

Studies in Systems, Decision and Control 370

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Digital Convergence in Contemporary Newsrooms

Media Innovation, Content Adaptation,
Digital Transformation, and Cyber
Journalism

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Nous autres écrivains (...) ne disposons du pouvoir politique ni des forces armées ni d'argent. (...) Nous ne disposons donc que du langage et, parfois, de l'enseignement. Nous ne pouvons donc que travailler à long terme.

Exactement dans celui du Grand Récit.⁶

We writers (...) do not have political power nor armed forces nor money. (...) Thus, we have only language, and sometimes, teaching.

Thus, we can only work in the long term. Precisely the term of the Great Narrative.

⁶Michel Serres in *L'Incandescent*, p. 405. Free translation into English.

Journalists and Health

Professionals Struggle for Life

We dedicate this book to journalists who died of COVID-19¹ as well as to health professionals—nurses, doctors, medics, hospital personnel, and public health units, who constitute an immense chain of expertise, fighting to save lives often without the necessary protection equipment. These people are in a much larger number than journalists; thus, they have many more dead.

The most advanced technology and the highest science do not seem able to contain a virus that spreads at unprecedented speed. Meanwhile, various countries elect governments with a mentality akin to the Middle Ages. Once in power, they mock the disease and act against the same democracy that elected them. They ignore science. They insult intelligence.

However, they do not despise the knowledge of Information and Communication

¹Two hundreds and ten journalists in 38 countries between March and mid-July 2020. See Press Emblem Campaign.

Technologies (ICT) to reach their power-thirsty goals. Understood here as a civilizational advancement and as the search for knowledge accessibility, the ICT are used to identify the most resentful segments of the population, which are also the most vulnerable to hate speech. The same social networks used by people to communicate and to become authors, not just spectators of the media universe, are also weaponized by political and economic groups to pursue the opposite direction, often times criminally. They poke wounds and stimulate resentment and frustration, in order to have their preys act against life and democracy.

In the bosom of formal democracies, totalitarian alternatives thrive.

Journalists and health professionals are not the means for such ideologies. They want safer, well-informed populations. But in the USA, India, Brazil, and many African, European, and Asian countries, these professionals face on a daily basis the double threats of virus and disinformation. They became a target for the hate speech that poisons social networks. Were not the Internet and social networks a possibility for liberation, for increased communication, and for expanding democracy? Behold the paradox Earth inhabitants have to deal with.

We will work toward having more and more humans fighting for life in our planet. May scientists, researchers, journalists, health professionals, and other professionals too be

*the bearers of the highest ethical values. May
this book be part of a path in that direction.
Many will join in this effort.*

Fred Ghedini

*Brazilian Journalist, President of Associação
Profissão Jornalista (APJor)*

Foreword: What Aeschylus Can Teach Us About Disinformation and the Importance of Journalism

When looking for some additional readings for this preface, I turned to Aeschylus as the perfect option to illustrate how deception and manipulation are ancient, especially in times of conflict. Personally, I believe that problematizing the importance of journalism in the twenty-first century is first and foremost thinking about the value of truth in a technologically mediated world. So, I thought that a good opening to this text could simultaneously lead the way and illustrate how far back dates the manipulation of truth. I'm always skeptical when I read that the first manifestation of fake news occurred in this or that precise moment and context. It surely must be difficult to identify that. But I thought that it would be safe to bring the words of Aeschylus, the Greek playwright who lived around 500 years prior to the birth of Christ. "In war, truth is the first casualty," said Aeschylus. I had quoted it more than once. I googled it once again and quickly found it, which reassured me: It is true and anyone can check it online. However, I wanted to be more accurate and went looking for the source of the aphorism. Aeschylus probably said it on a speech or wrote it in one of its plays. My search for the moment and place of that statement showed me that it was not just him, the father of tragedy as he is often called, who was presented as the author of the adage. It was also attributed to others. So, I investigated deeper and even sought for guidance from a scholar in classic Greek culture.

Eventually, two online pages put an end to my quest: a "Quote investigator"² and a "Wikiquote"³ guaranteed that it was misattributed. There is no evidence that Aeschylus wrote it or ever verbalized it. However, it is widely spread on the web. Gaetani describes precisely this: "during my research I have contacted many bloggers, asking them where Camus should have written/said this or that; their answer was always the same: «check it on Google». Indeed, their reasoning was simple but tremendously naïve: if a quote is reported by so many people—millions of references in some cases—the author of this quote 'must' be Albert Camus"

²<https://quoteinvestigator.com/2020/04/11/casualty/> on 20 January 2021.

