



Article

Technical Expertise in Newsrooms: Understanding Data Journalists' Roles and Practices

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Abstract: In recent years, there has been a notable increase in the integration of technology and the employment of technological experts within newsrooms. However, there remains a paucity of scholarly research examining the evolution and maturation of these practices. This article addresses this gap by analyzing data from ten semi-structured qualitative interviews with developers embedded in the editorial departments of Norwegian news outlets. The findings reveal that developers have become fully integrated and indispensable actors within newsrooms. They contribute comprehensively to the journalistic news production process, engaging in routine tasks such as news visualization as well as participating in extensive investigative projects. Furthermore, developers navigate their work and practices within the framework of journalistic logic, culture, and the principles of objectivity, thereby reinforcing the democratic function of journalism in society. Interestingly, the integration of developers has also induced spill-over effects among non-technical staff. While developers are the primary bearers of technical expertise, there is an increasing expectation for reporters to acquire technical competencies.

Keywords: data journalism; innovation; technical expertise; editorial developer; newsroom; collaboration; computational journalism



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1. Introduction

The advent of automation, AI-driven technologies, and big data has significantly transformed newsrooms over the past few decades, leading to an influx of technical experts such as software developers, programmers, and UX designers (Diakopoulos 2019; Karlsen and Stavelin 2013; Kosterich 2021; Lischka et al. 2022; Marconi 2020; Usher 2016). These technological advancements and the adoption of new tools have not only reshaped news work but also spurred bottom-up innovations among journalists and other newsroom staff (Örnebring 2016, p. 74). Collaborative efforts between reporters and developers have emerged as a key driver of innovation within newsrooms (Konow-Lund et al. 2022; Lewis and Usher 2014, 2016).

The rise of data journalism is often linked to this innovation pressure in media organizations. Some regard data journalism as a product that materialized through the need for innovation (Beiler et al. 2020), while others consider it an innovation process in itself (Zhang and Chen 2022). Borges-Rey (2016) points to the innovations that data journalism brings, including in the areas of “storytelling, collection of data and distribution of news” (p. 833).

In contemporary newsrooms, technical expertise is not only desirable but essential for capturing audience attention and ensuring profitability. Furthermore, data-driven stories and investigative reporting, produced by teams of journalists and developers, are believed to enhance news organizations' ability to fulfill their democratic role in society. However, the extent to which technical experts have become integrated into daily news production since the emergence of data journalism remains unclear. As Cindy Royal (2012) noted, the cultures of technology and journalism differ significantly: “they each carry different

ideas about objectivity, transparency, sharing of information and performance” (p. 8). This study aims to explore how technological experts have been assimilated into newsrooms, examining whether they align with or challenge traditional journalistic values and practices. Additionally, the study investigates whether these experts are confined to special data projects or have become integral to routine news production. To address these questions, this research focuses on the work practices, roles, mindsets, and practices of developers in newsrooms based on ten in-depth qualitative interviews with practitioners. The primary research question posed is as follows: How do developers integrate into newsroom workflows, and what impact does their involvement have on traditional journalistic values and practices?

Data journalism is a polysemic term (Lewis and Waters 2018, p. 3) with various definitions. Heravi (2019) describes it as a journalistic product where data serve as the source and computational methods are the tools used for information extraction and illustration. In the academic literature, data journalism is also referred to as data-driven journalism, programmer journalism, hacker journalism, and algorithmic journalism (Coddington 2015; Hammond 2017; Usher 2016). These concepts fall under the broader category of “computer-assisted reporting”, or CAR (Coddington 2015). In this article, the terms data journalism, editorial developing, and computational journalism are used interchangeably to describe data-driven storytelling. This study adopts Coddington’s (2015) definition of data journalism, which encompasses the practice of “obtaining, reporting on, organizing, editing, and publishing information in the public interest, incorporating statistics, computer science, visualization, design, and news reporting” (p. 331). Accordingly, the terms “data journalist”, “developer”, and “editorial developer” refer to technologists in newsrooms, while “reporters” denote traditional journalists.

