


Evolving data teams: Tensions between organisational structure and professional subculture

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Abstract

This study explores the integration of data journalism within three European legacy news organisations through the lens of organisational structure and professional culture. Interviews with data journalists and editors suggest that professional routines resonate with established data journalism epistemologies, values, and norms that appear to be constitutional for an inter-organisational data journalism subculture. At the same time, organisational structure either integrates the journalistic subculture by increasing levels of complexity, formalisation, and centralisation or rejects it by not accommodating it structurally or culturally. The three data teams work along epistemologies of computer-assisted reporting, investigative journalism, and data journalism but differentiate themselves through nuanced understandings of data journalism practice, driven by individual journalists. After a structureless episode, one team sets itself apart as it diverges from data-driven routines and orients itself towards technological and interdisciplinary interactive journalism. The findings show an interdependence of individual efforts, varying conceptualisations of data journalism practice, and interplay between organisational structure and professional culture.

Keywords

Computer-assisted reporting, data journalism, journalistic routines, newsroom organisation, organisational structure, journalism culture

Introduction

In his seminal paper *The Impact of Technology on Journalism*, Pavlik (2000: 236) concludes that technological change will shape “how journalists do their job” and “the structure of the newsroom.” Data journalism, as a practice dependent on technology (Lewis and Westlund, 2016), has been integrated into newsrooms over the past years, epitomising Pavlik’s prognosis. Emily Bell (2012) recaptures that “five years ago, data journalism was a very niche activity, conducted in just a handful of newsrooms,” indicating a growth of data journalism teams.

So far, data journalism has seen “uneven consolidation” (Stalph and Borges-Rey, 2018: 1079); more so, there is no unanimous consensus on data journalism across organisations on staff and managerial levels (Appelgren and Nygren, 2014; De Maeyer et al., 2015; Fink and Anderson, 2015; Karlsen and Stavelin, 2014), given the diverse geopolitical and socioeconomic data journalism ecosystem. Several efforts have been made to acknowledge more socio political and epistemological aspects to account for “the amorphous nature of the

practice itself” (Coddington, 2019: 230), mostly through studies on data-driven practices in national and institutional contexts (Appelgren and Nygren, 2014; BorgesRey, 2016, 2017; De Maeyer et al., 2015; Fink and Anderson, 2015; Karlsen and Stavelin, 2014; Parasio, 2015; Parasio and Dagiral, 2013). To add to this body of research and shift the focus away from technological deterministic stances as articulated by Pavlik (2000), this study seeks to highlight the role of individual journalists for organisational innovation and change, and move towards a more actor-centric perspective embedded in organisational theory. Schmitz Weiss and Domingo (2010: 1168–1169) argue

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that “social constructivism and the acknowledgment of individual action as the basis for social structures . . . is the best antidote to technological determinism.” In rejection of simple cause and effect models and structural contingency perspectives that marginalise or omit the role of human actors, this paper looks to Boczkowski (2004) who argues that technological developments trigger adoption processes, which are shaped by organisational structures, work practices, and representations of users, that eventually generate editorial effects. In order to cover some of these aspects, this study takes into account the formal and informal organisational structures (Hollifield, 2011; Tolbert and Hall, 2009) enacted by and surrounding the data teams of *The Guardian*, *Spiegel Online* and *Neue Zürcher Zeitung (NZZ)*.

Empirically speaking, this paper draws on 10 semi-structured interviews with data journalists and editors, and intends to generate comparative findings by analysing changing organisational structures as well as varying professional subcultures of data teams and their interpretations of data journalistic routines; these are understood as being constituted by both activities and discursive work (Witschge and Harbers, 2018: 120). This study illustrates the inner workings and organisational complexities of data units that, at first glance, have simply been growing and consolidated themselves or were folded into new setups as part of reorganisations. It goes to show that data teams have discursively conceptualised different interpretations of the same practice. Supposedly, the data teams find themselves amid imposed formal organisational structure and tacit informal structure (culture) that either promote or inhibit the teams’ conceptualisations of journalistic routines. The results suggest that the “epistemological ambiguity” (Borges-Rey, 2017: 4) of data journalism practice is coupled to individual journalists of a professional subculture. It appears that in some cases, the organisations’ structure accommodated data teams. In consequence, this leads to consolidation through structural growth, increased formalisation and complexity. In the case of *NZZ*, structurelessness and an incompatible subculture led to personnel change and a re-interpretation of data journalism practice. It stands out across all three cases that how data journalism is being practiced, is closely tied to the agency and mindset of individual journalists.

Data journalism and organisational structure

So far, organisational perspectives on data journalism as newsroom innovation have been scarce. In general, organisational factors are mostly conceived as

impediments to data-driven newswork. Karlsen and Stavelin (2014) found that data journalists had to challenge organisational structures in order to collaborate with ICT departments. Borges-Rey (2016) determines internal organisational constraints (editorial pressure; human, material resources) as limitations for regional offices in the UK. Similarly, time, tools, staff, and resources were identified as limiting factors in US newsrooms (Fink and Anderson, 2015). De Maeyer et al. (2015: 441) echo all these findings and expect that “the bulk of obstacles seem related to how news organizations function.” US data journalists take on heterogeneous organisational roles, ranging from spatially isolated data journalists to data editors or members of cross-departmental teams. These differences appear to be related to the size of the respective news organisation (Fink and Anderson, 2015). This finding suggests that the professional roles of data journalists are tied to structural aspects of centralisation, complexity, and size. Tabary et al. (2016: 77) found that three out of six examined organisations in Quebec “had developed specific protocols and created dedicated teams for data journalism.” Formalisation appears to set in not as a general rule of thumb rather than as a consequence after a few skilled and specialised actors or “data advocates” (Boyles and Meyer, 2017: 432) successfully championed the practice. Parasie and Dagiral (2013: 860–861) single out individuals such as Holovaty at the *Washington Post* or Pilholfer at *The New York Times* (among others) who “all share the concern that newspapers should set up dedicated units staffed with people familiar with journalism as much as code.” In a similar vein, Paulussen et al. (2011: 8–13) understand the implementation of innovations and collaboration as heavily personality driven, dependent on the willingness and agency of staffers.