³<https://en.wikiquote.org/wiki/Aeschylus>.

(2015, p. 41). This episode encapsulates various aspects that substantiate my view of why we should be discussing what is happening to journalism today.

Journalism has been facing dramatic obstacles and shifts since the twentieth century. However, the nature of these problems has been changing over time (Nielsen 2016; Pickard 2011). What we face today can be analyzed mainly from three angles: “first, an economic crisis concerning the very existence of the news media industry that underwrites journalism as an occupation, a form of salaried employment; second, a professional crisis concerning the demarcation of journalism itself, its separation from other kinds of work; and third, a crisis of confidence concerning the relations between journalism and the people who make up the public that journalism claims and aims to serve (Nielsen 2016, p. 77). Stemming from this threefold view of the crisis of journalism, I intend to analyze how the current techno-social, economic and political contexts pose enormous threats to journalism and democracy—after all, they are tangled together, and how people, more than ever, need trustworthy information.

Despite the promise of a more open and participatory system that cyberoptimists announced in the 1990s, what we see today is the permanence of mainstream media as the dominant actors. There is an immense multitude of “producers” (Bruns 2007) and a new breed of digital influencers. Nevertheless, the dominance of mainstream legacy media perpetuates what James Curran described as a “closeness between the media and the Establishment” (2019, p. 191), that can undermine the way journalism is seen by the public opinion. During the twentieth century, journalism was able to create an image of true value, a non-partisan means that allowed people to get the information they needed to interpret the world and govern themselves. Nevertheless, journalism is/was never bias-proof. It depends on choices and priorities. It delivers information, a public good that supports democracy, but it never ceases being a business.⁴ In the USA, for example, the clashes between profit and news values were increasingly won by the first, during the 1980s and the 1990s: “profit maximization came to dominate all other considerations” (Benson 2018, p. 1061). At the turn of the millennium, right before the Lehman Brothers collapse, American journalism was a product of its time: “a political economic analysis stresses that the reasons for lousy journalism stem not from morally bankrupt or untalented journalists, but from a structure that makes such journalism the rational result of its operations” wrote McChesney in 2003 (2003, p. 324).

What we see today is also a product of our time. The kind of journalism that we have results from the answers (some of which desperate) that were given by the media outlets to the dramatic changes in the media ecosystem, either caused financial restrictions, by the rise of new players, or by new consumption habits, among other reasons. One of the most relevant causes is the end of the business model that comfortably characterized journalism during the mass media monopoly (Pickard 2011). A few years ago, Benito-Ruiz (2009) coined the term “infoxication 2.0” to refer to a time which we could describe as highly saturated. A time that is

⁴In this text, the essence of the public service media or other forms, like community media is not discussed.

characterized by a permanent online stimulus and by the pressure of an ever-present technology. The fierce struggle to get more clicks, which is arguably the current measure of success for media outlets, is fought with the weapons of “Infocination 2.0”: promoting infotainment, exploiting highly attractive and sensational topics, worrying less with deontology and focusing more in viralization strategies (Romero-Rodríguez et al. 2018, p. 75–76).

Infocination 2.0 reflects one possible answer to the producer’s perspective of the million-dollar question: how do I make my product noticed in an immense sea of information? Being the first often seems to be the most important criteria, which increases the possibility of error and favors the headline instead of the background. Obviously, there is nothing wrong with breaking news. Anyone can make a mistake and later correct it—that is not fake news. However, the matrix of the web favors instant repetition—and that is what occurs immediately, mostly without confirmation. So, what happens when a user or a media outlet publish a lie? It will be repeated, sometimes like a snowball. Or when a number of bots disseminate the same information forging a large consensus? One piece of information may not be relevant if you follow 500 accounts on Twitter. How can you remember one specific fact in the midst of the fog? But the fact is that the repetition of a story increases exposition. It was already like that before the Web entered people’s lives:

“This repetition may be central to audience retention of the information. When the media present the same or similar stories over a period of time, they are giving the audience a chance to mentally rehearse the information. Even within television news broadcasts, viewers are often teased with major headlines before stories are shown. Such rehearsal allows individuals to retain the information, even in cases of passive learning” (Tewksbury et al. 2001, p. 534).