The empirical data for this study were collected through interviews with staff from three major Norwegian newspapers owned by the Schibsted Media Group: VG (*Verdens Gang*, a tabloid-style newspaper), *Aftenposten* (a national broadsheet-style newspaper), and *Bergens Tidende* (a regional broadsheet-style newspaper). These newspapers are renowned for their innovative use of data-driven techniques in investigative projects, having won national awards and received international recognition. The findings reveal that developers are now fully integrated and established actors in newsrooms. They collaborate with reporters and participate in all stages of the journalistic news production process, from daily news to large-scale investigative projects. Furthermore, developers perform their work according to journalistic values, embracing the logic, culture, and objectivity that characterize journalism and its democratic role in society. Based on these findings, this study proposes two concepts to illustrate the skills needed in future newsrooms: while developers bring technical expertise, reporters should acquire technical competencies to collaborate effectively on data-driven news items.

2. Theoretical Framework

This study is anchored in a theoretical framework derived from the academic literature on the implementation of technology in journalistic work and the integration of developers into newsrooms. This framework is delineated in two sections: the first examines the relationship between journalism and new technology, and the second focuses on the incorporation of developers as editorial staff in newsrooms.

2.1. Professional Practices of Journalism and Technology

Journalism is a highly skilled profession wherein practitioners exercise significant autonomy—a level of independence from both internal and external pressures that enables journalists to discover and accurately report stories in the democratic interest (Waisbord 2013). Waisbord posits that professional journalism has evolved from a mere occupation into a profession through the exercise of this autonomy and the development of ethical principles and values, such as objectivity and neutrality, alongside specialized skills. In Waisbord’s definition, professional journalism encompasses “authority, power, expertise, and com-

petence” (Waisbord 2013, p. 121). Alongside autonomy, the concepts of expertise and competence are crucial for understanding the technical skills required for producing data journalism. While expertise refers to the mastery of professional practices, competence refers to the knowledge and understanding of a particular domain.

With the advent of web technologies and the migration of news audiences to digital platforms, reporters are increasingly expected to acquire technical skills and coding competence to remain relevant (Kalender 2024; Mchedlidze 2024; Royal 2012). Scholars have suggested the need for training journalists to acquire technical skills (Kosterich and Weber 2019) and transform them into multi-skilled workers (Wright et al. 2012). Küng (2015) suggests that the “blending of journalistic, technological, and commercial competencies involving a deep integration of tech into editorial processes, the presence of digital editorial thinkers, and content creation processes that are content and data-driven” are essential attributes for maintaining competitiveness in newsrooms (p. 11).

Some studies have examined the roles of journalists and developers, finding that, in some instances, newsroom workers possess competencies in both journalism and development. These individuals have been labeled “hacker-journalists”, programmer-journalists”, or journo-coders (Karlsen and Stavelin 2013; Royal 2012; Usher 2016). Lewis and Usher (2016) argue that collaboration between journalists and developers enhances the quality of news. Beiler et al. (2020) noted that “in times of shrinking news budgets and increased pressure for innovation in media organizations, data journalism has come into the spotlight as an area still expanding in newsrooms” (p. 1571). However, there is an ongoing debate regarding the potential role of data journalism and its impact on the field (Coddington 2015). Zamith (2019), analyzing daily data journalism practices at *The New York Times* and *The Washington Post*, concluded that “general data journalism still has a long way to go before it can live up to the optimism and idealization that characterizes much of the data turn in journalism” (p. 470).

Amid the digital transition, Örnebring (2016) discussed the polarization of skills among journalists, with some groups experiencing upskilling while others face deskilling (p. 114). The concept of skill is closely associated with expertise and professionalism. Expertise and skill form the core of a profession, as they entail a deep knowledge of a specific area (Larson 1977). Modern journalism demands “multi-skilled” journalists, leading to a polarization of skills within the workforce (Örnebring 2016). This polarization can result in a loss of traditional journalistic skills. Örnebring (2016) concludes that this polarization abridges the values and everyday practices of journalists. Guo and Volz (2019) highlighted the redefining of journalistic expertise amid digital transformation. Through a content analysis of job announcements, they found that multi-skilled journalists are increasingly valued and sought after.

Thus, scholars have long recognized the profound impact of technology on journalism, producing a substantial body of academic research. This impact extends beyond traditional reporters to the overall staff composition of editorial departments, where technological developments have introduced developers as new actors in newsrooms.

