspondents, and Broadcast News Analysts,” with a projected 9 percent or 4,400 job loss by 2024 (Linden, 2017). Linden (2017) qualified those findings by stating that the comparison was insufficient in capturing the dynamic nature of the journalism profession. Their use of “full-time” as a qualifier did not account for the transition from salaried to contractual work, the increasing prevalence of freelance and non-traditional contributors, and the emergence of non-traditional media companies. In the context of this research, it is important also to note that AI-based automation strategies have not been widely implemented due to, according to the participant interviews, a lack of trust in their ability to function without constant human supervision.

The second effect leads to a specialization of the remaining workers. An editorial from 1928 issued a cautionary warning for reporters to find ways to specialize: “A machine may come along almost any day which can and will do your job better than ever you could. And there [sic] where are you?” (Mari, 2018, p. 1372). Prior research investigating automated journalism arrived at this same conclusion about the inevitability of intelligent machines displacing human journalists. “To be hired in the media, robots do not have to write better than humans—they have to write good enough. And they do,” (Miroshnichenko, 2018, p. 185). This implies the humans who remain must provide some asset, skill, or experience which management stakeholders perceive as valuable. Existing workers will seek professional development opportunities to separate themselves from what can be automated. Entering workers will be required to gain/possess new skills that automation systems can not replicate.

By adopting a long-term perspective on the relationship between technology and journalism, it is possible to discern how successive waves of innovation have left a layered and complex impact on the field, resulting in a palimpsestic imprint. News editors in the mid-1800s correctly recognized that the invention of the telegraph would "take over newsgathering, outsourcing it from the paper and allowing the paper to devote its energies instead to the philosophical work of making sense of the news" (Nerone & Barnhurst, 2003, p. 445). By the 1930s, the telephone outreached and outperformed the telegraph (Mari, 2018). At the time, talk of job displacement was overshadowed by a prevailing optimism that future technological innovations would improve the speed and efficiency of typesetters' work, such as the use of "head telephones" and chest-mounted transmitters (Mari, 2018). Direct messaging via social media and video teleconferencing today make the idea of a telephone call seem entirely antiquated. Yet each of these innovations build on the former philosophy of adopting the former technology – speed and efficiency to move news from the event to the reader as quickly as possible.

CHAPTER SIX

Conclusion

In order for humans and non-humans to coexist in the same space, it is important to have an awareness and understanding of how interactions between them can be stabilized. One way to achieve this is through HMC, which moves the machine from being solely a communication channel or intermediary into the role of communicator. HMC provides a way to view the machine as a mediator and to treat communication between humans and machines as an exchange of information toward some desired effect. This means that the AI synthetic journalist would no longer be merely a tool for human journalists, but rather an autonomous agent, endowed with the same responsibilities as human-journalist agents, capable of directly delivering journalism to an audience. This shift challenges traditional social frameworks for thinking about how the social is formed and how culture is created.

The traditional social framework of journalism assumes that the journalist, as a social type, has a unique responsibility to society to provide reliable and accurate news. However, the emergence of an autonomous AI synthetic journalist, with the ability to directly deliver journalism to an audience, raises questions about the role and responsibility of this new social type. For example, what impact will this have on the role of journalists as gatekeepers of information? Will the use of AI journalists challenge traditional notions of journalistic integrity and ethics? And, how will the development of AI journalists impact the broader media landscape? The shift from an intelligent intermediary to mediator highlights the need for new social frameworks that account for

the autonomy and agency of non-human actors in the production and dissemination of news. This requires a reimagining of the relationship between technology, society, and culture. Research suggests that this distinction is made early in the adoption of intelligent agents into the production of journalism as part of the socialization process.

HMC provides an ontology to perceive the machine as a mediator and to treat communication between humans and machines as though it were no different from human-to-human exchange. This research has discussed the use of communication as a tool for maintaining power over various groups, particularly the working class. Given that media organizations can influence the information they disseminate, they hold significant power over society. The integration of machines into the mediator role as synthetic social beings, a neo-class of communication, has the potential to challenge traditional power structures while perpetuating existing class divides. The notion of communication as an agentless activity raises questions about its impact on power dynamics and information dissemination in society. For example, would this new communication preserve existing power structures or could it be used to challenge them? Or, could this lead to an uncontrollable proliferation of echo chambers or will it promote a more diverse range of viewpoints?