That is why Camus or Aeschylus gained so many adages on the web. It is impossible that so many people are wrong.

The problem, one might even argue, is not the superficial true story, because if the topic is of any interest to the reader, he will search for some context. The problem is the weakening of the newsrooms that lead to an oversimplification of the narrative. The problem is when the reader is absolutely satisfied with an impoverished (but free of charges) version of what journalism should be. Background is the most important thing that journalism can provide. However, explaining the context requires time and people (like fact-checking does) in the newsroom, which is not the actual tendency. Some of my graduate students end their journalism internship without going out to the street with a senior reporter. Their work is desk only. And their biggest successes are measured by clicks and not by the actual impact of what they wrote. Reporting outside the newsroom or investigating seem to be endangered activities. Less people have to do more, but no one expects it to be better because there is no time. The case of the American newspapers offers a very clear example of this process. Newsrooms have cut down the staff to nearly 50% when compared to the period prior to 2008, despite “a modest increase in jobs after 2014 in other news-producing sectors—especially digital-native organizations—offset some of the losses at newspapers, helping to stabilize the overall number of US newsroom employees in the last five years” (Grieco 2020).

Drawing from our initial perspective, two other aspects are of paramount importance when looking at journalism today: the presence of disinformation in everyday life and the forces that circumscribe the freedom of the press and the Internet.

Let us begin by the global government censorship that is taking place all over the world (Curran 2018, p. 190). A number of cases, from Hungary to Serbia or China, show that we are far from having free media systems everywhere (Repucci 2019). Restrictions of freedom in the media are a recurring topic in democratic societies, mostly by their own cases of economic pressure or political interference. But the big picture seems to be absent from the public knowledge in those countries: “2019 was the 14th consecutive year of decline in global freedom,” according to the Freedom House (Repucci 2020). The world is not getting any freer. People who think that this is a distant and exotic narrative are utterly wrong. Trump has proven otherwise. To be more precise, “more than half of the world’s established democracies deteriorated” during this 14-year period and in 2019 only 42.6% of the countries analyzed are considered free (Repucci 2020).

In several democratic countries, a concerning number of nationalist movements has grown. Today, “where once democracies might have acted in unison to support positive outcomes to global crises, disparate authoritarian states now frequently step into the breach and attempt to impose their will” (Repucci 2020). This represents a concerning inversion of the democratization wave that followed the end of the Cold War, the fall of the Berlin Wall, and the collapse of USSR (Abramowitz 2019).

Reliable information is the main tool for fighting this trend. Having access to information that builds a strong public opinion has always been one of the fundamental premises of healthy democracies. In roughly two decades, the Internet scaled to the chief role in that process by becoming the main or one of the top source(s) of news in many countries (Shearer 2021; Newman et al. 2020). “Even in settings that are otherwise highly oppressive, an unrestricted online space offers immeasurable possibilities for free expression, community engagement, and economic development” (Shabaz and Funk 2020, p. 4). Information supports freedom of choice and self-governing. That is why restricting the freedom of the press or limiting the access to the Internet are part of the strategy of governments that sustain non-free regimes. Despite the limitations of their study, Kenski and Stroud suggested 15 years ago that the Internet could have a “positive and significant impact on political knowledge participation and efficacy” (2006, 187) which was considered a good sign despite not being the immediate solution for political disengagement. But that data was previous to the Web 2.0. On a more recent meta-analysis, however, the positive relation between the use of digital media and participation has revealed to be stronger in the era of social media (Boulianne 2018).

Internet use has also been associated with democratic diffusion in non-democratic countries (Placek 2020). Hence, the potential is clearly recognized. Nevertheless, the current situation is quite concerning. Internet freedom has also been deteriorating in the last decade, and the COVID-19 pandemic is accelerating this tendency, according to the Freedom House (Shabaz and Funk 2020). This

organization has identified three main trends during 2020: “First, political leaders used the pandemic as a pretext to limit access to information. (...) Second, authorities cited COVID-19 to justify expanded surveillance powers and the deployment of new technologies that were once seen as too intrusive. (...) The third trend has been the transformation of a slow-motion “splintering” of the Internet into an all-out race toward “cyber sovereignty,” with each government imposing its own Internet regulations in a manner that restricts the flow of information across national borders” (Shabaz and Funk 2020, pp. 1-2).

