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Computational Journalism in the UK newsroom: hybrids or specialists?

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Abstract:

As new forms of multimedia, data-driven storytelling are produced by news organisations around the world, programming skills are increasingly required in newsrooms to conduct data analysis and create interactive tools and news apps. This has prompted some universities to combine journalism courses with computer skills and there is much hype about the emergence of hybrid programmer-journalists, journo-coders, journo-devs who are equally proficient writing code and copy. To date, most of the academic research into computational journalism in the newsroom has been restricted to the United States where studies suggest a model whereby the roles of journalist and programmer are merged. There is, therefore, a need to identify the extent to which this organisational

model is replicated in newsrooms in other parts of the world. This paper is an exploratory study into two news organisations in the UK – the BBC and the Financial Times – to investigate the extent to which journalism skills and programming skills are being combined and the different professional identities being created. This study finds that the journalists and programmers are considered as two distinct professions and the idea of a hybrid role is rejected by the newsroom staff interviewed. A new model is identified in the newsroom whereby teams consisting of journalists, programmers and designers work closely together on interactive, data-driven projects. These findings are valuable to journalism educators in that they identify the technical skills and attitudes required by journalists working on innovative storytelling formats.

Introduction:

As journalism loses its traditional dependency on the medium of paper and becomes a digital enterprise (Hamilton & Turner, 2009; Jacobson, 2012, p. 5; Steensen, 2011), computational techniques have led to major new developments in the field of journalism and journalistic expression (Cohen, Hamilton, & Turner, 2011; Flew, 2012, Spurgeon, Daniel, & Swift, 2012; Jacobson, 2012; Lewis & Usher, 2014).

Journalism's digital era is no longer just about finding efficiencies to replicate traditional models of newsgathering and storytelling – PCs to replace typewriters, for example (Flew et al. 2012) The new digital era is about using computer technology to extract, analyse and visualise data (Gray, Chambers, & Bounegru, 2012; Nygren & Appelgren, 2013) or using programming skills to build news applications such as maps, interactive multimedia stories, tools to explore data (Jacobson, 2012; McAdams, 2014; Royal, 2010); or even creating online news games enabling the audience to play, for example, at being the protagonist in a news story in order to better understand a complex organisation (Bogost, Ferrari, & Schweizer, 2010).

Usually the term “computational journalism” is used to encompass this range of techniques and developments (Cohen et al., 2011; Karlsen & Stavelin, 2014; Lewis & Usher, 2014). But what is less clear is who should be doing the computational journalism in the newsroom and what should we call those carrying it out. Is a new generation of programmer-journalists emerging? Do all journalists need to acquire programming skills? These are important questions that directly affect all those who are involved in journalism education. Do our students need to ditch shorthand and learn to code instead?!

There is much excited talk in the United States of the rise of the journo-coder, programmer-journalist, hacker-journalist, journo-programmer - the terminology is undecided (Pillohofer, 2010).

Indeed, ‘Why all your students must be programmers’ was the provocative title of one of the liveliest panel discussions at the August 2013 Conference for the Association for Education in Journalism and Mass Communication in Washington, D.C. On Twitter, it was dubbed the #AEJM-CBattleRoyale (Hernandez, 2013).

Already, some institutions are combining journalism and computer science programmes (Cohen et al., 2011). Notable amongst these is the Columbia University Graduate School of Journalism (together with the Tow Center for Digital Journalism) which offers a dual degree in Journalism and Computer Science the stated goal of which “is for its graduates to help redefine journalism in a fast-changing digital media environment.” (Columbia Journalism School, 2014).

Here in the UK, some of the top journalism schools have also introduced computing into their courses. Most recently, the University of Cardiff launched a Masters in Computational Journalism in 2014 which aims to “enable students to acquire specialist knowledge of journalism and computer science.” (Cardiff School of Journalism, 2014)

However, there is frustration that the “should journalists learn to code?” debate has become meaningless (Veltman, 2013) because of a failure to define what “coding” actually means in a journalistic context. For some, it can only ever mean expertise in programming languages such as JavaScript, Python etc. For other, it seems to mean little more than advanced computer literacy. Very little research has explored the extent to which journalists in newsrooms are actually using programming skills, if at all. Some research has been carried out in American newsrooms, notably by Cindy Royal (2010) at the New York Times, and more recent research has been conducted in Norwegian newsrooms by Joakim Karlsen and Eirik Stavelin (2014). But none has yet been carried out in a British context although British news organisations have been very dynamic in innovating in this area of journalistic activity (Gray et al., 2012). It seems that as universities increasingly offer their journalism students courses that include some level of computational skills, it would be useful to explore and analyse what actually happens in newsrooms and there is room for more study in this area (Anderson, 2012).