It also becomes important to consider that to fully incorporate this ideology, the machine must likely have goals and agenda just as humans do. If we define an agenda as a deliberate effort to achieve a particular set of objectives, then regarding an AI synthetic journalist, this could manifest as an agenda aimed at engaging readership. Financial opportunities lie in readership, and the crucial factor is whether people are reading the content. Although recent advances in news organizations have demonstrated that not all

content needs to be produced by human beings, the market for journalism remains dependent on human consumption and engagement to be economically viable. The ultimate goal of reporting news is to reach human readers.

The recognition that intelligent machines could have their own agendas poses ethical challenges that journalism has long grappled with. Awareness of such capabilities may play an important contributing role to the already existing low levels of public trust and support for journalism (see: Jang et al., 2022; Owsley & Greenwood, 2022). Some questions that may arise are whether the machine will selectively target particular audiences, selectively engage with different audiences in different ways, or will it be politically motivated to appeal to left or right-leaning groups, and who would ultimately be in control of the machine's decision-making ability – the developer, the organization, or the machine itself. In the event that a machine possesses an agency and agenda akin to that of its human counterparts, would it be ethical to presume that any external entity should exercise overt control over the machine, beyond what a news organization, for example, exerts over their human journalists? In other words, considering the agency and agenda of machines being similar to that of humans, what ethical risks could arise if a news organization exerts control over machines beyond what they do over their human journalists? And, how might intentionally biasing a machine to serve a news organization's business agenda impact the perception of journalism as an industry and what steps can be taken to mitigate these risks?

It is important to consider that communication research is about who we are as individuals in relation to others and the reality we create. The switch from a human-first journalist distinction to a human and non-human journalist distinction alters the

relationship between human and machine from a process to the creation of meaning between human and machine. Whether and to what extent this transformation is occurring in journalism and with journalists is at the center of what this research set out to explore, by asking how the diffusion of AI as an emerging technological innovation may impact the sociocultural behavior patterns of journalists in modern semi-automated newsrooms adapting to the use of AI in the news production workflow. Understanding the impact of emerging technological innovations on the behavior patterns of journalists is a crucial part of exploring the broader question of where power resides in the communication process.

Carey argued that power in news communication is not simply a matter of who controls the means of production and distribution, but is instead a complex and multifaceted phenomenon shaped by multiple social, cultural, and economic factors (Carey, 2009). Communication is a social and cultural practice that plays a key role in shaping the ways in which we understand ourselves, our relationships, and our world. As introduced previously in this research, those who control the means of communication have significant power to shape our social culture. Organizations that control access to/over AI technology may be able to exert even greater influence over public discourse and decision-making, potentially to the exclusion of marginalized voices and perspectives. One of the main concerns that can be extracted from the interview data is that the use of machine automation in reporting and response activities (machines-to-machine communication) could result in the exclusion of humans from the process all together, potentially leading to a decline in social and cultural practices. The lack of human involvement in the news production process could also lead to a homogenization

of perspectives, with only the views and biases programmed into the machines being represented, limiting the range of opinions and ideas available to the public. The absence of human involvement in the process of internalizing news information poses a threat to the retention of agency, which could potentially be ceded to those groups controlling the technology and the decisions made by these machines. A concentration of power in the hands of only a few organizations with the resources to develop and deploy these technologies risks further entrenchment of existing power dynamics that could potentially worsen already present socioeconomic inequalities.

A second concern is the further erosion of the public sphere if it could be argued that a public sphere even still exists. In order to maintain a public sphere, it is essential for individuals to engage in rational, informed discussion about issues of public concern. Intelligent social media algorithms already create echo chambers that reinforce users' preexisting beliefs and limit exposure to opposing viewpoints. Expanding use of intelligent algorithms to not only filter but also generate information may exacerbate the risk of isolating individuals from meaningful dialogue. The public sphere was defined as a space for rational, informed debate. News media plays a critical role in shaping our understanding of the world and the events happening around us. If this role is entirely taken over by machines, it raises questions about the impact this could have on our collective consciousness and our ability to engage in meaningful public discourse. From the data participants provided, it was suggested AI-generated news reports may lack the critical analysis and contextualization that are essential for meaningful public discourse. Without this, we run the risk of losing a critical aspect of our social and cultural practices, and potentially ceding control over social narrative to those who control this technology.