2.2. Developers’ Expertise in the Newsroom

Several studies have highlighted the challenges and opportunities associated with integrating developers into newsrooms. Their findings suggest that the sizes of developer teams in newsrooms vary across the industry, typically comprising two to five staff members combined with reporters and developers (Appelgren and Nygren 2014). However, larger groups are observed in more extensive, award-winning projects (Loosen et al. 2017).

Lischka et al. (2022) found that technologists—developers—often perceive themselves as service providers in newsrooms, lacking the recognition and status of their journalist colleagues. Developers noted that their skills remain unfamiliar to journalists and other non-technological workers. Lischka et al. (2022) stated that “developers still work on demystifying their profession and normalizing their skills” (p. 9). Even among those who achieve recognition as fellow journalists, Appelgren and Linden (2020) pointed out that data

experts possess diverse skills, including “investigative journalism methods, programming, knowledge in statistics, data management, statistical reporting, and design”, which can pose challenges for journalistic production (p. 62).

Despite these challenges, some findings suggest that developers in newsrooms regard themselves as integral to the democratic mission of journalism. Royal (2012) describes how, at *The New York Times*, managers sought and hired individuals with strong technical expertise and a passion for journalism (p. 12). Usher (2016) also emphasized the importance of news judgment for developers hired in newsrooms: “to create interactives and work with other journalists requires news judgment, the ability to understand the needs of the larger journalistic output, and therefore underscores the integration of hacker journalists into the newsroom” (p. 83).

Collaboration is recognized as a critical driver of innovation and “a key mode of governance” (de-Lima-Santos and Mesquita 2021; de-Lima-Santos 2022). Borges-Rey (2016) stressed the collaborative nature of data journalism, concluding that it involves “a combination of journalistic and computing logics to see beyond the structures of computerized information” (p. 841). Moreover, Borges-Rey (2016) argued that “despite generalized claims in favor of journalistic authority over computing skills, data journalism has potentially disrupted an otherwise quite normative practice by gradually infusing the performativity and reflexivity of traditional journalists with traces of computational thinking” (p. 841).

The distinction between reporters and developers is increasingly blurred, with reporters now expected to possess coding skills. Guo and Volz (2019) noted that digital transformation has redefined journalistic expertise, leading to a high demand for multi-skilled journalists. According to Bisiani et al. (2023), data journalists are often “self-taught, resourceful, and multi-skilled”, frequently working independently and facing challenges similar to those of traditional journalists, such as issues with data access and time constraints (p. 1). de-Lima-Santos (2022) observed that the boundaries between technological and journalistic skills within news organizations are increasingly merging. For example, at ProPublica, journalists have had to acquire coding and design skills, while non-journalistic professionals have developed writing abilities. This overlap has given rise to new professional roles that influence the development of technological skills in newsrooms.

Despite these overlaps, there are natural synergies between the skills of developers and reporters. Problem-solving, for example, is a critical skill in newsrooms that both good reporters and developers possess. Usher (2016) argued that “the newsroom, with new challenges every day, offers hacker journalists a chance to build new projects to help illustrate social problems and issues in the public interest” (p. 76). Karlsen and Stavelin (2013) utilized the Aristotelian view of craftsmanship and *techne* to conceptualize the developer’s role in newsrooms, emphasizing computing as a craft practiced in the newsroom. They argued that, although the tools and skills of data journalism differ from those of traditional journalism, the aims and values of data journalism remain inherently journalistic.

However, we must also consider the dual nature of the news business—serving both the public interest and business interests. Picard (2005) argued that “commercial media will seek to fulfill economic motives before public service motives” (p. 338). Therefore, critical questions regarding the business model of news and its broader implications for news media and society must be posed.

3. Methods

This study employed qualitative, semi-structured interviews with ten developers and chief developer executives from three Norwegian newspapers. Norwegian newsrooms, despite the current economic challenges facing the news media business, are generally well resourced in terms of labor and assets. Additionally, Scandinavia is highly ranked for press freedom and trust from audiences (Syvertsen et al. 2014). Therefore, this study was conducted in an ideal environment, focusing on leading newspapers in the Scandinavian region. The developers interviewed for this study are employed at three Norwegian newspapers owned by the Schibsted Media Group. Schibsted, which generated EUR

2.4 billion in 2022, was founded in 1839 as a printing house. The company now operates websites, newspapers, and magazines in more than 25 countries, positioning itself as a global player in terms of revenue and digital market presence.