This paper is a small-scale exploratory study which investigates computational journalism in the specialist units of two newsrooms in the UK, namely the BBC and Financial Times. It addresses the following research questions:-

Q1 – Does the hybrid journo-coder/programmer-journalist model exist in UK newsrooms? If not, what alternative model is being implemented?

Q2 – What technical skills are required of journalists working in the field of computational journalism and how are these acquired?

Definitions

As mentioned above, definitions and terminology in this field are still disputed and undetermined (Gynnild, 2013). Much of the literature concerned with computational journalism seeks to locate it in a historical context with a natural, evolutionary development. The consensus is that computational journalism has its roots in the “precision journalism” described by Philip Meyer in his 1973 book of that name. Indeed, in the latest edition of the book, Meyer reveals that Newsweek had described him as a “computer reporter” five years before his book was published (Meyer, 2002). Meyer’s emphasis, however, is primarily on the application of social science methods to journalism and therefore is associated strongly with investigative journalism. Mainframe computers were the tool which enabled him to store and analyse scientifically the huge amounts of data he collected. This is usually referred to as Computer-Assisted Reporting (CAR) and its history has been well-documented (Flew et al., 2012; Parasie & Dagiral, 2012).

The more contemporary practice, data journalism, has evolved from CAR but Bounegru (in Gray et al., 2012) argues there is debate as to the extent to which the two have diverged. Unlike CAR, Data Journalism is not solely concerned with investigative journalism but can be used to find or

enhance a wide range of stories (Gray et al., 2012; Mair & Keeble, 2014). Bounegru concludes that data journalism is best seen as an evolution of the CAR tradition but the emphasis on the word “data” is significant in that it recognises a new era of journalism epitomised by the volume of data freely available to all (Bounegru in Gray et al., 2012)

Others have described the way in which CAR has evolved into Computational Journalism by utilising Web 2.0 technology which allows for new forms of journalistic storytelling such as multimedia, interactive features as well as journalistic investigation (Flew et al., 2012; Hamilton & Turner, 2009; McAdams, 2014). The significant implication here is that whereas CAR (and data journalism) was largely carried out by people who solely identified as journalists, computational journalism brings technologists and journalists together to develop new tools and interactive storytelling techniques (Flew et al., 2012; Lewis & Usher, 2014). Sometimes the end product will not be a traditional story, but a tool that allows the audience to use the data to answer questions of personal interest (Parasie & Dagiral, 2012).

Meanwhile, Gynnild (2013) draws attention to the difficulty of defining this evolving field and points out that the terminology is not keeping up with the speed of innovation and change. Her list of the new terminology that has emerged in the 21st century is indicative of the problem of trying to find meaningful and widely-accepted definitions:-

“data journalism, data-driven journalism, computational journalism, journalism as programming, programming as journalism, open-source movement, and news applications.” (Gynnild, 2013, p. 5)

Gynnild herself suggests the term Computer Exploration in Journalism (CEJ) to describe an approach of “journalistic co-creation” using algorithms, data and social science methods in reporting and storytelling (Gynnild, 2013). However, this term has not been adopted more widely.

The term “computational journalism” seems the most useful in that it is broad enough to embrace the full range of activities discussed above.

Literature Review

Since the computerisation of newsrooms, technology issues have become a major area of focus for newsroom studies (Boczkowski, 2004). This has given rise to two conflicting theoretical frameworks. The first stresses a determinist approach, as emphasised by Pavlik (2000), who asserted that “Journalism has always been shaped by technology” (Pavlik, 2000, p.229). A similar technological determinism is suggested by McNair (1998) who writes that “the form and content of journalism is crucially determined by the available technology of newsgathering, production and dissemination” (McNair, 1998, p.125). Bardoel and Deuze (2001) are more cautious claiming that, whilst there is a strong deterministic component, technology itself is not the sole determining factor in changes to journalism (Bardoel & Deuze, 2001)

The second, contrasting approach is to reject the idea of technological determinism as an unhelpfully simplistic way of explaining changes to newsroom practice (Cottle & Ashton, 1999; Örnebring, 2010). Instead, more recent academic research has adopted a sociological framework (Boczkowski, 2004; Schudson, 2005). Michael Schudson’s “Sociology of News production,” first published in 1989 but revised several times since then, has been influential in focusing attention on the newsroom as a complex sociological construct, the dynamics of which affect the way in which technological developments are adopted (Schudson, 1989, 2005). This has influenced much of the subsequent research work on computational journalism in newsrooms. Anderson (2013) applies Schudson’s four classic perspectives on the sociology of news – political, economic, organisational and cultural - to computational journalism, adding two more of his own – technological and institutional (Anderson, 2013). He notes the need for further research into “the social organization of news-work” (Schudson, 2005) in order to understand the “ground-level newsroom dynamics” of computational journalism and explore potential differences between ethnographies

of digital newsrooms over a period of time (Anderson, 2013, p.1014).