A study by Boyles and Meyer (2017) stands out, as it examines US data teams exclusively through an organisational lens. They identify four critical junctures that data journalism practice passes through until a dedicated and self-sufficient data unit is established: (1) Exemplary, voluntary effort of one journalist (data advocates) who carries out data-driven newswork on top of regular workload and related to their beat. In case the first step proves to be successful, a (2) single dedicated data journalist, without strict affiliation to a certain beat or department, is hired. This data journalist then looks for (3) collaboration with like-minded colleagues, negotiates with editors to further partition and specialise data newswork. Eventually, a separate (4) data unit is set up, and while size may vary, it is mostly headed by a data manager who defines an agenda and coordinates the team; in addition, “the data unit team is often charged to develop easy-to-use tools” (Boyles and Meyer, 2017: 435) that are

deployed for the rest of the newsroom. This study found that the integration of data journalism affects organisational structures as to the expansion of structural complexity, specialisation of staff, as well as increase in size. Young and Hermida (2015: 392) found adapting a novel newsrooms technology to be a discontinuous and iterative process that can even go unnoticed for some time, until full integration.

Furthermore, collaboration is widely identified as a core characteristic that is directly entangled with organisational structure, as it defies horizontal complexity by transcending departmental borders. Collaborative efforts can be external, based on informal networks (Bradshaw, 2014; Hermida and Young, 2016; Lewis and Usher, 2014), between graphic designers, journalists (De Maeyer et al., 2015) as well as programmers (Weber and Rall, 2012), and between data teams and specialist correspondents (Borges-Rey, 2016) – qualities characteristic of the interdisciplinarity of data journalism (Young et al., 2018).

Tolbert and Hall (2009: 19–43) propose three core dimensions of structure: (1) Complexity surmises horizontal complexity (specialised subunits and specialists performing certain tasks), vertical complexity (hierarchical levels of formal structures), and spatial complexity (locations of departments or offices). (2) Formalisation examines to what extent tasks and procedures are codified as imposed rules. From an organisational standpoint, higher degrees of formalisation can lead to more reliable and stable outcomes, notwithstanding that it can also impede innovation. In the face of high uncertainty, lower levels of formalisation prove to be more effective and vice versa. Despite overlapping notions of professionalisation and formalisation, the former stems from professional culture (e.g., through training or learning from others within that group), and the latter is based on stipulated rules put forward by organisational structure – both aim at organising and regulating the behaviour of members. Finally, (3) centralisation examines the distribution of power within an organisation that is closely interrelated with vertical complexity. In the case of organisations of professionals, high-ranking members are responsible for decision-making and assessment, which usually indicates higher levels of centralisation. Still, lower level members can be in charge of work procedures.

Organisations generally seek to preserve control over their members. Under this notion, the three dimensions of formal organisational structure covariate (Tolbert and Hall, 2009): Particularly with regard to professionalised personnel, a negative correlation between centralisation and formalisation can be assumed, as professionals are trusted to make worthwhile decisions. Size is related to the specialisation of members: More specialists mean a higher level of

complexity. Some newsrooms, however, do not immediately afford specialised staffers, so single members as a “one-man band” (Hollifield, 2011: 202) are in charge of various tasks. Bigger teams offer more leeway for employing specialists. At the same time, communication and coordination under such circumstances become more difficult and might, as a result, lead to greater formalisation or decentralisation. Based on this reading, the article poses the first research question in order to focus on formal organisational structure:

RQ1: What structural changes accompany the integration of data journalism teams?

Data journalism and professional culture

Organisational culture¹ is the other integral compound of organisations. Eldridge and Crombie (2013: 89) define organisational culture as “the unique configuration of norms, values, beliefs, ways of behaving and so on that characterise the manner in which groups and individuals combine to get things done,” linked to the distinctive character of an organisation. Culture is an “invisible sociological structure that is historically and socially constructed” (Hollifield, 2011: 204). Organisational culture directly relates to formal structure as it manifests itself through it, but adds more layered dimensions with *espoused beliefs* and *tacit underlying assumptions* (Schein, 2004: 26). An organisation’s culture itself encompasses “various interlocking, nested, sometimes conflicting subcultures” (Martin and Siehl, 1983: 53). Within a news organisation, various occupational subcultures can lead to “differential articulations and manifestations of forms of journalism” (Hanitzsch et al., 2019: 34) or a differentiation into functional and occupational subgroups (Schein, 2004: 274): “But for the purpose of defining culture, it is important to recognize that a fragmented or differentiated organizational culture usually reflects a multiplicity of subcultures, and within those subcultures there are shared assumptions” (Schein, 2004: 21). How subgroups form subcultures depends on their “occupational background and functional experience” (Schein, 2004: 148) – in other words, data journalists’ socialisation, understanding of their profession, and daily habitual activities are constitutive and indicative of routines of a professional data journalism subculture, itself being a component of the respective organisational culture. In general, “research suggests that conflict between organizational and professional cultures is common” (Mierzewska and Hollifield, 2006: 46). Hollifield et al. (2001) discussed these intermediate frictions and found that organisational culture has an increasing impact on newsrooms vis-à-vis

professional journalistic culture (see also Hollifield, 2011). Altogether, it would seem that there are simmering tensions between journalism's organisational cultures and inherent professional subcultures in the face of innovation (Westlund and Ekström, 2019; see also Nielsen, 2012).