The last topic I want to emphasize is the fact that we live in a time of information disorder (Wardle and Derakshan 2017). We know that manipulation and fake news are an ancient phenomenon (Figueira and Santos 2019) on the media. The difference today is the immense quantity of information that flows through the web. Anyone can produce and distribute information online with no more than a simple smartphone. No special training is required to deliver a piece of video that ends up having the same exposition as a feature from the CNN.

The North American presidential elections of 2016 seem to be the pivotal moment that brought fake news to the attention of everyone (Allcott and Gentzcow 2017). Following the election, President Trump used fake news not only as a recurring argument but also as a strategy during its mandate. Fake news was adopted as a label for what was inconvenient, a political tool (Sullivan 2017; Levinson 2018). The expression was clearly instrumentalized depriving it from its meaning⁵ (Sullivan 2017).

Nevertheless, fake news is only a part of the problem. That is why other expressions are better at framing what is going on. Claire Wardle and Hossein Derakshan congregate three notions to refer to the situation in a more comprehensive manner: “dis-information. Information that is false and deliberately created to harm a person, social group, organization or country. Mis-information. Information that is false, but not created with the intention of causing harm. Mal-information. Information that is based on reality, used to inflict harm on a person, organization or country” (2017, p. 20). The information ecosystem became more complex than ever. Information that is created by anyone spreads quite easily and is endorsed by legacy media or by a close friend on Facebook. People receive this immense quantity of information every day, a lot of which is fake, imprecise, or misleading. Moreover, the algorithmic matrix of the web environment can favor a biased reading of the facts and contexts [filter bubbles or echo chambers (Pariser 2011) are just an example] that is not always acknowledged by the users.

This is not the place to discuss and problematize the possibility of confirmation bias, conspiracy theories, naïve realism, bots, alternative facts, polarization, populism, or any other topic that is related to the use of information as a weapon of manipulation. The fact is that daily contact with manipulation attempts became a shrapnel from our relationship with technology. But most people are not ready to deal with that “info-war,” as Aro (2016) calls it.

⁵Although it must be considered that fake news is an expression that refers to very different realities (Tandoc et al. 2018).

In the era of post-truth (McIntyre 2018) facts no longer constitute the congregating truth, which is terribly frightening, as we are realizing during the pandemic. “Post-truth is not about reality; it is about the way that humans react to reality. Once we are aware of our cognitive biases, we are in a better position to subvert them. If we want better news media outlets, we can support them. If someone lies to us, we can choose whether to believe him or her, and then challenge any falsehoods. It is our decision” (McIntyre 2018, p. 172). However, if want to know if Aeschylus said “In war, truth is the first casualty,” and you find a thousand confirmations through Google, why would you continue looking? That is surely not the common user’s behavior.

I agree with Umbelino when he says that we need a more substantial and structural change that embodies the spirit of the Enlightenment: “inform to fight the lie; inform to form a critical spirit; inform to emancipate; inform to question; inform to create the fascination of what is new and different” (2019, p. 176). That is why the author argues that worrying with improving the information has to be parallel and symmetrical to an investment in the development of the person (2019, p. 176).

People need to recognize and defend and support quality and reliable information as a public good. As part of a humanist view of the world, I believe that such an embracing and critical thinking will be able to impact the current spiral of decay that affects trust in democracy and journalism.

From the journalists’ perspective, it is fundamental to be able to understand the *zeitgeist* and face these challenges knowing that this is not just about technology. A deterministic discussion will always be insufficient. It is more important to understand people’s minds than what happens behind the screen, like Jenkins wrote: “convergence does not occur through media appliances—however sophisticated they may become. Convergence occurs within the brains of individual consumers” (Jenkins 2006, p. 3). This book offers an opportunity to deepen our knowledge on what is happening in the newsrooms and what may be the future of journalism.

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Preface

There are times of paradigm breaking in journalism, either through the connections of readers' social networks, changing mass communication, or through mobility and ubiquity in the use of cell phones. We certainly live unexpected moments in social communication, for those who have been on this road for a long time as well as for new professionals in other areas, and students who think that it has always been so. Everyone in this business is surprised by the breakdown of communication paradigms; professionals who have migrated to journalism also witness the breakdown of their paradigms and those of communication organizations. Journalists, photographers, designers, and editors, everyone is being severely tested.