Understanding these factors and their impact on our collective social culture can provide valuable insights into the workings of power in news communication and may suggest ways to prevent some of the most severe possible outcomes.

These are valid concerns that have been raised regarding the potential exclusion of human involvement in news communication and the erosion of the public sphere. The extent to which journalists engage with intelligent technology and the degree to which organizations develop and integrate its use into news operations will have a profound impact on the effectiveness of news in promoting social stability.

Research question one asked how the adoption of emerging innovative technology may impact journalists and their work. The emergence of automation technology and outsourcing in journalism has necessitated a greater focus on advanced professional development among journalists prior to entering the workforce. This has resulted in an increase in graduate education and continued professional development courses to maintain competitiveness within the industry for the participants. While the core tasks of journalists have remained constant, the evolving nature of news technology has led to a transformation in the skills required to execute these tasks effectively, highlighting the importance of continued adaptation and learning in the newsroom. Respondents noted that while changes in automation and inclusion of additional bureaus have brought additional new resources and duties, their tasks are much the same as they have always been. Overall, the changes involving jobs and roles have been a gradual process, but outsourcing and partially automated tasks have brought about a shift in the way newsrooms operate, with a greater emphasis on collaboration and cross-platform work.

The adoption of an innovation is a complex process that requires a balance between the adoption of new technology and adherence to established practices. Adoption is not a linear process and the rate at which an innovation will spread through a population varies across stages and time. Changes in behavior are required for adoption to occur, and the time it takes for these changes to occur can vary depending on the context. The extent to which an innovation becomes adopted relies on the effective movement of knowledge between the involved social members. This involves understanding the needs and concerns of each group and tailoring the message accordingly. It also requires building trust and rapport with the intended audience. Innovation begins with explorers who experiment with the innovation, but according to theory, this activity must be followed by opinion leaders and other influential individuals who can help spread the innovation more widely. The remaining phases in the adoption of an innovation are; the early majority, followed by the late majority, and finally the laggards. In order for an innovation to reach widespread adoption, it must move smoothly between these groups, with each group providing a platform for the next. When discrepancies occur between definition and experience, controversy occurs and friction develops until the misalignment is resolved. This creates an iterative process of developing the actual adoption of an innovation over time through continued communication across networks between stakeholders. Ultimately, successful adoption of an innovation depends on the ability to create a compelling narrative that resonates with the beliefs and values of the target audience.

Some of the research findings illustrate the exploratory behavior of participants who creatively utilized emerging technologies in newsrooms. Prior to being formally

recognized as reporting activities, journalists uncovered rich data in spreadsheets and stories through coding for data mining. This behavior supports the notion that innovation and its diffusion can occur at both the individual and organizational levels. At the individual level, innovation is often driven by personal creativity, curiosity, and a desire to solve a problem or meet a need. At the organizational level, innovation is often driven by the need to stay competitive in the marketplace, improve efficiency and productivity, or meet the changing needs of customers and clients. For the individual, the pursuit of social rewards motivates the adoption of new products, with individuals in higher social positions often seeking new products/practices to establish and communicate social differentiation. Organizations are motivated to innovate and adopt new practices by the pursuit of economic viability and production efficiency, with the intention of achieving greater profitability and return on investment through improved economy, speed, and efficiency.

This research set out to investigate how AI, when operationalized as a mediator of news information, is diffused as an emerging innovative technology in newsrooms, and how this activity impacts the sociocultural development and behavioral patterns of journalists and reporters during the newsmaking process. The study revealed that while the use of AI in the form of digital news avatars to deliver news reports resembling that of a broadcast reporter is still in the exploratory phase in the organization under study, there has been noticeable progress in the diffusion process of AI implementation. The implementation has been made through the use of AI as a mediator for written news reports and an assistive tool that reporters rely on for their work.

Research question two asked how the social culture of a newsroom may change as a result of innovation and innovative technologies adopted in journalism. The nature of the journalistic occupation is changing. There has been an observed decline in the number of full-time journalists at the organizational level, with a corresponding increase in the prevalence of non-traditional media companies that engage in journalistic work. Changes have also prompted a new need for human-agent teaming in automation, which is governed by the principle that requires humans to be in command of and responsible for the team's outcomes. To be in command, the human must be actively involved in the team process, be adequately informed, and monitor agent behavior. Under the current conditions of AI automated news reporting development, such expectations may impose additional labor strains on reporters, who are required to continuously monitor the accuracy of reports produced by the machine. The agents must also be able to monitor the performance of the human. Evidence of contention has already emerged between competing technology organizations over access to training data for improving machine performance. Without such reciprocal exchange, however, these agents would be incapable of learning and developing better performative outcomes.