As Hanitzsch (2007) points out, journalism culture – and essentially culture – is a concept hard to pin down and operationalise. It is oft applied without foregoing theorisation, thereby entailing conceptual ambiguity and limited explanatory power. He argues that “journalism culture needs first to be deconstructed in terms of its constituents and conceptual dimensions” (Hanitzsch, 2007: 371) in order to generate meaningful and robust findings. Hanitzsch (2007) follows up and proposes three constituents of journalism culture: “institutional roles, epistemologies, and ethical ideologies” (371). Ethical ideologies focus on principles of relativism or idealism that journalists subscribe to, whereas institutional roles mirror normative concepts of journalists' roles. The third and last dimension of journalism culture and the dominant etic framework for professional culture within this study is epistemology, “how journalists know what they know and how knowledge claims are articulated and justified” (Ekström and Westlund, 2019a: 2). Hanitzsch (2007) splits epistemology into objectivism and empiricism, whereas the latter ranges from empirical approaches, which tend to look to the evidentiary use of measurements or data, and analytical approaches, which prioritise analytical reasoning. Epistemology appears to be not only a constitutive element of journalism culture but also fundamental to journalism's *raison d'être*: “Journalism has become, and remains to be, one of the most influential knowledge producing institutions in society” (Westlund and Lewis, 2017: 269). Therewith, journalism may well be considered an epistemic culture (see Knorr-Cetina, 1999, 2005; also Godler and Reich, 2017) that actualises itself through certain practices of “creating and warranting knowledge” (Knorr-Cetina, 2005: 67). As epistemology covers practices, norms, and routines as well as the materiality of knowledge claims (Ekström and Westlund, 2019a), the concept integrates several dimensions of journalism's professional cultures.

Ekström and Westlund (2019b: 260) emphasise the plurality of journalistic epistemology, mostly related to different forms and genres. Within data journalism as a subgenre, a variety of epistemological concepts has been established that serve as emic components previously drawn from members of the data journalism subculture. These are discussed subsequently to undergird the concept of epistemology and professional culture accordingly and then contrasted with observations presented in this study.

Coddington (2015) differentiates computer-assisted reporting (CAR), data journalism, and computational journalism along four poles, two of these being professional orientation and epistemology. CAR culture follows traditional journalistic norms and routines, closely tied to investigative approaches and subordinates data to these paradigms; the socio-scientific analysis of sampled data and hypothesis testing are understood as enhancing professional expertise. Parasić and Dagiral (2013) saw this “consistent epistemological model” as a continuation of the established democratic role of journalism. While this is inherent to CAR, the authors see this normative epistemological modus challenged by the interplay of journalists and programmers, a collision of two social spheres and conclude that research “should investigate both the epistemological and socio-political meanings that are collectively assigned and discussed at the interface between these worlds” (Parasić and Dagiral, 2013: 869). Data journalism, while heavily building on CAR's virtues (Anderson, 2015: 349), diverges from them by engaging with cross-disciplinary professions and applying “more inductive and exploratory” (Coddington, 2015: 342) analysis of large datasets. This signals a shift away from the mere use of data as evidentiary material towards a more data-centric approach. Parasić (2015: 376) further distinguishes these two streams regarding their epistemic use of data, CAR's “hypothesis-driven path” and data journalism's “data-driven path.” While for the former data serves as a means to investigations, data is understood as a central storytelling device for the latter (Coddington, 2019: 230). Usher (2016: 91) also makes this distinction and attests that “data journalism brings the entirety of the data set to the public, at least as much as possible, whereas CAR journalists would likely use internal databases sharing just key details for their analysis.” Usher (2016) considers interactivity and particularly visualisations as focal elements of data journalistic storytelling. In a similar vein, Borges-Rey (2016: 841) found two prevalent epistemological paradigms “reporting through the articulation of quantifiable evidence and its subsequent contextualisation through human testimony” and combining “journalistic and computing logics to see beyond the structures of computerised information and unearth novel insights.” He later dubbed these two strands the “*newshound* approach and the *techie* approach” (Borges-Rey, 2017: 4) and defined them as the two opposing poles of an epistemological continuum that arrays proposed epistemological considerations of data-driven practice. Based on this model, CAR and investigative journalism are to be located near the *newshound* approach, computational journalism close to the *techie* approach, while different

conceptualisations of data journalism fill the range between these two extremes. Data journalism claiming this latitude marks it a “fluid and mutable” (Hermida and Young, 2019: 45) practice “where different professional interpretations and activities are indicators of professional renegotiation and regeneration” (34). Computational journalism, “information production using algorithms operating within the value system of journalism” (Diakopoulos, 2019: 40), demarcates the other end of the continuum, culminating in the techie paradigm. To explore to which epistemological modes the interviewed data journalists adhere, as indicators for data journalism subcultures, this article poses a second research question:

RQ2: To what epistemological paradigms do data journalists subscribe, both as members of a news organisation and of a professional journalistic subculture?