Oslo-based *Aftenposten* and *VG* are Norway's largest newspapers, while *Bergens Tidende* is a prominent regional newspaper based in Bergen, the second-largest city in Norway. These newspapers are renowned for their in-house innovations and are considered leading media outlets in Scandinavia. Consequently, they provide an excellent opportunity to study the roles of developers in well-established news organizations.

Qualitative interviews are used to gain insights into individual experiences, attitudes, and views (Singer et al. 2011). Interviews enable researchers to uncover "areas of broad cultural consensus and people's more personal, private, and special understanding" (Arksey and Knight 1991, p. 4). Given that data journalism is often conducted in teams, the decision was made to interview a minimum of two developers from each newspaper to provide comprehensive information about the culture and main goals within each department. The list of interview participants is presented in Table A1. The participants in the study are distributed unevenly due to the varying sizes of the data journalism departments across the three newspapers. While *VG* and *Aftenposten* have larger teams, *BT* has a smaller team, which influenced the number of interviews conducted. Consequently, the study includes 5 participants from *VG*, 4 from *Aftenposten*, and 2 from *BT*. Despite this uneven representation, the number of participants was sufficient to capture the culture and structure and understand the roles and practices within the editorial departments.

To encourage openness during the interviews, the interviewees will remain anonymous. All participants read and signed the consent letter prior to their interviews, ensuring that ethical considerations were thoroughly addressed. They were asked to discuss and interpret their workflows, collaboration dynamics, and relationships with other newsroom actors, such as reporters and editors. The interview data were analyzed using an open coding method, allowing the researcher to identify and explain comprehensive themes within the empirical data (Creswell 2012). Through this coding process, the following themes emerged: technical expertise, competence, journalistic mindset, journalistic judgment, collaboration dynamics, changed newsroom practices, newsroom structure, innovation, conflicts, and data presentation and visualization. These themes were subsequently categorized and consolidated into main categories. Based on the results of this analysis, the findings are reported in the following categories: technical skills in newsrooms, defining the role of developers, and the combination of data and journalism.

The data were collected over a two-year period that coincided with the COVID-19 pandemic, which significantly increased the demand for data-driven reporting. As noted by scholars, data journalism gained prominence and enhanced its reputation during this time (Bisiani et al. 2023; Konow-Lund et al. 2022; Mchedlidze 2024). Thus, studying data journalism during the COVID-19 period, when technical expertise became especially crucial, provided an ideal timeframe for this research. The interview guide used for this study is provided in Appendix B.

4. Results

This section presents the analysis of interviews with practitioners of computational journalism in newsrooms. The findings are organized into three main categories: the need for technical expertise in newsrooms, the integration and roles of developers in the newsroom, and the combination of data and journalism, emphasizing the importance of data as a journalistic source.

4.1. Technical Skills in Newsrooms

Norwegian newsrooms have established data journalism departments that integrate editorial technologists and reporters. The titles of these technical staff members include *editorial developer* or /and *data journalist*. These individuals typically possess coding skills and have learned journalism, or vice versa, where journalists have acquired coding skills.

However, it is more common for developers to have a background in computer science or IT.

All interviewees, except for two who had a journalistic background and learned coding, had an educational background in IT or computer science. These two individuals held positions as chief editorial executives, leading their respective departments.

The findings reveal that editorial developers are involved in all stages of news production. They perform two main types of tasks: working on large investigative projects and assisting reporters with data presentation and visualization in day-to-day journalism. Their workflow generally follows this sequence: finding, cleaning, analyzing, and visualizing data. As A1 explained, “when we work with the investigative journalism group, we are finding, analyzing, and scraping data; while in day-to-day journalism, we focus on the presentation and visualization of data”.

The structure of newsrooms has evolved in the digital age, not only in terms of duties and personnel but also physically. Successful collaboration requires reducing the physical distance between developers and reporters, who often work closely together on news items. In newsrooms, especially in breaking news departments, editorial developers create new products and services or conduct data analysis, which varies in scope, scale, and pace.

The initiative-taking and idea-creation processes between reporters and developers vary significantly. Sometimes, reporters come up with story ideas and communicate them to developers, while other times, developers find interesting points in datasets that warrant further investigation. Story idea development can also be a collaborative process. VG1 described it as follows: “Sometimes reporters come to us with a dataset and ask us to analyze it—see if we find any interesting points in the data material”.