Unsurprisingly, Information and Communication Technologies (ICT) gave people the power to publish data, facts, events, and opinions. ICT also turned citizens into potential opinion leaders, making them, at the same time, consumers and producers ("prosumers") of information. The combination of "presumption" and the use of new products have allowed the emergence of new communication platforms that form an information ecosystem of its own and, unfortunately, do not prevent misinformation.

The breaking of the journalists' monopoly paradigm has been felt for some time. However, it is more dramatic nowadays due to the popularization of social networks and to a quasi-compulsion to use them. These are the times of new paradigms in social communication, disinformation, and post-truth. Such phenomena have led communication companies to seek survival, especially in the last decade. Sustainability has always been required from newspaper managers through different paths. Researchers are in charge of in-depth investigation and theoretical knowledge to help finding sustainable models. Studies identified the use of tools without the proper preparation of teams, and the adoption of new work procedures by increasing the mediation of ICT. In most cases, instead of facilitating management for executives not very fond of these practices, companies find it hard to set goals.

The chapters of this book present studies showing that traditional advertising business plans have changed as dramatically as the production of content. Advertisement in weekend newspapers comes from the twentieth century. In this ad segment, innovative companies with a global business changed the system. Ads are

paid per view. The logic of pay per view has radically affected the traditional journalistic business models. In the context of the markets of journalism and advertising, these changes led to more complex issues and new challenges to the survival of most journalistic organizations.

At the beginning of the current century, convergence processes were integrated into most newsrooms of local and national newspapers, groups of journalists, and publications for specific or specialized niches. Along with these ongoing processes, came the need to encourage collaboration in newsrooms, facilitated by information systems, and to review the workflow in the organization due to the presence of digital media, and also to choose data first for news production, and guide other activities from there. Nevertheless, before or in parallel, it was necessary to invest in computer and data journalism. The narrative should be centered in a large repository with the support of ontology or networked vocabulary (knowledge graph). It should provide greater accuracy and reliability of the information to face the increase in fake news and should increase the involvement with the communities and audiences that we intend to serve (Tsakaretau and Pogkas 2017).

The practice of collective editing of journalistic articles, distributed over time and space thanks to ICT, and the multichannel dissemination of news demonstrate that the factors mentioned are preponderant. They catalyzed the rupture of the centrality of newsrooms and transformed the production of information to virtual newsrooms, something contemplated in chapters of this book. These practices and context enabled the emergence of two concepts: (1) “deprofessionalization” of the main actor of newsrooms and (2) “deinstitutionalization” of journalistic organizations and transformation of the journalists’ workplace.

We are experiencing new paths toward an interdisciplinary journalism. Mass communication was characterized mainly by the dramatic expansion of newspapers, radio, and television’s reach. Technologies imply the use of new work methods, many times inverted. Journalism scholars continue to attempt representation through description or multi-faceted models, one of the issues this book focus on. In parallel, there is the arrival of the convergence of the media, the hybridity of the means or distribution channels, and the ubiquity allowed by cell phones.

The technologies bring instruments and procedures already incorporated in software developed for other service sectors. But they often present difficulties of use for older journalists, who reject them. The expectation is that information systems seek to be collaborative, and friendlier, and that artificial intelligence is embarked, probably in the algorithms, with tens of thousands of code lines. However, there is a real danger that intelligent agents would replace human beings if lawmakers do not establish ethical and moral limits, with universal adherence by nations around the world.

The search for newsrooms’ models was the inspiration for a set of chapters. According to the theory of collective intelligence and the semantic sphere (Lévy 2013), the first requirement of the research was to be centered on the networked citizen and to facilitate the construction of creative and intercultural dialogues. The need to adapt content production came from the introduction of mobile devices and the presence of social media. Therefore, in order to survive in the hybrid society

anticipated by García and García (2019), news organizations now operate in the media, and need to choose products and solutions that exploit as much as possible the capabilities of new devices, and social networks.

The expanded newsroom has become more sophisticated, also due to the spatial and temporal distribution, something that is well contemplated in this book. Now, the public space is also part of the newspaper, and everyone watches the rise of virtual newsrooms, a process also endured by Information and Communication Technologies (ICT) itself, when centralized CPDs shifted to distributed processing and then to cloud computing. In this scenario, newspaper professionals and communication specialists are increasingly dependent on ICT, which implies the need to include more technology in course programs of journalism. Students must know what is computational thinking and must have skills to use tools that allow handling the large volume of data available, in order to be able to deal with contemporary media (Pavlovic and Ljajic 2017).