The two research questions focus both organisational, objectified structures as well as practices and underlying epistemologies of journalists. Organisational theory has come to acknowledge, “that human agency plays a much greater role in organizational performance than scholars once believed” (Hollifield, 2011: 206). The role of journalists’ agency also for structural factors has been pointed out by several studies: Hamilton and Turner (2009: 18) stated that “Journalists... will ultimately determine how quickly and how far the field of computational journalism develops” highlighting the significance of individuals in the further implementation of computational approaches. In a similar vein, also Steensen (2009: 832) remarks the significance of innovative journalists for newsroom innovation. A process he considers “complex and random, due to the unstable structure of online newsrooms.” Young and Hermida (2015: 392–394) found the implementation of computational journalism at the *LA Times* to be an iterative process driven by journalists who increasingly articulated traces of computational thinking. This process also involved re-interpreting previous learnings until the journalists arrived at the final adaptation of the practice. These results highlight the role of individuals for organisational processes; therefore, this study moves towards a more actor-centric perspective, whereupon gathering practitioners’ accounts appears to be a reasonable approach.

Methodology

Subgroups such as specialised data journalism teams subscribe to different paradigms and their culture is constantly evolving, necessitating continuous research (Schein, 2004). Three legacy news organisations (*The Guardian*, UK; *Spiegel Online*, Germany; *NZZ*,

Switzerland) serve as case studies and were analysed based on 10 qualitative in-depth interviews (30 minutes on average) spanning 2.5 years (2016 to mid-2018) to extract detailed insights at a given instant while also covering changes over time by interviewing some informants multiple times. A first wave in early 2016 comprised four interviewees: one data journalist of *The Guardian*’s data team (DJ1), one data journalist-turned-editor working with *Spiegel Online* (DE2), as well as one former data editor and one data journalist working with *NZZ* (DE4, DJ3). In a second wave in late 2016 and early 2017, one interview with an executive editor of *The Guardian* was held (EE1), one with a data journalist working with *Spiegel Online* (DJ2), and one interview with the then-newly appointed data editor of *NZZ* (DE5). A third and last wave comprised two interviews the data editor of *The Guardian* (DE1) spanning six months and a second interview with *Spiegel Online*’s data editor (DE3). In the case of *NZZ*, the team’s setup and organisational structure appeared to have become consolidated by 2018, which made another data collection redundant. The interviewees were identified as adequate informants either as they were mentioned by other interviewees or as they had been founding members of the surveyed data teams, new additions to the teams or driving forces behind observable reorganisations. Interviews were held whenever personnel changes or organisational restructurings had been announced through press releases and Twitter or based on personal communication with past interviewees.

The data analysis follows a naturalistic approach that “aims at developing idiographic knowledge” (Guba, 1981: 77). The naturalistic concept of trustworthiness of this qualitative study is taken into account through checking credibility (collecting referential material; triangulation; member checks) and transferability (purposive sampling; thick description). In a last step, a qualitative content analysis was conducted to identify relevant topics and reoccurring themes of the discussions. The flexibility of this design further allows identifying aspects a posteriori that were not considered in earlier stages. The abovementioned aspects of organisational structure and professional subculture and epistemologies were used to inform the interview guideline. Talking points revolved around data teams’ genealogy, current and past team setups, data journalistic routines, and formal structures within the newsroom.

The cases were selected via purposive sampling, as they appear representative of their kind (Creswell, 2013: 99–100), that are legacy news media organisations, which have adopted data journalism, employ differing conceptualisations of the practice, and show changes in structure and team compositions. As a

“collective case study” (Creswell, 2013: 99), this study takes into account more than one organisation in order to generate findings that detail differences and similarities across the surveyed teams. *The Guardian* is considered as having spearheaded the data journalism movement launching the *Data Blog* in 2009. It heavily revolved around transparency, the curation, and public provision of datasets to readers. Projects such as the MP expenses crowdsourcing project and the WikiLeaks war logs reflect *The Guardian*’s long tradition of investigative reporting and watchdog journalism. *Spiegel Online* is the online sibling of the German newsweekly *Der Spiegel*. Its investigative culture dates back to the *Spiegel* affair in 1962 that is considered a defining moment for press freedom in Germany. The organisation was amongst the first to launch an online version of their magazine in 1994, heralding online journalism and, still today, employs dedicated editorial staff independent of the print outlet. Their data journalism initiative started in 2013. As part of the *NZZ Group*, the daily *NZZ* and its online outlet *nzz.ch* introduced data journalism in 2013. In 2015, the remnant of the first team was folded into a new interdisciplinary *Storytelling* team. By 2019, the *Storytelling* team and a video team were merged into a new visuals team, in an effort to further pool specialists. The organisation is known for its objectivity and focus on international affairs. After comprehensive personnel turnovers, the paper has been increasingly shifting to the right since 2015 (Daum and Shaller, 2017).