Constant negotiation between reporters and developers is essential for data analysis and presentation. Developers noted that reporters with computational skills are easier to collaborate with and preferred these partnerships. However, developers often have to persuade reporters that “some data do not represent what they think it represents”. According to A3, “Sometimes reporters want to present data that there is no statistical basis for, or there is no ground to claim something. Therefore, often we must take the role of statisticians and say, “No, this is not a correlation”, “and mostly they listen to us”.

Previous studies have emphasized the importance of mutual understanding and “speaking the same language” between reporters and developers for productive collaboration and news innovation (Lewis and Usher 2014, 2016).

In Norwegian newsrooms, the deficiency in technical skills has been addressed by hiring editorial developers who can handle the technological aspects of news production. This approach theoretically avoids the polarization of skills observed by Örnebring (2016), where some reporters fall behind due to a lack of technological knowledge. However, the findings suggest that upskilling or deskilling still occurs, as developers indicated that reporters with computing and technological competence are easier to collaborate with. Reporters are not required to have coding expertise but are expected to understand the logic behind data-driven news processes. While reporters in some countries are expected to learn coding (de-Lima-Santos 2022), in Norwegian newsrooms, reporters are more expected to understand data and computing logic to collaborate effectively with developers. As B1 noted, “Some reporters are better at understanding what one is talking about and at understanding the method behind data exploration”. This results in diverse skill levels in newsrooms. Some reporters are very good at data, understanding the method behind the results, and are capable of running data analysis and creating simple graphs and charts on their own.

4.2. Defining the Role of Developers

The role and position of data journalists (developers) in newsrooms have evolved significantly over the years, as reflected in their professional labeling (Usher 2016; Lischka et al. 2022). Positions that were once called backend developers or multimedia developers are now often referred to as *data journalists* or *editorial developers*. These pro-

professionals typically work in breaking news departments and investigative journalism departments. Previously, collaboration between reporters and developers was informal, but it has now become more formal, highlighting the collaborative nature of data journalism (Borges-Rey 2016; Küng 2015).

All respondents hold positions within the newsroom, rather than in technological departments. At VG, data journalists are part of the breaking news department, whereas at *Aftenposten* and *Bergens Tidende*, they are part of the “Visual” departments (audio and video). While collaboration within the newsroom is common, cross-departmental collaboration is rare. Developers now have more time for research and exploration than in the past, and they can rely on previously developed tools, as VG 4 noted:

Maybe our role has sharpened more. We started with doing everything possible, many things in one day. Now we have developed in-house tools that make things faster, so now we have more time to do data analysis or create something completely new, custom-made designs on cases.

Developers, like reporters, are given autonomy, which is essential for innovation and the creation of new services and products in newsrooms (Konow-Lund et al. 2022). Editors rarely question the methods behind data journalism products, granting developers freedom and trust to practice their profession.

Time is a limited resource in newsrooms for both reporters and technological actors. To adapt to the fast pace of journalism, developers have created software interfaces that are automated or can be easily used by reporters to create visualizations on a deadline. Over the years, developers have moved from starting from scratch to using ready-made tools for tasks such as presenting and visualizing maps and graphs, making the process faster and easier.

Developers report high levels of autonomy in their decision-making and often find stories on their own without instructions from reporters or editors. They have access to various public data portals and are free to find deviations in the data that might lead to news stories, uncover failures within governmental agencies, or reveal abuses of power. In this sense, developers, like journalists, exercise the role of “watchdog” for a democratic society. They possess diverse expertise, with some specializing in statistics and data analysis and others in visualization and presentation.

The length of developers’ work depends on the project. Sometimes, they create simple maps or charts, while other times, they are involved in long investigative projects. They believe that the most potential for data journalism lies within these longer projects, as A3 expressed: “It is preferable that one is involved in the investigative projects. Consequently, you get ownership on it, I think it’s really nice to work on such projects”.

Developers’ essential task is to structure chaotic information and data meaningfully. They process and present the data and develop tools needed to create news products. The process of data journalism begins with an idea and finding ways to tell or present a story. As Usher (2016) noted, developers in journalism first work with the goal of telling a public information-related story and then think about how to tell that story in code.