Currently, some TIC tools facilitate the creation of transmedia content. In contrast, they reduce the difficulty in preparing and making available information more targeted to readers and sometimes help compromise the requirements of reliability and truthfulness. Some chapters of this book explore this aspect of the search for theoretical models in journalistic production. The new context should not reduce the professionals' social responsibility toward readers, viewers, and listeners. The new models for the production process must highlight the need for new functions for journalists and other professionals. Nevertheless, the opposite also happens, and many journalists need to better understand or accept the concepts and fundamentals, such as immersion, the capacity and limitations of each technology or solution (Hardee and McMahan 2017). In the same context, training is necessary for the use of tools, which are always replaced by new versions. Practices of innovation in routines and for the launch of new products are also needed.

The research project that gave rise to this book is entitled Multimodal Digital Media or MDM: a model proposal for a semantic framework of a collaborative environment for information management in a newsroom. The MDM project is detailed in the Appendix. The model should consider that the cooperative and distributed production routines would be managed from different ICT supports, with convergent digital media and a greater connection factor between sender and receiver, but within a humanistic and social context. Therefore, the construction of the semantic computational model of this research started from the understanding that the model could be composed of structured layers, something similar to network models, where a layer meets the request of the upper layer and requests services from the layer below it. The use of metalanguage based on the semantic approach of collective intelligence and digital media would establish the relationship between the elements of the model. However, it ended up arriving at a tetrahedral model with multiple faces, presented at the end of this book.

The model evolves throughout the project, and even after, to represent the process of producing journalistic articles. Among the justifications is the growing connection of people worldwide through social networks or digital media and the context of the mobility of communication. The first model used the concept of

structured layers and then moved on to reliable figures such as the cube, where the cube's faces represent the essential functions of production. Finally, it evolves to the tetrahedron, where the management of flows, content, knowledge, and social networks are the main elements of the semantic and integrated computational model. However, it continued with the support of the Semantic Web tools. This means a convergent and integrated digital structure for contemporary newsrooms (Lemos 2018).

What is the book, given this explanation? It is the result of the work of the authors dedicated to a research project funded by the Brazilian Federal Government (CAPES/CNPq). They concentrated their efforts on the production of scientific articles and now on the construction of chapters related to research, which focuses on integrated and converging newsrooms and perspectives. The research project covered the fields of e-communication, computer science, and information science, all areas of the authors' expertise. The articles result from their technical visits to investigate newsrooms' productive routines and flows in major dailies from Brazil, Costa Rica, England, and the USA.

The prospects point to the production of midterm news. Factors are very similar to what happened in other service activities that had an increase in ICT-based tools, with an increasing connection from new media combined with the growing digital economy practices. Journalistic organizations have undergone digital transformations, and only those that have or have undergone full or accurate transformations must survive. In newsrooms, this includes the processes of searching, processing and distributing data and information, and the use of big data, with secure, automatic, and agile retrieval of information.

Objectives of the Book

The studies developed had their epistemological basis in the development of descriptive and exploratory research. They considered social and relational aspects to the work of communication professionals busy with such tasks in newsrooms. Other aspects were incorporated, such as learning to think and representing the accomplishment of tasks as a flow of information within the organization—as a workflow tool. We cite, for instance, the psychological effects of using interfaces with the computer, where many of their artifacts reside, be it systems, apps, and hitherto unconventional access (Karen 2005; Heravi and MCGinnis 2015).

This book includes theoretical and conceptual research and empirical studies such as ethnographic research in newsrooms of major newspapers, application of methodologies in emerging issues of journalistic production, focus groups of professionals and researchers, and social network analysis in the research segments or areas of interest.

The first applications or experiments are already happening in the Communication Department of UnB, through the experimental publication *Campo Multimídia*, with theoretical support in the area of computer and information science. Other applications are under development.

The Chapters

The book consists of 10 chapters and comprises three segments. The first one presents preliminary results of the MDM project based on technical visits to selected news organizations. The theoretical basis and methodologies were established in the propositional documents and approved by the researchers. The second segment presents the consolidation of the methodology. The main scientific productions are achieved from the analysis of data and information collected and compared with other works available in the academic literature. The last segment of the book focuses on the evolution of the framework model for newsrooms and the development of systems for collaborative work environments, as well as the implementation of tools for news production and information centers.