Results

Structural factors: Increasing complexity and centralisation

Since its launch in 2009, *The Guardian*’s *Data Blog* had been heavily focused on transparency, the curation of datasets as well as making them publicly available to readers, and, ultimately, introducing data as a viable source for journalists. After several personnel changes until 2016, comprehensive reorganisations took place:

The *Data Blog* is pretty much on hiatus. We still occasionally do data-blogger posts and stories... So after Alberto Nardelli left we haven’t really directly replaced him in the way that Simon [Rogers] was running the *Data Blog*. I think it’s kind of run its course and so that kind of reporting has been folded into what the *Data Projects* team does day to day. I don’t think we technically said “Oh, the *Data Blog* is dead!” or anything like that. I think what we’ve ended up doing is just sort of taking that approach to data to reporting and made it part of what we do. (EE1)

The *Data Blog* can be considered a stepping stone for data journalism at *The Guardian*. Developed practices, routines, and acquired knowledge around datawork were absorbed by the *Data Projects* team – one data editor and two data journalists – that was established in 2014 and further evolved these techniques. At the same time, a new subgroup of the visuals department, the *Interactive team* was assorted, comprising interactive designers, data visualization specialists, and developers, allocating skills that are shared with the *Data Projects* team, resulting in around 15 to 18 people that do data journalism across two teams (EE1). After additional personnel changes, the *Data Projects* team assembles one data editor and two journalists.

After starting out as a science writer for *Spiegel Online*, one journalist introduced data journalism to the organisation 2014. Without any affiliation to other teams, they had been supported by the in-house IT-department and two journalists from the documentation department of *DER SPIEGEL*, who did fact-checking, research, and data analysis, “due to the organisational structure that is present and that you can build on” (DE2). Following this provisional state from 2014 to 2015, the *Spiegel Online*’s data team took shape – temporarily supported by interns and *Google News Lab* Fellows – assembling a multifaceted team of two city planners/developers led by the data journalist-now-editor.

It was just with the start of the data journalism section that we could build up a team. And now, I think, we consolidated its size. Sure, we do not have every skill in this team as we would like to. There are gaps, particularly regarding design; this is where we could expand our team. (DE3)

During long-term or technologically challenging projects, the team is supported by an in-house multimedia team. After the data editor was appointed to the editorial board in 2017 (DE3), another data journalist was added, completing the current line-up. The steady growth of *Spiegel Online*’s data team shows a natural development with little external agency. The data team was built up carefully while utilising previously established competencies. Moving towards a discrete team, a team member thinks “that there is a critical size for a team in order to be efficient” (DJ2), and the data editor details that “if we would have a bigger team, there would be more room for specialist tasks and personnel” although “aside from team size, having individuals that pool multiple skills can lead to synergies, as you can act as agent for the team” (DE2). Both data editor (DE2) and journalist consider it “important that, as an in-house team, you have good connections to all kinds of units and that you are not acting as an insular team

without any interaction. It is important to be integrated into the newsroom” (DJ2). The team considers itself very well integrated into the newsroom despite spatial complexity, as they are located on another floor. An advantage, according to them, because their “workflow differs from those within the newsroom; it takes longer and we need a quiet place when programming or analysing data” (DE2). These accounts show that functional data journalistic subcultures have formed around certain, increasingly formalised, routines, substantiating Sylvie and Gade’s (2009: 122) summa that “cultures self-perpetuate via members’ continuous communication and confirmation of shared knowledge.”

NZZ Data, the initial data team at *NZZ*, was established in 2012 and led solo by one data journalist, coming from the business reporting team, who then teamed up with another data journalist. Until 2015, the team’s size fluctuated between one and two members.

For a long time it was only one person. After that it was my colleague and me. Then my colleague left and I worked alone until I got a new colleague. Now, the whole team has been disbanded and realigned respectively after I left. The data team has been merged into the *Storytelling team* that features frontend developers, infographics specialists and my ex-colleague. (DE4)

In 2015, one single data journalist resumed the team and “closely worked together with the *Interactives team*” (DJ3), one developer and two designers, forming the interim *Interactive Data team*. By the end of 2015, a new editor was hired to create the *Storytelling team* that absorbed and expanded the previous team, now including infographics specialists, data journalists, interactive developers, and frontend developers.

Across these organisations, two developments clearly come to the fore: First, when introducing data journalism to these organisations, all of them started with one broadly skilled data journalist: “It certainly starts with lone wolves but to do it successfully in the long run, you need a team of three, four or five people” (DJ2). Second, data journalists have become parts of bigger teams that assemble more differentiated profiles such as developers, interactives designers, and other specialists. These findings support Tolbert and Hall’s (2009: 46) argument that small units do not have enough people to allow individuals to specialise so they would have to carry out various tasks; all cases show a growth in horizontal complexity within the data teams as additional data journalists, designers, or coders joined, entailing specialisation in skills and knowledge. These increases in size and professional palette brought about higher levels of centralisation

and vertical complexity by appointing managerial editors or promoting team members.

Professional subcultures and formalisation

The moment *The Guardian’s Data Projects* team superseded the *Data Blog* by becoming the main output for data journalism during 2016, illustrates the formative workings within a data journalism subgroup. Members of a professional subculture mediated data journalism practice. It shows that previously established informal practices were not shelved but passed on. Additionally, the *Data Blog’s* practices were altered and adjusted to fit a more journalistic and less data-centric setup (EE1, DE1). Collaboration with other reporters is a defining characteristic of the *Data Projects* team after it clarified this function in the beginning:

And a lot of my work and my colleague’s is kind of getting reporters and editors to understand what it is that we do and what we can be used for. So sometimes, they come along with an idea and if it’s something they’re already really excited about and it fits the bill of what we can do then that’s something that we’ll run with. (DJ1)

This account illustrates the process during which change agents clarify the innovation through social construction, by mutually clearing up questions regarding epistemologies, workflows, and goals: The *Data Projects* team had to point out that they were “not a research team” (DJ1) and their “element is more in-depth analysis that a regular reporter on a beat couldn’t do” (DJ1). The executive editor then took this concept even further by labelling the *Data Projects* team “aggressively collaborative” (EE1):

They are always, always working with other journalists. They are not there to do their own single by-line stories. Occasionally, they will write for themselves and those would be the kind of pieces you would have seen on the data blog in years past. But the difference is they’re there to do what I like to call a force multiplier for the newsroom. (EE1)

With the *Data Blog* laying the groundwork in 2009, introducing a set of practices for data work, setting up the initial structure, the *Data Projects* team built on that and re-negotiated what has been previously established. Now, collaboration is one of the designated characteristics of the team’s practices (DJ1, EE1, and DE1). Whereas highly professionalised staff does not necessarily require high degrees of formalisation, collaboration came to be a tacitly imposed rule.