One of the most comprehensive empirical studies of how new technologies are adopted in newsrooms is Boczkowski's (2004) research into three online newsrooms in the United States (Boczkowski, 2004). In strongly rejecting the determinist approach, the author focuses on the process of adoption, arguing that newsrooms' appropriation of new multimedia and interactive technologies is related to variations in organisational structures, work practices, and representations of the end-user (Boczkowski, 2004). Following in this tradition of rejecting determinism, Weiss and Domingo (2010) propose that networks and hierarchies in the newsroom influence innovation and they use Actor Network Theory and the meta-theoretical approach of Communities of Practice (Wenger, 1998) to explain the relationship between journalists and technology (Weiss & Domingo, 2010). In particular, the Communities of Practice approach is used to explain how knowledge is gained and shared within the social environment of the newsroom as new technologies are learnt and adopted.

These socio-organisational approaches would seem to offer rich opportunities for exploring the variations in the way computational journalism is incorporated into newsrooms and the delineation/description of job roles. They also offer opportunities for comparisons to be made across national boundaries and between news organisations of different sizes (Fink & Anderson, 2014).

A parallel strand of scholarly work has sought to position computational journalism in the field of journalistic practices as a whole. Much of the initial research in this regard has been conspicuous in its optimism, claiming that the multi-disciplinary approach of computational journalism could ultimately lower the costs of watchdog reporting making it easier to hold governments to account (Cohen et al., 2011; Hamilton & Turner, 2009). Similarly, Flew et al (2012) claim that computational journalism increases opportunities for producing quality news at high speed and reduced cost, adding "real value to journalistic knowledge production" (Flew et al., 2012, p.168).

However, a criticism of these analyses is that they have been overly-optimistic, based mainly on speculative future-gazing. They tend to rely on analysis of the journalistic output produced by computational journalism without questioning how computational techniques might challenge the philosophical orientation of newswork or the social organisation of the newsroom (Anderson, 2013; Lewis & Usher, 2013).

Powers (2012) addresses some of these problems by investigating how journalists themselves discuss new technologies in news production. He suggests that journalists discuss changes in the technology of news production in three distinct ways:-

- part of a continuum of evolving journalistic practice
- threats to be subordinated
- the basis for journalistic reinvention (Powers, 2012).

Whilst the study is limited in its use of published articles rather than interviews with working journalists whose views might be less extreme, it does raise the important issue of the epistemological challenges that data-driven, computational practices can present in traditional newsrooms, a point overlooked by some of the optimists discussed above.

Although there has been academic interest in computational journalism for some years, there have been very few empirical studies of journalists and programmers working in newsrooms in this field. The earliest example of such a study is Cindy Royal's 2010 case study of the interactive news technology department at the New York Times (Royal, 2010). Drawing on a social meaning of news framework, Royal conducted an ethnographic observation of the department combining physical observation with lengthy interviews with key protagonists. Her research found that the technologists she interviewed identified their work as journalistic with a strong editorial element - "as fluent in journalism as they were in coding" (Royal, 2010, p.3) - suggesting the idea of a hybrid job-role combining both skill sets. Royal found that the culture of the department was rooted in the open-source, hacker culture which strongly influenced the newswork produced. Most of the interviewees described themselves as essentially self-taught enthusiasts who felt that media

education should therefore inspire students to become problem-solvers rather than simply teaching them to code (Royal, 2010). Whilst this research provides a very important starting point for further empirical studies, a drawback of this approach is its focus solely on the New York Times newsroom as a means for developing general theories. There are reasons to suspect that the NYT department at this time was atypical being under the strong leadership of the highly influential pioneer in computational journalism, Aron Pilhofer. There is a need, therefore, to see how Royal's findings compare with other newsrooms in different contexts.

Parasie and Dagiral (2012) focus their study on the city of Chicago, looking specifically at what they term "programmer-journalists" (Parasie & Dagiral, 2012). They use a combination of qualitative research interviews and quantitative news content analysis to examine the impact of bringing programmers into the newsroom to work on data-driven news projects. This study is significant in that it suggests that bringing programmers into newsrooms challenges the epistemologies of journalism because the methods and background of these "programmer-journalists" rest in the hacker culture which differs acutely from traditional CAR journalists'. Although the study is limited, as acknowledged by the authors, in being focused just on Chicago, their findings confirm the fears expressed by many journalists in Matthew Powers' study discussed above (Powers, 2012). Specifically, Parasie and Dagiral conclude that programmers place great emphasis on granularity of data rather than statistical analysis and storytelling as practiced by traditional journalists.