The first chapter presents the results of a multiple case study, carried out in five newsrooms on three continents: *Correio Braziliense* and *O Globo* (both in Brazil), *La Nación* (Costa Rica), and BBC and Reuters (England). The analysis explores how technological convergence processes affect journalistic organizations and professional culture in accelerated production routines, reduced staff, declining revenue, and public participation. Some issues observed in newsrooms were explored, such as the insufficient use of new technologies impacting on people's activities. The first chapter also reveals several factors that shape the practice and the need to implement newsroom innovations (García et al. 2018). The qualitative analysis of the case studies reveals thoughtful and innovative perspectives on the examined issues; all reveal a journalistic profession undergoing deep and rapid changes as it adapts to a fast moving context.

The second chapter explores data journalism and professional profile in a comparative study in newsrooms across the USA, UK, and Brazil. It presents the phenomena of changes in journalism from different angles, some focused on cyclical changes, others on structural changes. However, the big challenging issue is to realize how much these changes—in professional routines and due to the adoption of technologies—effectively result in transformations. The chapter treats a critical problem in the context of modern journalistic practices and the journalist's identity—what is the job of a modern investigative journalist? Is s/he a programming buff, a mathematics expert, or a jack-of-all-trades? What role do data, big data, and data mining play in the modern journalist's identity? While the chapter does not provide definitive answers (and no exploratory study can), it does offer insights and perspectives from a variety of journalism stakeholders in reputed media outlets in Brazil, the US, and the UK. In the highly digitalized contemporary

scenario, the chapter shows that the work of journalists has been significantly transformed and refined, due to a latent need to approach other areas of knowledge, specifically in the fields of computer science, information, and data science.

The focus of the third chapter is to analyze the workflow of the editorial staff at the Costa Rican *La Nación*. In the newsroom, actions of convergence and integration allowed the authors to understand the paper's modernization initiatives, thus prospecting the use of ICT in the treatment of content in newsrooms and news production. The study identified the non-functional and functional requirements in the newsroom's production information flow (workflow) as the basis for describing collaborative work environments and the use of IT. A digital transformation: The newsroom is still key to understanding contemporary journalism, but what would we see inside one located in a legacy media organization? One finding: a lot of empty chairs (Kosterich and Weber 2019).

The fourth chapter presents a case study that mapped part of the work environment in a newsroom, identifying the use of ICT and outlining prospects for technology in newsrooms. The daily *O Globo*, based in Rio de Janeiro, showed promising results for the future, and all the pros and cons in collaborative processes supported by IT. In order to understand the newsroom as a whole, the 4C collaboration model application is used with its dimensions of communication, coordination, cooperation and connection, and business process management tools to express workflow, allowing a preview of near-future news production. There are differences and changes between traditional employment patterns and positions in the newsroom, and the new requirements for journalists and professionals include new skills and knowledge of new technologies, involving programmers, coders, and data specialists (Kosterich and Weber 2019).

The fifth chapter seeks to identify the main functional requirements of the work environment in the journalistic newsroom, and collaborative tools and information systems in the dimensions of communication, coordination, cooperation, and connection. Moreover, we also wanted to identify software and frameworks used by collaborative technologies. We sought to verify how these IT tools support the management and production of journalistic content, with possible support of ontologies and Semantic Web standards. Based on a visit to the BBC's newsroom in Central London, the news production workflow in the newsroom was used as the main tool to analyze the processes of convergence. A major focus was on the workflow in the newsroom to understand and explore the process of convergence and integration.

The sixth chapter investigates the importance of the conversations and their potential to contribute to newsroom's production routines. This study was initially characterized as a descriptive, applied, and exploratory research based on the ontology of language. By developing the instrument of data analysis, called matrix of senses, the research was also considered methodological, based on grounded theory methodology (GTM). One of the essential contributions of this work is to situate the importance of the conversations, giving them a formal, theoretical, philosophical, and methodological visibility in the news production process.

The matrix of senses contributed to the explanation of patterns of behavior and presented itself as an instrument that can be customized and replicated to other

contexts in which conversations play an important role. In the context of a conversation, journalists are expected to reskill, deskill, and upskill their practices and working routines, generally without any direct supervision. In doing so, they vulnerably move in and out of large and small newsrooms and news organizations, trying both to make a difference and to make ends meet in an exceedingly competitive market (Deuze and Witschge 2018).