Continuous personnel changes and downsizings appeared to have scattered *NZZ Data's* initial organisational structure. Due to these and other interferences brought about by managerial decisions and dissent about data journalism routines, a certain data journalism subculture was formed amongst the initial duo though without external ratification or concrete structural legitimisation. The initial duo “always claimed that the data team does more investigative reporting and supports colleagues who want to work with databases or push investigations” (DE4). In retrospect, it turned out to be problematic that the data journalists were also “in charge of other internet stuff such as web-documentaries” (DE4), making it difficult for them to construct their identity as an investigative team since “creating visually pleasing features might have given executives the impression that this is a more valuable quality that should be furthered” (DE4). It appears that a discursive clarification of their idea of data journalism subculture was negated by an overly generalised scope of duties and a general structurelessness that obscures clear role and task descriptions or managerial guidance (Lowrey and Gade, 2011).

As a result, the contested professional claims were not passed on and the last remainder of *NZZ Data* started collaborating with the interactives team early on (DJ3), forming the interim *Interactive Data team* (DE5), thus setting up an important connection that would be constituted through the *Storytelling team*. The *Storytelling team* was then designed around a two-fold concept: First, they produce their own stories, mostly “explanatory pieces about complex topics that have concrete value for the reader and help him understand” (DE5). The team also supports other desks on a daily basis, inputting story ideas or developing storytelling formats for stories that are work in progress (DE5). This shows that the team is much involved in producing news items or helping with the realisation of those. Second – and this appears to be a unique feature across the examined organisations – the *Storytelling team* acts as a technology-driven enabler for the whole newsroom with the goal of equipping other in-house reporters with tools for producing data-driven stories and visual elements on their own as well as developing new storytelling concepts. The head of the team explains that they “are constantly expanding this toolbox in order to give the editorial staff possibilities to do visual storytelling, to create charts or simple maps so that they are not dependant on someone from our team” (DE5). These efforts led to *Q* a browser-based toolbox that launched and was made publicly available in 2017. This customised, in-house built kit proved to be more instrumental than other third-party tools that “are often a tad too complex or offer too many options so that we cannot ensure any

consistency. More importantly, the teams now do not have to familiarise themselves with different tools but one integrated platform” (DE5). Just like the data teams of *The Guardian* and *Spiegel Online*, the *Storytelling team* heavily collaborates with other desks, pitches their story ideas to them, sometimes acting more as a supporting team but also approaching correspondents that help them realise their own projects (DJ3, DE5).

Journalistic routines and epistemologies

This section now summarises findings on how the data journalists enact truth claims. Based on the following articulations, I intend to retrace references to data-driven epistemologies as laid out above. The statements show that data is used as evidentiary material to legitimise normative concepts of journalistic newswork and in some cases as storytelling devices. At the same time, these different approaches hint at integral values and beliefs of data-driven practices.

While the *Data Blog* used data in a descriptive manner (DE1), the *Data Projects* team employs data to add depth and substantiate stories; a different conception of data journalism:

When I took over, I was very clear that I don't want to do these kinds of quick, over the day description stories.... The data cannot be the story itself.... the focus had been on this descriptive *Data Blog* so I turned it into working much more with investigative and longer-term stories. (DE1)

The executive editor confirms their investigative background-heavy approach: “A lot of work that they do tends to be explanatory or investigative.... the kinds of projects that the editor and the team tend to get involved in, are the slightly longer-term dates to weeks” (EE1). The executive editor further differentiates between external and internal modes of operation. When working with the interactives team, it frequently leads to data-based visualisations that are a more immediate account of the *Data Projects* team's work. More often though, as the team is geared towards collaborating with other journalists, resulting stories may not necessarily resemble archetypical data-driven stories. The data editor considers data journalism a twofold concept: “You have the analysis side and the visualisation side. And for me, I'm very much planted in the analysis side” (DE1). The data journalist concurs by acknowledging, “sometimes, I think the best data stories don't have a number in them at all. You wouldn't be able to read it and know straight away that it's a story from a dataset” (DJ1). The executive editor agrees that the *Data Projects* team's stories

“might just be text . . . there might not even be a number in the story” (EE1). Writing with numbers or employing visuals does not seem to be the decisive part of their conceptualisation of data journalism as “it might just be that part of the reporting process involved validating the core hypothesis of a story” (EE1). This suggests a very narrow definition of data journalism that revolves around assessing datasets regarding their empirical validity and reliability as well as statistical analyses to test hypotheses (EE1) – exhibiting the socio-empirical nature of data journalism.² Whereas data visualisation is considered a separate, even subordinated feature of data journalism, it is acknowledged as a means for digital storytelling. These accounts show that the practice is deliberately separated in data-driven investigation and data-driven storytelling (EE1). These accounts display that epistemological claims are justified through hypotheses-driven analyses of data.