Research on innovation in newsrooms has highlighted several interesting observations regarding changes in jobs and roles, including increased collegiality and greater willingness to collaborate across platforms, routine meetings and interactions with journalists from diverse platforms, bureaus, countries, cultures, and time zones. Dupagne and Garrison (2006) discovered from their research into convergent newsrooms that journalists felt that their jobs had changed as they were required to learn about other platforms they worked with regularly, resulting in a trend that occurred in the early years

of the century, referred to colloquially as “backpack” journalism. Although the findings of this research do not validate the notion that reporters experience significant job changes due to skill development, they acknowledged a rise in camaraderie and occasions to work jointly with reporters from diverse cultures.

Research question three asked how the social culture of a newsroom may change as a result of intelligent machines moving into mediator roles in journalism. The concept of directing automations to specialty teams and bureaus surfaced numerous times in the interviews. However, participants indicated AI technology is still too early in its development to be a reliable resource for daily reporting. While one division of TNO actively researches AI automation solutions, other departments have established ways to increase efficiency and performance by creating these special teams, special desks, and entire bureaus in lower-wage earning countries, all staffed by human reporters.

Technology is a constant factor in the newsroom. Journalists are already surrounded by algorithms, which unconsciously and seamlessly take care of everything from web searches to photo and text editing. The adoption of new technology and its effects on journalism are shaped by the organizational structure and occupational practices within the industry. Social groups with vested interests in automated news, including publishers, news managers, developers, advertisers, and government regulators, are stakeholders with the power to influence the trajectory of technological adoption in journalism. The use of an actor-network approach to researching diffusion of technological innovation is particularly advantageous in mapping power dynamics among various actors involved in the implementation of technological innovations in newsrooms. Within this context, disputes have traditionally arisen regarding the

definition of a technology and the process of reaching a consensus, with technical artifacts often considered as an additional actor in the equation. This is where friction occurs. This research has defined friction or controversy as a state characterized by questioning an issue or innovation that can lead to disputes between actors, not limited to human-to-human interaction. This is where the stability of sociotechnical networks comes into play. According to Latour (2005), stability is not permanent and may falter as disagreements arise. Therefore, controversy, as the genesis of instability, is crucial to consider in the context of emerging digital innovative technologies. This understanding of how to observe instability helps to address the question of where controversy may exist in the present diffusion state of AI operationalized for news.

Possibly the most controversial aspect of AI research and development lies on the horizon, in what may be yet to come. There was concern mentioned about the gradual conditioning of audiences to expect less sophisticated news content before the normalization of AI technology in news reporting. This can be described as an inefficiency in properly defining the technology to its users. Inadequately defining a technology for its users can be attributed to a lack of attention paid to the social conditioning that may transpire during the developmental stage, prior to the technology attaining its maximum potential state. This phenomenon may result in a compromise between technological advancement and audience satisfaction, ultimately leading to the creation of news content that may not meet journalists preferred standard but is deemed acceptable by readers.

There is an expression used in Chinese – Chà bù duō (差不多) – which literally translates as “almost” and is used to describe something as “good enough”. The Chinese

use this expression to approve of something once it is deemed acceptable. A thing needn't be refined any further once it is "Chà bù duō". The data collected suggests that research and development in AI for news production travels in two directions. On the one hand, researchers and developers strive to improve the quality of the product. On the other hand, consumers begin with high expectations of perfection, but as they engage with AI technology like Siri, Alexa, or chatGPT for example, they become aware of its limitations and flaws. This process of exposure to new trials and iterations of AI experiments leads to a reduction in consumer expectations over time. When the velocities of the two directions reach an equilibrium point, with research progressing while people's expectations decrease, there may be no further incentive to advance the technology. If this equilibrium is achieved at a level below the expectations of professional journalists, the standard and quality of journalism would be compromised. External factors could also contribute to this risk of altering consumer expectations prior to the realization of synthetic AI news reporters capable of matching present journalistic standards. For example, the influence of social media and other online platforms, which prioritize speed and virality over accuracy and quality could lead consumers to expect the same level of immediacy and entertainment value from AI-generated news content, even if it sacrifices accuracy and quality. Although raised as a separate area of contention with the problematic issues of social media, as one of the participants mentioned, this external rapidity of discreditable information that proliferates across social media channels compounds the vicissitudes faced by reporters increasingly each day. Therefore, as the industry moves forward with generative AI technology, maintaining a high standard in journalism and ensuring the highest standards of journalism is upheld becomes increasingly vital. This concern

regarding the potential pitfalls of this technology underscores the need for vigilance in maintaining these standards.