A major limitation of the research discussed so far is that it focuses almost exclusively on the United States. Whilst this is understandable in that much of the innovation in this field has taken place in the States, it is a weakness if we want to understand the processes whereby computational journalism has been adopted in newsrooms and derive hypotheses. An attempt at a broader approach is made by Weber and Rall (2013) who interviewed experts - a mixture of journalists, designers and developers - involved in the production of data-driven interactive news products in eight media companies - five in Germany, two in Switzerland and one in the USA (the New York Times again) (Weber & Rall, 2013). They noted a stark contrast between the European and American examples. In Germany and Switzerland, there was a clear definition of separate roles for journalist and programmer/designer. The journalist was responsible for the research and content of the news product with the programmer and designer responsible for the visual/interactive element. At the New York Times, in contrast, the programmers considered themselves to be journalists and were also involved in research and content, as found by Royal (2010). The authors hypothesise, therefore, that the key "success factor" in computational journalism is for each team member to think and act like a journalist (Weber & Rall, 2013, p.170). This "holistic approach," they claim, is what makes the New York Times a role model in this field. However, the authors' hypothesis rests on an assumption that the New York Times does indeed represent best practice and a role model without explaining how this is the case. In such a small study, it seems simplistic to make such a strong claim.

Using the Aristotelian concept of *techne* to frame and analyse their findings, Karlsen and Stavelin conducted a relatively small study into computational journalism in Norwegian newsrooms (Karlsen & Stavelin, 2014). The authors use the term "journalist-programmers" to describe those working in computational journalism in Norway who combine journalistic skills with programming skills (Karlsen & Stavelin, 2014, p.37). Elsewhere in the study the authors discuss journalists and developers working in teams so it is unclear how many of the nine people interviewed for this study were indeed self-described hybrid journalist-programmers or what level of skill they had in programming. It is therefore difficult to draw direct comparisons with other studies. However, the study does claim to support Royal's (2010) findings that all those interviewed who were working in computational journalism saw themselves first and foremost as journalists.

This review so far has examined the literature concerning computational journalism in the specific social organisation of the newsroom. But beyond the newsroom, there is growing scholarly interest in new forms of digital media and production which exist at the periphery of what might still be called journalism and it is useful to include a brief analysis of this "emerging technological space" (Ananny & Crawford, 2015, p. 192) because of its implications for the future

development of computational journalism and, thus, for journalism education. These studies have explored the extent to which journalism and technology can merge into what some see as a hybrid culture whereby journalism is defined as an ideology rather than a distinct profession (Deuze, 2005). Here, the idea of hybrid journalist-programmers seems well accepted, an inevitable evolution even as news is reinvented for the internet age,

“working in a space between technology design and journalism, influenced by both but not entirely beholden to either as they create systems that gather, sort, rank, and circulate news” (Ananny & Crawford, 2015, p. 204)

This intersection of journalism and technology is further explored by Lewis and Usher (2014) in their two year qualitative study of the global Hacks/Hackers organisation – an informal, grassroots network of journalists (“hacks”) and technologists (“hackers”) whose stated aim is to explore the future of news and information (Hacks and Hackers, 2010). The authors use the concept of “trading zones theory” (Galison, 1997, cited in Lewis & Usher, 2014) to argue that informal relationship-building is an important part of the process of bringing journalism and technology together, leading to the emergence of a shared language between distinct professional groups (Lewis & Usher, 2014). However, the study found that most Hacks/Hackers chapters lacked the institutional support identified in the trading zone concept and this led to frequent misunderstandings and differences of priorities between the journalists and technologists. That there is an urgent need for journalists to learn the language of technology and for journalism schools to address this is a recurrent theme in the recent literature (Doherty, 2012; Jacobson, 2012; Royal, 2010; Weber & Rall, 2013).

This review of the literature highlights the need for more empirical research into newsroom practice in the UK context – a gap which this paper attempts to address. In particular, the roles and skills of journalists and programmers need to be defined in order to facilitate comparisons across national boundaries in future studies.

Method

A case study approach was used to establish organisational structure at the BBC’s Visual Journalism unit and the Financial Times’ Interactive News team. Both of these teams are primarily producing data-driven, multimedia, interactive features. Interviews with the leaders of these teams enabled the researcher to study the role of journalists and developers working on these news products. The production process was examined as was the relationship between these specialist teams and the rest of the newsroom. These news organisations were chosen because of their innovative development of data-driven, interactive stories on their websites and because they enable the study to explore different newsroom settings; the BBC is a public service broadcaster whereas the Financial Times is a commercially owned daily newspaper. Both the BBC and Financial Times have global audiences.