In a similar way, *Spiegel Online*’s team does not show high levels of formalisation or centralisation by strictly developing their stories along a “clear product vision or mantra” (DE3). Collaborating with other desks and external organisations is obligatory for the data unit, across all beats despite heavily revolving around politics and business. On this note, central values and self-conceptions were articulated: “I think it is important to constantly look into matters of transparency, financing of parties, MP’s side earnings, and elections” (DE3). Acting as a watchdog “is our legitimisation. It is imperative that we create relevance and fight for transparency. We are doing this within algorithmic accountability reporting projects at the moment” (DE3). This reasoning also appears to be prevalent among the team’s data journalists, demonstrating espoused normative beliefs that guide the group’s culture: “We do not do stories that are based upon the mere existence of a dataset. This is no cause for reporting. It has to be relevant, it needs to explicate something or add new aspects to a discussion” (DJ2). After all, data journalism is interpreted as being intrinsically investigative:

There is the thesis that proposes that every data journalist, who approaches a dataset in an impartial manner and finds something new, does investigative work. It does not necessarily have to be a scandal that you expose. The workflow of looking into a dataset, assessing it, and deriving journalistically relevant hypothesis from it, is akin to investigative reporting. (DE2)

Whereas *The Guardian*’s data team uses datasets to prove or disprove the core hypothesis of a story, interviews with *Spiegel Online*’s team indicate another data journalism epistemology: Datasets cannot only be used

to test previously established hypotheses but also be investigated in a more explorative manner, not starting with strong but light hypotheses, giving the journalists more freedom during data analysis. These two data teams exemplify two different approaches to the epistemic exploitation of data analogous to Parasie’s (2015) hypothesis-driven and data-driven approach.

Initially, *NZZ Data* “wanted to do investigative journalism. There is no big tradition [of investigative reporting] at *NZZ* though. So we were out on a limb” (DE4); this account illustrates the friction between organisational culture and professional subculture. Still, *NZZ Data* often saw “people that came to us with an elaborate hypothesis and we looked for fitting datasets, acting as researchers in the background. We tried to approach our own stories from an investigative angle” (DE4). This indicates that the first instalment of data journalism at *NZZ* also worked along epistemologies similar to the other data teams. On the contrary, this approach did not always get the needed support:

If we said that there is an investigation that we could do, that is a bit more elaborate, that we would need the help of a correspondent, we need to go more in-depth – this was often not put into practice. This was a bit frustrating. We also did not have the opportunity to do long-term investigations because these were not the stories that necessarily did as well as appealing multimedia features. (DE4)

This account illustrates that when the journalists perceive that they are being held from maintaining their professional standards, they become dissatisfied (Hollifield, 2011: 205). Even though the other organisations’ teams are not labelled “investigative,” their statements have shown that this approach is an accepted part of their professional set of values. The *NZZ* case shows how organisational culture can delimit professionals’ interpretation of the journalistic routine. After disbanding *NZZ Data*:

there is no investigative team that I could get in on. This simply is not the focus of *NZZ* . . . I would have to start at nothing, do extensive investigations and get a hold of hidden data and this is just not realistic. (DJ3)

This statement foreshadows the developments that manifested through the introduction of the *Storytelling team*. Just as the other data units, this unit heavily relies on collaboration with other desks by approaching specialist correspondents (DJ3, DE5) – however, not by collaboratively investigating a lead but by developing and providing storytelling formats and technological infrastructure:

We have defined certain storytelling formats that can be employed in breaking news situations. For instance, “What we know and what is still unclear,” a new visual breaking news explainer that we call “reconstruction of events.” For the most part, editorial staff will effectively provide content and we supply visual elements. (DE5)

The composition of the team (three data journalists, three infographics specialists, three developers, headed by a data editor) amplifies that they stepped away from investigative reporting and moved towards a more diversified portfolio: The team covers beats such as sports, elections, or breaking news, predominantly by collaborating with specialist correspondents from other desks. On top of that, explanatory formats add background to current affairs, again, in collaboration with desks. Journalistic duties and computational efforts go hand in hand, as the *Storytelling team* is acting as a support unit, as “teacher and helper” (Fink and Anderson, 2015: 472), that assembles both technologists and journalists, equipping their colleagues with a toolkit, thus enabling the newsroom to realise data-driven and visual stories.

Discussion and conclusion

As journalism in general, also data journalism as a professional occupation is hardly homogenous. Similar to Fink and Anderson (2015: 479), the results illustrate that “the conception of data journalism was extremely vague, both rhetorically and organizationally.” *The Guardian’s Data Projects* team articulates as core traits collaboration; hypothesis-driven, investigative approaches; and data as a means of investigation, subordinated to journalistic norms and values. After shifting away from the *Data Blog’s* data-centric approach, the team’s paradigm resonates with CAR tradition and can be placed close to Borges-Rey’s (2017) newshound paradigm. *Spiegel Online’s* data team also endorses investigative approaches and watchdog journalism but at the same time expresses a more data-centric concept: the team considers the exploration of a dataset as an inherently investigative and inductive process that can generate hypothesis. Moreover, the team understands data as a reporting object putting forward questions as to transparency and algorithmic accountability. With this broad conceptualisation of data journalism practice, this team covers a wide range from CAR to Parasie’s (2015) data-driven approach on Borges-Rey’s (2017) continuum. *NZZ’s* first data team acted under a similar epistemological paradigm and related espoused beliefs. Their investigative conceptualisation of data journalism practice, however, never took hold; they did not