It is important to recognize that innovation is not necessarily better but is simply perceived as new by potential adopters and diffusion is not synonymous with replacing preexisting technology or methods. Innovation arises when current practices reach their capacity to advance or produce additional output, often characterized by inefficiency or lack of cost-effectiveness. The successful diffusion of an innovation is influenced by a variety of factors. These include the characteristics of the innovation itself, such as its complexity, compatibility with existing systems, and relative advantage over existing solutions. The characteristics of the individuals or organizations that adopt the innovation, such as their level of risk aversion, their capacity to absorb and implement new ideas, and their perception of the innovation's benefits, are also important. The context in which the innovation is being introduced, including the social, cultural, economic, and political environment, can also affect the speed and extent of diffusion. Additionally, the channels of communication and the methods of dissemination used to promote the innovation can impact its adoption. This process is dependent on a complex network of intercommunication and exchange between relevant stakeholders. At its core, diffusion is dependent upon identifying pathways of least resistance towards greater efficiency and/or increased economic viability.

One of the primary reasons for the failure of an innovation to reach diffusion is interference of competing innovations, which can create ambiguity and confusion regarding their meanings and definitions. In addition to the interference of competing innovations, there are other prevailing factors that may lead to the failure of an

innovation to reach diffusion. These include a lack of compatibility with existing systems, resistance to change from stakeholders, insufficient marketing or promotion, inadequate funding or resources, and the complexity of the innovation itself. Furthermore, social and cultural factors, such as values, norms, and beliefs, can also play a significant role in hindering the adoption and diffusion of an innovation. These potential barriers must be carefully considered and addressed in order to increase the chances of successful diffusion.

This dissertation concludes that, despite decades of research and development, the diffusion of AI automated news production in the form of AI synthetic news reporters remains largely in an exploratory stage. The study maps the current state of one news organization's development in the diffusion process, relative to the larger course of time, by examining the social behavior of those involved in news production during two significant periods of disruptive innovation. Given the significant global influence of this organization on news reporting, the implications of the social and journalistic behavior described by its participants can be indicative of broader social and journalistic trends across news organizations that serve primarily US and western European audiences through reasonable assumption without suggesting generalizable findings. This research upholds the proposition that diffusion is an iterative and cumulative process that can co-occur with other innovations.

The research conducted for this dissertation suggests that based on current trends, it is conceivable that a significant portion, if not the majority, of news content consumed by audiences in the future may be produced and presented by synthetic AI journalists. This assertion is made with caution, however. While this future is not an absolute

certainty, it is likely based on existing scholarship and this research. In every industry, where automation is possible, it is probable. Two established principles support this hypothesis. One, that any task or process that can be automated will eventually be automated (Zuboff, 1988). And two, automation of a task will occur only when/if all relevant social groups with influence accept it (Linden, 2017).

The automation of low-skilled labor-intensive processes is envisioned to create a future where humans are liberated from tedious tasks and can channel their time and energy towards artistic and intellectual pursuits. However, this idealistic expectation may remain elusive and challenging to achieve in practicality. While the automation of low-skilled labor-intensive processes can bring benefits such as increased efficiency, reduced costs, and decreased human error, there are several challenges to achieving the idealistic expectation of liberating humans from tedious tasks. The implementation of automation technology may require significant investments in infrastructure, software, and training, which may not be feasible for all organizations. Additionally, there may be social and cultural barriers to the widespread adoption of automation technology in what would be considered a creative skill work sector. Some individuals may be resistant to change or may have concerns about the ethical implications of replacing human workers with machines. The transition to a more automated workforce may require rethinking and restructuring of existing societal and economic systems. From an economic standpoint, the main reason why this expectation may remain elusive is that the primary goal of businesses is to maximize profits by reducing costs and increasing efficiency. The automation of low-skilled labor-intensive processes can help achieve these goals, but it may not necessarily lead to the creation of new, more fulfilling jobs for workers. In fact,