Semi-structured interviews were then conducted with journalists and developers working in these specialist teams to gather qualitative data from those working on computational journalism in the newsroom. The interviews were conducted between July 2013 and May 2014. In order to develop the semi-structured interviews, an initial face-to-face group discussion with key members of the BBC Visual Journalism Unit, including the team leader, Andrew Leimdorfer, was set up to establish themes to be further explored in the interview stage. This was followed by a similar telephone discussion with Martin Stabe, who was leading the Financial Times’ team. Semi-structured telephone interviews were then conducted and recorded with journalists, developers and team leaders at both the BBC and Financial Times. This yielded 10 interviews in all which lasted between 30 minutes and 45 minutes each. The sample is small because the population size of the teams themselves is small. However, it was found saturation had been reached even with this small number of interviewees and no additional data was emerging to develop the various categories (Glaser & Strauss, 1967, p. 61; Strauss & Corbin, 1990, p. 188). The interviews were

transcribed and coded according to categories related to the research questions. Two categories then emerged as the most significant:-

- Skills and skills acquisition
- Attitude to work role

“Skills” is an important category because it helps us reach an evidence-based definition of what “coding” might mean in a journalistic skill-set and thus helps transform the “should all journalists learn code?” debate into something more meaningful and helpful for journalism educators. Similarly, it is important to study how those currently working in computational journalism acquired - and continue to acquire - their skills since this could be used to inform the design of new courses for multimedia **storytelling**.

The “attitude to work role” category is key to this study in that it enables a deeper understanding of how journalists and developers view their professions in the newsroom context. Specifically, the interviewees were asked about their attitudes towards the idea of a hybrid journo-coder/programmer-journalist.

Finally, listings of jobs, traineeships and internships advertised on the Gorkana website (<http://www.gorkana-jobs.co.uk/jobs/journalist/>), the specialist media recruitment agency, were gathered from 18th June 2014 – 8th January 2015. Only those based in the UK were used in this study. Duplicate job adverts were removed from this selection as were jobs which were specifically in sales. This resulted in 1166 unique listings. The job descriptions were then filtered to search for “interactive,” multimedia” and “data” roles. This filter produced only a small number of results and so was expanded to include other key words, namely “digital”, “content”, “web”. These results were then analysed further and those which specified some level of coding skills in the job requirements were noted.

It is recognised that Gorkana is not the only journalism job listing site and it is not claimed, therefore, that this selection represents every journalism job advertised in the UK. However, it was chosen because of its comprehensiveness.

Analysis and Results

Analysis of advertised journalism jobs

Analysis of the Gorkana journalism job adverts provided quantitative data about the value placed on coding skills in UK newsrooms. Of the 1166 unique listings (N=1166) collected in the timeframe of the study as described above, 24 jobs (2.1%) specifically mentioned some level of coding in the skills required for the job. A further 4 jobs (including one advert for a graduate programme) required data analysis skills. Thus 2.4% of total jobs in the study timeframe specifically mentioned some form of computational skills.

Of the 24 jobs with a coding requirement, 6 were newsroom designer roles and these all required a good level of proficiency in HTML/CSS. The remaining jobs covered a broad range of journalistic roles which have been categorised as follows:-

Digital Content – 13

Social Media – 3

Data Journalism – 1

Interactive Journalism - 1

Of the non-designer roles, only the Interactive Journalism role specified “expertise” in HTML/CSS and JavaScript. The Data Journalist role required Python, JavaScript and MySQL. All the other journalistic roles (16) specifically mentioned some level of HTML and of those, 5 also mentioned CSS. The level of skill required in these roles was generally described as “basic” or “an understanding of” rather than proficiency and was always in the context of working in a Content Management System rather than front-end coding. It is therefore clear that few recruiters specifically require journalists who can code. However, this may not be because it is an undesirable skillset. Rather it could be that recruiters do not expect to find many potential candidates with this

Organisational Model – the Team Approach

A clear organisational model emerged from the case studies and is visualised in Figure 1. In contrast to much of the literature based on US examples, the hybrid, programmer-journalist model (Parasie & Dagiral, 2012; Royal, 2010; Weber & Rall, 2013) is strongly rejected in the news organisations studied in the UK and instead a team approach is adopted whereby journalists, programmers and designers work closely together to produce multimedia, interactive news products. Martin Stabe argues that truly hybrid journo-coders or programmer-journalists do not currently exist in the UK.

“We’ve decided at the FT that the only way to bring those skills into the newsroom is to create a team that has people who come from both those backgrounds, plus designers. You really need a numerate journalist, a developer who can work on deadlines, and a designer who understands technology. If you have those three people working together, you have a journalist-coder.” (Martine Stabe, Financial Times, 2013)

Significantly, he points out that the developers in this triangular team remain members of the IT rather than the editorial department so their career path in mainstream web development is not broken.