Journalistic items, such as news stories or products, require journalistic judgment. Developers must understand journalism to perform their work and possess news judgment to integrate into newsrooms. This dual expertise allows them to exercise high levels of news judgment and critical thinking characteristic of journalism. A3 described their job as follows: “You must look critically at the data, analyze, structure, and ensure that they represent what they are supposed to represent and not [what] someone thinks they represent. You must be creative in the way you combine data”.

Creativity and innovation are crucial aspects of developers’ work in newsrooms. They constantly develop or improve new services, products, and ways of gathering and disseminating data. Developers emphasize the need to understand fields outside of computing, such as geography or economics, depending on the project. This multidisciplinary approach complements the journalistic mindset and competence in different domains required for their roles.

4.3. Combination of Data and Journalism

Data journalism involves managing large amounts of information and structuring it in a way that is presentable to readers. Developers assist reporters in organizing and analyzing these data sources. Despite advances, data access remains challenging due to privacy policies and other barriers. However, improvements have been made, with public institutions increasingly providing data in machine-readable formats. VG4 noted this shift: “Previously you could get images of a table in pdf formats—that is not machine-readable. But lately, government agencies have become better and know what kind of formats one would prefer to get”.

Developers often have to find alternative ways to import data when they are not provided in readable formats, a process that can be time-consuming. They play a crucial role in data collection, analysis, and presentation, working alongside reporters to ensure that the data are accurate and meaningful. All informants described journalistic logic and rationales behind the data they collect, the choices they make, and the questions they pose. In some cases, developers are presented with a research problem, question, or hypothesis, and they need to find related data. In other cases, developers have the data, and they find interesting points or deviations in a dataset, later communicating to reporters and instructing them on further steps—for example, to contact sources or look at documents. VG5 said, “You should get very happy when you get large datasets. I am very inspired when I get large data sets and start to explore it”.

A3 claimed the following:

What we do with data is that we see what kind of material it is. We find deviations, outlier in the material, run some analysis on it, then you try to convey to the journalists who work on the case, maybe here is something interesting you should look at further, maybe you should talk to this person, and so forth.

Despite the distinct values and modes of working, the findings point to the fact that computational journalism has adapted to journalistic modes of operation. Developers frequently take on investigative tasks, such as contacting sources for information and data, demonstrating their dual roles in computational and journalistic work. Moreover, editorial developers face challenges similar to those of journalists, such as time constraints and the need to prioritize certain projects over others. As BT2 points out, “time, resources, and the prioritization of tasks are crucial factors in data journalism. If data journalists have sufficient resources and time, they can solve all kinds of tasks”.

5. Discussion

The combination of tech and journalism has produced tremendous potential for data-driven stories. This study was conducted at a stage when technologists are not new actors anymore (Usher 2016); they are familiar members of newsrooms. While editorial developers can be regarded as integrated into newsrooms, a further issue concerns the role of reporters and their ability to work on data journalism projects. In contrast to popular discourse, the findings here show that reporters are not required to possess high-level technological skills. Instead, they are required to understand the method behind the data analysis. In other words, even in cases where technological experts have been added to the staff, reporters are expected to have a familiarity with computing and know what kinds of questions can be asked of the dataset. The ability to understand the logic of technology contributes to seeing the space of opportunities and posing the right questions not only to sources but also to datasets.

So, on the one hand, we have developers who had to learn journalistic mindsets to be integrated into newsrooms. On the other hand, we have reporters who had to acquire computation competence, computational thinking, and skills necessary to work on data journalism. While the term “multi-skilled” (Lewis and Usher 2016; Guo and Volz 2019; Örnebring 2016) journalists is a broad definition and might entail different skills, this article suggests that we should characterize technical skills by making a conceptual distinction

between the technical skills of developers—as “technical expertise”—and the skills needed by reporters—“technical competence”. While technical expertise describes the mastering of professional practice, competence is defined as having knowledge that is required for an “understanding” of something.

Remarkably, even in “ideal” newsrooms that are resource-rich enough to hire technical experts, we can still see a hierarchy of skills among journalists. While reporters who possess technical competence are privileged in newsrooms and have an advantage, reporters who do not possess technical competence—in terms of understanding data, statistics, and coding—are at a disadvantage in terms of collaborations with developers. One might argue that in the future, holding technical competence will be an essential skill for reporters to work on data journalism in newsrooms.