it is possible that automation could lead to job displacement and contribute to widening income inequality, as those with the skills to work with technology may benefit at the expense of those who do not have those skills. In addition, the benefits of automation may be unevenly distributed, with profits flowing primarily to business owners and shareholders rather than to workers. While the ideal of liberating humans from tedious tasks through automation is appealing and has been a repeating concept across both processes studied in this research, significant economic and social factors remain that may make this goal difficult to achieve in practice. Although there are potential risks that may threaten the idyllic vision that organizations promote and individuals hold, technological advancements have the potential to improve the efficiency and accessibility of journalism. However, removing humans from the process of creating journalism could have severe implications for democracy, posing the greatest threat to its principles.

Democracy is founded on the principle of humans able to engage in civil discourse. The ability of individuals to engage in respectful and constructive dialogue, even when they hold differing opinions or beliefs, remains, idealistically, a central belief of American democracy, despite challenges to this philosophy brought on by modern interpersonal communication trends. Journalism foundationally is a construct manifest in support of that civil discourse. Journalism serves as a critical source of information, providing citizens with the facts and context necessary to engage in informed and meaningful discourse. Through journalism, we learn about the issues facing our communities and the world, and engage in discussion and debate with others. Removing humans from the act of creating journalism risks the greatest deficit to democracy. Continuing the evolution of technology has the capacity to improve the efficiency,

accessibility, and reach of journalism. Nevertheless, it is the responsibility of human journalists to deliver the essential elements of context, analysis, and critical thinking required by civic audiences to make informed decisions regarding their lives and governance.

Future research

This research explored the impact of the early diffusion stages of an emerging innovative technology on journalists' productivity and the social culture of their newsroom. During the examination of the adoption of this technology, it was discovered that the usage of prior technologies has greatly impacted journalists in conducting their reporting, as well as the social culture of the newsroom. For instance, the transition to digital access to information via the internet, remote conferencing for more efficient global collaboration, and organizational decisions to create outsourcing solutions that rely on human labor in low-wage earning countries have all played important roles. Diffusion of innovation is a protracted process that requires significant effort and attention. Conducting more longitudinal research that examines the impact of the adoption of emerging innovative technologies on the social culture of newsrooms and journalists in their reporting roles over time would contribute to a deeper understanding of the impact of technology on the journalism industry and inform strategies for improving the adoption process of new innovations and innovative technologies.

While this research has provided a comprehensive examination of the relationship between AI and journalism, other important tangential topics arose from the interviews as

well, which fall outside the scope of this research and require further investigation to better comprehend this complex and evolving subject.

The increasing use of AI in news reporting, specifically its potential to act as a mediator for machine-to-machine communication, raises important questions about the future of news as a commodity. While some of the participants commented on this aspect of AI's role in journalism to shed light on this issue, there is a need for further research to examine the potential implications of this trend. Specifically, future research could investigate the impact of AI-mediated news reporting on target audiences and their trust in news content. This research could employ a mixed-methods approach, combining qualitative interviews and focus groups with quantitative analysis of news consumption patterns. The findings of this research could have significant implications for the news industry, as well as for the development and regulation of AI technology.

Secondly, participants who bridged the transition to digital-access information from traditional archival repositories talked about how access to information via the internet may have led to an imperceptible bias towards information that was digitally available. This may add a unique perspective to already voiced concerns about the potential bias in AI systems developed for operationalization in newsrooms, which are trained on large datasets of digital information. Future research could investigate the extent to which AI synthetic journalists may be inescapably biased towards digital information, and the implications of this bias for the efficacy of journalism. By examining the training data used in AI systems and analyzing the outputs of these systems, a researcher could investigate the potential for bias and explore strategies for mitigating its impact.