This team model is replicated at the BBC where Andrew Leimdorfer agrees that hybrid journo-coders are not necessary, preferring instead to bring together highly talented specialists. It is interesting to note that this is similar to the model Weber and Rall observed in their German and Swiss examples (Weber & Rall, 2013).

In this model, the journalist is responsible for sourcing the data and carrying out the initial analysis in order to find the news story to be pursued and then contextualising it. Indeed, the story remains central to the whole team’s approach. Leimdorfer believes that simply mapping data and presenting it to the reader in a granular form does not constitute “journalism.” This would seem to reject the concept of “journalism as programming” (Gynnild, 2013, p. 9) and differs significantly from the model described by Parasie and Dagiral in Chicago where “programmer-journalists” were primarily focused on giving readers tools to access the granular data rather than storytelling, thus challenging the epistemology of the journalism itself, according to the authors (Parasie & Dagiral, 2012). In the BBC and Financial Times model, the news product is driven and managed primarily by the journalist and there is no epistemological dilemma because storytelling remains central to the project.

“The journalist won’t ever leave the process. This is the thing. They’ll be on it right up to the final day. Quite often, once it’s been designed, they might be suggesting tweaks, discussing things around finer points of UX to make sure they get the user experience they want for their storytelling.” (Leimdorfer, BBC, 2013)

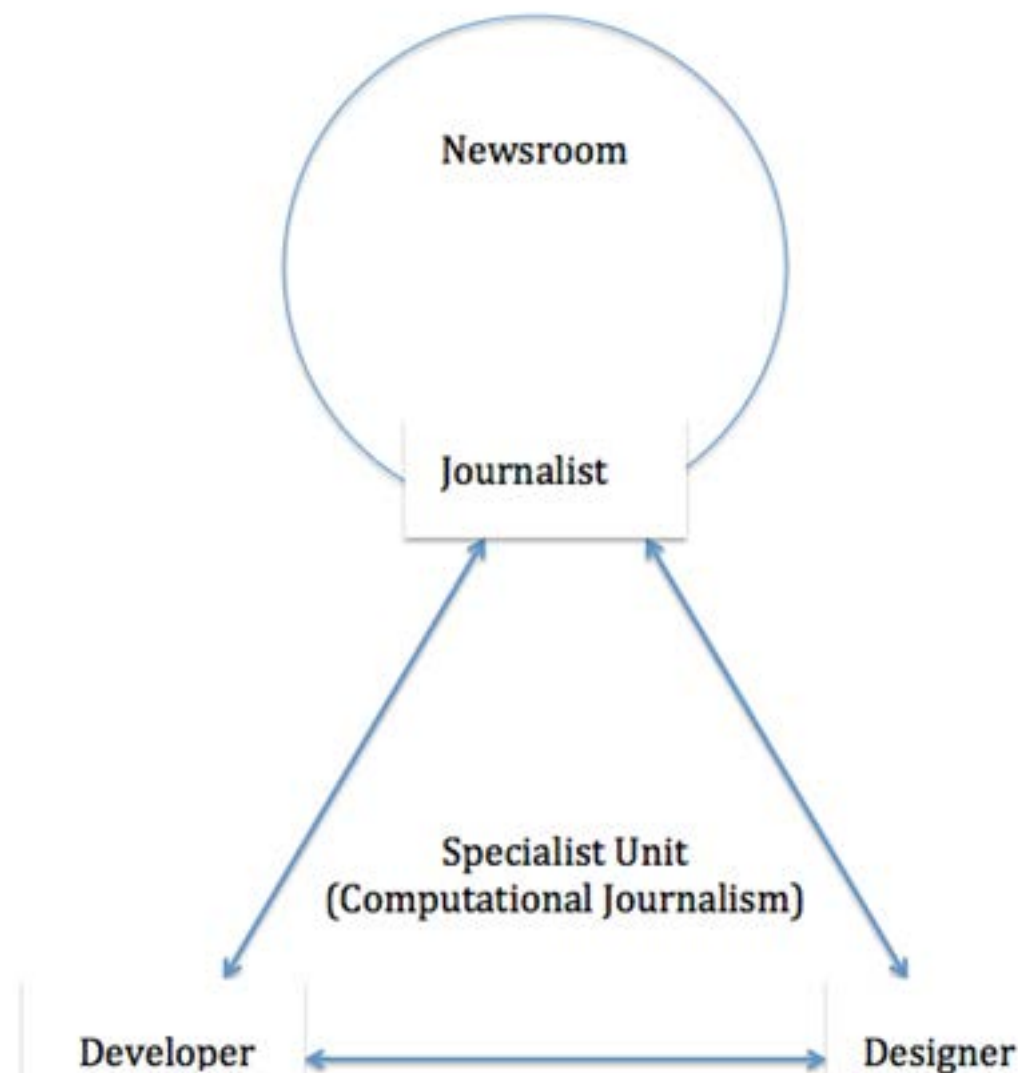
Within this model, the developer may at times be heavily involved in the journalistic process. For example, finding the editorial interest in census data may require highly specialist data-analysing skills so the journalist will work closely with a developer to combine the data in different ways until the news story is found. Furthermore, the developer does not simply “take orders” from the journalist but is able to suggest ways in which data can be visualised or stories explored by the audience, for example, whilst remaining a feasible project within the technical and time constraints. This close, on-going collaboration throughout a project distinguishes the BBC and Financial Times model from the model identified by Weber and Rall (2013) in Germany and Switzerland where the authors found journalists effectively passing on the journalistic content to the developers in a more linear workflow rather than the continuous triangle identified in this study.