manage to legitimate their investigative endeavours and acted as cosmopolitans (Gouldner, 1957), who, in renunciation of the organisational culture, would identify with their professional subculture. The instalment of the *Storytelling* team brought about a change of course, now pooling data journalists and technologists to imbue the newsroom with data-driven infrastructure and formats. This tech-heavy unit only partially resonates with epistemological paradigms inherent to data-driven journalism but rather with Usher’s (2016: 184) conceptualisation of interactive journalism: As the team has data journalists, graphics designers as well as programmers, they assemble all skills needed for a “visual presentation of storytelling through code.” Due to its small sample, this study’s limited scope cannot offer generalisable and extensive findings; still, they do support the oft-observed conceptual fluidity of data journalism (Borges-Rey, 2017; De Maeyer et al., 2015; Fink and Anderson, 2015; Hermida and Young, 2019). Recognising data journalism as an “emergent field where fluidity is a defining element in journalistic processes, practices, positions and products” (Hermida and Young, 2019: 33), it stands to reason that this fluidity is a keystone of data journalism culture, which consequently provokes tensions between organisational structures and culture, and data journalism subculture. Which epistemological modus of data journalism is enacted and “the degree to which a subculture is articulated is partially determined by the stability of the organizational context” (Bloor and Dawson, 1994: 291). Under unsettled circumstances, as exhibited through reorganisations in the cases of *The Guardian* and *NZZ*, the journalists’ subcultures and their background appear to come to the fore more clearly and reveal the tensions between organisational and professional cultures.

These findings do by no means signal that data journalism subculture abandons traditional journalistic norms and values or that data teams are working towards establishing a counter-culture; instead, the subculture incorporates journalistic conventions and epistemologies, and perpetually rewrites them in an ongoing effort to normalise, institutionalise, and legitimise data-driven newswork as a part of professional journalism.

From an organisational perspective (RQ1), *NZZ’s* disintegration of *NZZ Data*, a team that set out to do investigative reporting, and, eventually was folded into a team of technologists and data journalists, exhibits frictions within informal organisational structure (organisational culture vs. professional subculture) as well as problems due to structurelessness. *The Guardian* and *Spiegel Online* steadily integrated their data teams by increasing structural complexity, formalisation, and centralisation while still giving leeway to professional

self-actualisation. These examined professional journalistic routines and underlying epistemologies cohere with the dispositions of individual journalists that identify with a professional subculture (RQ2). The similarity of all three conceptualisations of data journalism indicates that the subculture transcends institutional space and acts as an inter-organisational unifying force; this challenges historical organisational structures of newsrooms (see Boyles and Meyer, 2017) that now have to accommodate data journalism subculture, which might withal challenge a currently dominant organisational culture and lead to normative conflict. Looking to answer the second research question partially confirms that the concept of organisational structure is to be “recognized as a product of human agency rather than economic rationality” (Hollifield, 2011: 206).

This begs the question whether individual professionals shape organisational culture through externalising their professional culture (Bloor and Dawson, 1994) or whether organisational culture constrains and even negates the formation of a certain subculture that is considered incompatible (Mierzejewska and Hollifield, 2006). “Instead of being monolithic phenomena, organizational cultures are composed of various interlocking, nested, sometimes conflicting subcultures” (Martin and Siehl, 1983: 53). Follow-up research into these aspects would certainly advance our understanding of data journalism culture in organisational contexts. For one, biographical research and narrative interviews with data journalists could allow retrace their socialisation and background as well as social and professional affiliations. As data journalism subculture appears to sanction a range of epistemological modi, role perceptions, norms, and ethical ideologies that are habitual components of individual journalists might affect to what modus data journalists adhere. In-depth interviews with senior editors and managers could shed light on the interplay of organisational and professional cultures and broaden the limited scope of this study by building on a more comprehensive data basis. In addition, while all three examined organisations are legacy news media and representative of their kind within a collective case study, *The Guardian*’s business model sets itself apart. This might affect managerial decisions as well as the overall organisational culture, supposedly giving its staffers and the data team more autonomy. At the same time, this study only took into account institutional data journalism practice. The role of external organisations remains untouched. *Spiegel Online*’s team (at least at one point) collaborated with *Google News Lab* fellows, vindicating Schein’s (2004: 277) argument that when subcultures stabilise, “organizations acknowledge this most clearly when they develop rotational programs for the training

and development of future leaders.” Inquiry into inter-organisational and external cooperation could certainly broaden our understanding of professional data journalism culture. It appears that through data journalism, entrepreneurial efforts of tech companies lead to changes in organisational structures, as new staffers are externally funded and accommodated within the organisation. This case shows that data journalism’s “participatory openness and cross-field hybridity” (Coddington, 2015: 337) admits external actors that act as “external reference groups” (Bloor and Dawson, 1994: 278) that can shape the subculture and eventually its surrounding organisational culture and structure. Research should therefore explore “sociocultural external pressures” (Usher, 2016: 185) via the role of tech companies within data journalism subculture.

After all, this article puts forward the hypotheses that how data journalists carry out data-driven newswork is connected to two spheres: The professional sphere comprises the organisational subgroup that assembles certain individual actors that bring about practices and underlying epistemologies that are shaped by the professional culture these journalists relate to. The organisational sphere comprises organisational structure that either integrates a subgroup by structurally accommodating it or uncouples it by leaving it structurally unbound and organisational culture that can reify a compatible professional subculture or reject a conflicting one.

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Notes

1. Due to overlapping notions, organisational culture and informal structure are used interchangeably (see Abell, 1996).
2. Tracing back to Meyer’s seminal work *Precision Journalism* from 1973.

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