Collaboration among developers and reporters can lead to more productivity in newsrooms, helping reporters to focus on important aspects of journalistic work. Moreover, those collaborations often result in award-winning data projects, create new methods of data analysis suitable for investigative projects, and contribute to the innovation of journalistic products and services. The findings are consistent with Küng’s (2015) suggestions that the blending of technological actors and journalists—and under the influence of commercial needs—has an enormous potential and advantage.

An important finding of this article is that data journalists not only possess journalistic values and judgment but also are autonomous, high-skilled individuals, having competence not only in computer science but also in other disciplines, such as geography, art, politics, and so forth. Modern journalism needs not only multi-skilled journalists (Bisiani et al. 2023; Guo and Volz 2019; Kalender 2024; Lewis and Usher 2016) but also multi-skilled developers who have an interest and passion for news and are literate within different disciplines. Developers who have those characteristics are the ones most sought after for hiring in newsrooms.

Unlike newsrooms in the US, the editorial developers interviewed here are not expected to write stories, and likewise, reporters are not expected to code or run statistical analyses of datasets. In some instances, reporters assist in working with data in Excel and Google Sheets, or developers might contact sources themselves. This points to the problem-solving skills that are outlined as an important aspect of newsroom work (Guo and Volz 2019).

In the cases studied, the combination of journalism and data has compensated for the lack of technological skills in reporters. While the upskilling and deskilling of reporters have contributed to polarization in some newsrooms, this trend might be counteracted by introducing high-skilled developers with an interest in journalism, as found in Norwegian newsrooms. Moreover, this study argues that developers possess journalistic judgment and objectives and work in accordance with journalistic values.

In summary, editorial developers as well as reporters exercise high levels of autonomy. In his book, Örnebring (2016) found that autonomy in journalism is a typical characteristic of European democracies; that is, reporters are relatively shielded from internal or external pressures. The same is true in the case of Norwegian newsrooms. Reporters and developers are autonomous in their work practices, which is regarded as a positive aspect. Reporters and technologists have different skills and expertise but operate under the same logic, values, and standards of objectivity. Ethical principles and values such as objectivity and transparency have moved journalism from an occupation to a profession (Waisbord 2013) and are likewise exercised by editorial developers.

One might argue that data journalism has the potential to fulfill the requirements of professional journalism, which entails highlighting social differences and promoting democratic values. It can be argued that professional journalism’s requirements for “authority, power, expertise and competence” are fulfilled by both reporters and developers in newsrooms (Waisbord 2013, p. 121). Thus, the findings indicate that the values and aims of data journalism are the same as those of traditional journalism (Karlsen and Stavelin 2013).

Unlike the findings of [Lischka et al. \(2022\)](#), the presented results show that editorial developers feel empowered and integrated in newsrooms.

Both developers and reporters have had to adapt to each other's fields. Developers have learned journalistic mindsets, while reporters have acquired computational competence. This dual skill set has led to more effective collaborations and innovative news products. This study suggests a conceptual distinction between the technical expertise of developers and the technical competence required of reporters. Even in resource-rich newsrooms, a hierarchy of skills exists, with technically competent reporters having an advantage. This trend may indicate that technical competence will become essential for reporters working on data journalism in the future. Collaboration between developers and reporters enhances productivity and allows journalists to focus on core aspects of their work, rather than being replaced by technological advancements.

6. Conclusions

In response to the research question posed in this article, this study argues that developers are fully integrated actors within newsrooms, exercising both autonomy and influence in their roles. They are typically involved in the day-to-day production of journalistic content, often collaborating closely with reporters and journalists. Developers uphold journalistic principles and values and have become a natural part of the journalistic landscape in Norwegian newsrooms. The impact of data journalism has been positive, aligning well with the traditional values of journalism.

Thus, the combination of data and journalism has adapted to traditional journalistic modes of operation. Developers not only assist with technical aspects but also contribute to the storytelling process by identifying interesting points in datasets and guiding reporters on further investigation. The practice of data journalism is grounded in journalistic values and judgment, ensuring that data are presented accurately and responsibly. This approach contradicts the findings by [Lewis and Usher \(2016\)](#), who argued that journalists and programmers have divergent understandings of ideal journalism. The integration of technological and journalistic logics has led to productive collaborations, award-winning data projects, and innovative journalistic products and services.