The seventh chapter presents algorithms, numbers, and quantitative approaches that are changing Brazilian communication studies. It discusses the impact of transformations generated by the digital media ecosystem, from the quantitative explosion of emitters, sustained by the ubiquity of the binary networks and technological devices that support the production of content. By using design science and the digital methods approach, the authors explore the possibilities of epistemological and methodological expansion, based on interdisciplinary initiatives and the incorporation of new skills in the formation of professionals and researchers, in order to understand the current situation of data overload and tools poorly adapted. An application at LabCom/DCS/UFMA has identified four domains of knowledge that intersect to define the key requirements of immersive journalism: the fundamentals of immersion, standard immersive technologies, the fundamentals of journalism, and the main types of journalistic stories (Hardee and McMahan 2017).

This chapter addresses one of the core issues in contemporary journalistic production process: the increase in content and its storage in big data require the use of ICT and some expertise to do it. As the authors point out, there is a need for training journalists and communication professionals. It is no longer possible to outsource knowledge and skills in ICT. Professionals must know how to scrape the web, access API databases and services, use infographics in articles, learn computer language programming, and even the use of ontologies. This work has value for readers who may know the two more practical and useful research methods at the moment: design science and the digital methods approach.

In the eighth chapter, a reflection on origins, dissemination methods, contexts and confrontation of the disinformation culture, the authors report situations that promoted the distortion of facts at different moments in history, treating it as “disinformation” in the context of information science. A debate is proposed on initiatives and measures that can help raise people’s awareness, improving their training for choosing and using the information in different situations. The article discusses possibilities that can contribute to curbing the spread of fake news and the culture of disinformation. To cope with the problem, the authors suggest the adoption, as a reference, of the concepts of digital literacy and information skills. Where are the actions to deal with disinformation? The basic answer is to use citizens’ literacy horizontally, from children to adults. There are four relevant factors in the context of disinformation:

1. facilitated elaboration of content;
2. growing use of information by the digital economy forced by the pandemic;
3. the information war versus counter-information in globalization, nowadays also forced by the pandemic;

4. online newspapers with data journalism can be used to combat or generate fake news.

The ninth chapter brings the Semantic Web CMS to newsrooms. It proposes an ontology of viruses to improve the representation of knowledge in authoring environments. A semantic CMS is a tool that helps searching for texts related to the subject being written, while making semantic notes of what is produced. The challenge is to take semantic notes on a subject in the news details, since new subjects hardly have an ontology available on demand. This work describes the creation of the Zika virus' ontology by the project team, a new and relevant issue at the time of the epidemic, implementing annotation of news about Zika. The authors show the viability of using ontologies at the very moment of text production in a newsroom, unlike other approaches in which ontologies are used mainly for post-publication or to retrieve information

In the tenth and last chapters, the authors demonstrate how the consumers of news change their behavior of accessing and interacting with news content, of which they are now *prosumers* (combined news *producers* and news *consumers*). The challenge is to transform those proactive collaborators from a post-truth, era where political polarization and hate speech generate fake news, into a new renaissance period where a more supportive, generous, peaceful, tolerant, and inclusive environment produces reliable news in a virtual newsroom. Strict business processes and human analysis helped by AI tools could achieve it. In this scenario, applications such as WhatsApp, e-mail, Twitter, or Facebook are not only a source of information but also new channels of communication that publish customized content. Consequently, communication organizations face significant challenges posed by the decrease of paying readers and the competition imposed by emergent technologies that allow new ways to produce and disseminate news.

This book describes a unique moment in the newspapers' information production process. Firstly, the service sector and the media will have to invest in digital transformation, not only by investing in technology but also in its HR and the design of processes. The economy has moved very fast into the digital environment, resulting in a mass of digital illiterates. Therefore, the information will be a "commodity" when sponsored or directed to a specific objective, such as the cases of an epidemic or an advertising campaign. In the case of a specific and in-depth journalistic article, shaped for a recipient or a segment of society, for example, it requires delivering well-treated information, and it might charge the reader. This means hiring talented professionals who use proper IT tools. On the other hand, general-purpose information must be carefully constructed, occasionally via robots, but ensuring that they do not mix with other unreliable sources, or even fake news, as this will be more and more frequent.

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