Although this team approach rejects the need for hybrid journo-coders/programmer-journalists, this model works only if the journalists on the team have the appropriate skills to at least understand what is technically possible....

“...who can write just enough code to understand what the developers are doing, who can do

The developer on the team is regarded as a precious and limited resource so the more data-analysis work the journalist is able to do on their own to find the story, the more likely they are to be successful when pitching for developer time to build a multimedia, interactive news package.

Figure 1:



As visualized in Figure 1, the journalist on the team is also the point of contact with the wider newsroom and often ideas for data-driven stories and interactive formats come from subject-specialists outside of the team. At the BBC, this goes even further with the journalist also responsible for ensuring the interactive news packages and apps produced by the team are integrated into the whole news output with, for example, text-based online articles and on-air features for radio and television audiences.

Skills and Skill Acquisition

The interviewees were asked to list their key technical skills and these have been categorised in Table 1.

The table demonstrates a clear distinction between the skillsets with none of the journalists interviewed claiming programming as a skill. Instead, the journalists said their skills were in data

analysis, primarily Excel spreadsheets which were universally mentioned as the pre-requisite skill for working in this field of journalism. One journalist mentioned a basic knowledge of the statistical programme, R. Tools for mapping and visualising data were valued by journalists because they enabled them to further analyse the data. However, the journalists did not build the maps and visualisations that would be seen by the end-user of the website. These were built by the developer and designer on the team.

Table 1:

	Developers	Journalists
Front End (User Interface)	HTML/CSS	
	JavaScript	
Back End (support systems eg database management)	Python	
	PHP	
	Ruby	
	SQL	
	UNIX	
Data-analysis/presentation		Excel
	MPS	
	SPSS	
	GIS mapping software	GIS mapping software
	R	R
		Tableau

Although Table 1 shows the answers given by interviewees when asked to list their key technical skills, further questioning did reveal a more nuanced picture. The journalists refused to describe themselves as having programming or coding skills or a need to acquire them but they did admit to some “basic” knowledge. Certainly Martin Stabe believes more and more journalists have enough knowledge to be able to write simple programming scripts in Python, Ruby or PHP to scrape data from a website and store it on a spreadsheet, for example.

“From a full time developer point of view, these are fairly trivial, simple tasks they wouldn’t mention on their CV. If you asked a top-notch developer what their skill set is, they probably wouldn’t mention they could write complex Excel functions or that they can manage a database on SQL or write a really simple scraper in Python. For a journalist those are exceptional skills and definitely accessible skills and skills that an increasing number of journalists have.” (Stabe, FT, 2013)

This clearly demonstrates the need to define clearly what is meant when discussing whether journalists should learn to code because there is a broad spectrum of skill. Journalists working in specialist teams at the BBC and FT do not consider their level of skill to be sufficiently high to merit the term “coding” because it is so far down the spectrum compared with the experienced developers they work alongside who are able to produce software. However, the journalists have enough knowledge of some programming languages to enable them to carry out, for example, important data-gathering tasks such as web scraping.

It was interesting to note that only two of the developers interviewed had a Computer Science higher education background. The other developers – like the journalists – came from a humanities/arts background but had developed a strong interest in programming which they had pursued informally. This replicates Royal’s findings at the New York Times where few of the technologists

interviewed had a purely Computer Science background and had instead acquired their programming skills through informal self-directed learning (Royal, 2010).

All respondents agreed that learning new skills and pushing the boundaries of their knowledge was a major part of their job and took up to 25% of their work time each week.