A third area of concern derived from topics discussed by participants is in education. Every participant talked about their own experience in continued professional development. There appears to be a gap between newsroom expectations of entering journalists, what potential future journalists are willing to invest in education, and what learning and training is offered by higher education institutions (See: Gotlieb et al., 2017; Wenger et al., 2018). One aspect that could be explored is the prevalence of new workshops and online course offerings for remote and distance learning, which may have been impacted by the COVID-19 pandemic. Additionally, there is a need to examine the extent to which professionals are actively engaging in these opportunities for continued professional development and returning to education to pursue higher degrees remotely, as institutions recognize the potential for remote/distance learning in journalism education. Research into this area could also benefit from a mixed-methods approach. Quantitative data could be collected through surveys or analysis of enrollment numbers to determine the prevalence and popularity of remote and distance learning opportunities for journalists while interviews or focus groups with journalists and educators could provide qualitative data on their experiences and perceptions of the effectiveness of these learning opportunities. The potential impact of this research is substantial, as it can provide valuable insights for journalism educators, newsroom managers, and policy makers to better comprehend the current status of journalism education and make informed decisions about curriculum and training opportunities.

Ultimately, these research possibilities would aim to contribute to a deeper understanding of the complex relationship between AI and journalism, and to inform discussions about the future of news in the digital age.

Footnotes

[1] To protect the privacy of the participants involved in this research, all participant and business names have been anonymized and pseudonyms and aliases are used. More detailed information about this can be found in the methodology section of this study.

[2] Two measurements were used to determine unavailability. Recruitment messages that returned an "undelivered" error message citing an invalid email address at the recipient organization were identified and contact information was updated to attempt each subsequent formatting style of seven known alternative formats. Each alternative format also received "undelivered" error messages. Second, muckrack.com houses a database including members of the news industry and their most recent publications. Many "undelivered" error messages were associated with people whose most recent articles listed on muckrack.com were years old publications.

[3] The CMS Daylyn refers to is an AI assistive technology that supports reporters at TNO by facilitating the detection of patterns, deviations, critical details, and proposing fresh narratives that journalists ought to consider writing. The in-house system is trained on large-scale data analysis to proactively recommend novel, fact-based story angles to journalists during their reporting tasks.

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Appendix

Interview Questions

1. Talk about if and how technology (changes/impacts) the way you conduct your journalism. Be as detailed and specific as possible about how it does or does not have an impact. (addresses RQ1/RQ2)
2. Can you describe an experience when you changed the way you went about reporting because of a particular technology? (addresses RQ1/RQ2/RQ3)
    a. Was this change in response to a newly introduced technology or was this the initiation of a new application of technology to meet the needs of your reporting? (addresses RQ1/RQ2/RQ3)
3. Talk about if and how technology (changes/impacts) the way your newsroom operates. Be as detailed and specific as possible about how it does or does not have an impact. (addresses RQ1/RQ2/RQ3)
4. Talk about if and how AI machine journalists performing the role of producing news/journalism (changes/impacts) the way you conduct your journalism. Be as detailed and specific as possible about how it does or does not have an impact. (addresses RQ1/RQ2/RQ3)
5. Describe an experience when you changed the way you went about reporting because of AI machine journalists performing the role of producing news/journalism either at your organization or outside your organization? (addresses RQ1/RQ2/RQ3)
6. Talk about how you are developing a culture of innovation that advances new ideas and practice. (addresses RQ1)

7. Talk about how AI machines producing news (impacts/changes) the culture of a newsroom. (addresses RQ3)

Vita

Chad Stuart Owsley was born and raised in the suburbs of St. Louis, Missouri in 1974. Before attending the University of Missouri Columbia, he lived in China for 12 years in Jiangxi and Guangdong provinces from 2007 until 2019. He taught visual media communication for journalism as a Lecturer of Journalism at Guangdong University of Foreign Studies in Guangzhou, and also taught visual journalism studies courses part time at Beijing Normal University - Hong Kong Baptist University in Zhuhai.

His professional career includes roles such as the Foreign Editor in Charge of Silk Road Post and the visual editor and project manager for new media development at Guangzhou Morning Post weekly newspaper, Guangzhou Daily Newsgroup. Additionally, Chad worked as a Foreign Reporter for GDTV World channel, Guangdong Television, and as a Photojournalist for Demotix Newswire service.

Chad's academic achievements include a Master of Science in Journalism with honors from the College of Communication at Boston University in 2010, and a Bachelor of Arts in Photography with honors from The Art Institute of Colorado in 2006. Additionally, he holds an Associate of Fine Art with honors in Photography from St. Louis Community College, Meramec, which he earned in 2003.

While at the University of Missouri, in addition to studying for his PhD in Journalism, Chad also earned a minor in College teaching, served on the Graduate Student Council, and was nominated for the Midwestern Association of Graduate Schools 2023 Excellence in Teaching Award.