One might argue that data journalism has matured and become a standard part of news production, fulfilling professional journalism's requirements for authority, power, expertise, and competence. Developers possess not only technical skills but also journalistic values and judgments, operating under the same standards of objectivity and transparency as traditional journalists. This integration has empowered developers and created a collaborative environment that fosters innovation and democratic values in the newsrooms.

7. Limitations and Future Research

This study focuses on large, successful newspapers with significant resources, providing an ideal illustration of data journalism practices. However, it does not represent other newsroom environments or countries. Future research could compare data journalism practices in less resourced and less autonomous newsrooms, exploring how these conditions affect collaboration and innovation.

This study also lacks the perspective of reporters working with editorial developers. Including reporters' views could provide a more comprehensive understanding of the dynamics between developers and journalists. Future research could investigate reporters' perceptions of developers and the evolution of their collaborative roles over the past decade. A further limitation of this study is that its findings are derived from the personal narratives of participating developers in newsrooms, introducing a potential bias. The reliance on individual accounts limits the study's generalizability, as the results may not fully represent the broader experiences or perspectives of developers in different contexts.

Lastly, a critical approach could address the commercial aspects of data journalism, examining its business models and value to the media industry. This perspective would

provide insights into the economic sustainability and impact of data journalism in the broader context of the media landscape.

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Data Availability Statement: Due to privacy and ethical considerations the data is not archived publicly.

Conflicts of Interest: The author declares no conflict of interest.

Appendix A

Table A1. Interview participants.

Position	Newspaper	Interview Date	Code of Participant
Editorial developer	VG (<i>Verdens Gang</i>)	Fall 2021	VG1
Data journalist	VG (<i>Verdens Gang</i>)	Fall 2021	VG2
Data journalist	<i>Aftenposten</i>	Spring 2022	A1
Chief developing editor (manager)	VG (<i>Verdens Gang</i>)	Spring 2022	VG3
Data journalist	BT(<i>Bergens Tidende</i>)	Spring 2022	BT1
Chief developing leader (manager)	BT(<i>Bergens Tidende</i>)	Spring 2022	BT2
Editorial developer	<i>Aftenposten</i>	Spring 2023	A2
Editorial developer	VG (<i>Verdens Gang</i>)	Spring 2023	VG4
Developing leader	VG (<i>Verdens Gang</i>)	Spring 2023	VG5
Editorial developer	<i>Aftenposten</i>	Fall 2023	A3

Appendix B. Interview Guide

Professional and Educational Background of Editorial Developers

1. What is your current job title at “specific newspaper”?
2. How long have you been working with “specific newspaper”?
3. How many years have you worked in data journalism, or as an editorial developer?
4. Could you describe your educational background?
5. Have you received formal training in journalism, computer science, or a related field?
6. Did you start your career in journalism before transitioning in developing, or did you start as a developer and move into journalism?
7. What are your primary tasks and responsibilities at “specific newspaper”?
8. Can you describe a typical day in your role?

Understanding Data Journalists’ Work Routines

1. Are you involved in writing or contributing to data-driven stories?
2. How do you typically come up with ideas for data stories?
3. Do you apply journalistic principles when working on data journalism projects? If so, how does it influence your approach?
4. Do you collaborate with journalists or other developers in your work? If yes, how does this collaboration typically work?
5. Are there specific journalists or developers you find particularly effective in collaborating on data journalism projects?
6. What strategies do you use to make data journalism more accessible and understandable to readers?
7. How do you ensure the accuracy and reliability of your work?
8. As someone bridging the gap between data development and journalism, how challenging was it for you to learn journalistic principles?
9. What skills or knowledge do editorial developers need to work effectively within journalistic environment?
10. Can you recall a specific project you’ve worked on within data journalism? Please describe the step-by-step process you followed in that project.

Data Journalism as Innovation in Newsrooms

1. Do you see data journalism as a form of innovation within your newsroom?
 2. Are you involved in innovation processes or the creation of new products at “specific newspaper”? If yes, what role do you play?
 3. How do you identify the need for new products or innovations? Are these driven more by leadership, employee input, or crises situations?
 4. Who typically initiates innovation or the creation of new products—editors, journalists, or developers?
 5. Who typically takes the initiative during a crisis situation?
 6. How crucial is pace/speed when working on innovations?
 7. Do journalists at “specific newspaper” generally have technical expertise?
 8. How important is technical expertise in the newsroom? Does it affect the pace or the quality of news production?
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