“Every year there’s a different way of doing things, producing graphic or interactive, so you have to constantly look at what you know about how to do your job.” (Journalist)

“You learn by always coding at the edge of your understanding...It’s about constantly throwing yourself into a slightly uncomfortable situation then learning your way out of it.” (Developer)

“I don’t think you can do this role without the attitude and willingness to learn new skills all the time and I think the point at which you stop learning is probably the point you’re not at the top of your game any more.” (Journalist)

This learning is distinctive in that it is informal, self-directed and highly reliant on online resources and knowledge-sharing. Formal courses did not play a significant role. Learning from colleagues in the newsroom was cited as a major source of information and skill-sharing was a distinctive aspect of the teams at the BBC and Financial Times.

“Basically, it’s asking people around you. It saves time. If you try to literally teach yourself, that’s very time-consuming. People are often very willing to help.” (Journalist)

“I’ve learnt so much from fellow colleagues – how to build code that is robust and can scale without breaking.” (Developer)

Other sources of learning came from informal meet-ups such as HacksHackers and the online community such as NICAR and the Centre for Investigative Journalism. Developers also spend time analysing the code underlying their competitors’ interactives and news apps (the New York Times’ was mentioned specifically) in order to learn. Journalists found it particularly helpful to use the internet to seek out other journalists working in the field rather than trying to learn from official software training guides, for example, which tended not to be geared towards journalistic use.

This culture of “perpetual reinvention” (Powers, 2012, p. 37) - constantly pushing boundaries, updating skills, learning from a community of fellow practitioners - owes more to the hacker culture (Lewis & Usher, 2013) with its emphasis on innovation, tinkering and collaboration than the traditional newsroom culture and has been observed in other studies of computational journalism in the newsroom (Karlsen & Stavelin, 2014; Royal, 2010). Indeed, Gynnild (2013) argues that developing this “innovation-oriented mindset” is more important for ensuring journalism’s future impact on society than adaptation of technology itself (Gynnild, 2013, p. 15/16).

Attitude to work role

As explained earlier, interviewees were asked about their attitudes to their work role, specifically their attitude towards the idea of hybrid journo-coders/programmer-journalists.

Only one of the interviewees – a developer - described himself as a “journo-coder” or any of the other hybrid job descriptions.

“I’d like to think that any developer that works on any journalism team is a journalist.” (Developer)

This interviewee believed that any work which involved building something to tell a story for an audience was “journalism” which is similar to the attitudes found in studies based in the United States (Royal, 2010; Weber & Rall, 2013) where programmers in newsrooms tend to see their work as journalistic.

However, this response was in stark contrast to all other responses from this study where interviewees identified strongly as either developers or journalists and were, indeed, sceptical about

the possibility of combining both skillsets in one person in any meaningful way. Typical statements include:-

“I’ve never met a journalist who is particularly adept at coding in my fairly limited pool.” (Developer)

“I just say I’m a journalist who specialises in maps and charts.” (Journalist)

“I don’t think a person can straddle both. To make an interactive requires so many different areas of knowledge, you need years of experience just doing that. And journalism is a whole other area of expertise so you’d be lacking in focus on one side.” (Developer)

“I think it’s great that we have crossover in our world - a bit like a Venn diagram - but I think I’m never going to be at the level that (a developer) is at and I think my time is better spent doing the more journalistic part of the work” (Journalist)

“I’m an expert in my field, the journalist is an expert in their field and together we get things done. There’s a huge amount I don’t need to know - law, editorial guidelines, style - I just don’t get that involved in that kind of thing.” (Developer)

The programmers interviewed did not feel competent finding news stories or writing copy and relied on the journalists for this aspect of the projects. However, all programmers did say they had acquired some understanding of the journalistic process – the need for a news angle, hitting deadlines, understanding the audience – which they felt distinguished them from programmers working in the IT department.

Thus, given this strong belief in clearly-defined, specialist roles, collaboration becomes a key component of the attitude to work where members of the teams are, in the words of one interviewee, constantly “bouncing bits of knowledge off each other.” This requires an understanding of each other’s sphere of expertise leading to what Andrew Leimdorfer at the BBC has described elsewhere as “tech-savvy journalists and news-savvy technologists” (Leimdorfer, cited in Herman, 2011). The interviewees describe learning each other’s “language” in order to collaborate successfully thus enabling two separate groups of professionals (journalists and developers) to combine ideas and innovate. This intersection of professional disciplines in a shared space with common goals is consistent with the trading zone concept which Lewis and Usher (2014) used to investigate the Hacks/Hackers global network. The authors found that simply putting technologists and journalists in the same room did not lead to mutual understanding and productive collaboration because of the clear “barriers” between each profession’s understanding of the other (Lewis & Usher, 2014). However, the institutional setting of a newsroom with clear leadership and carefully selected team members seems to overcome these obstacles and results quite readily in cross-disciplinary innovation.

Conclusion:

A socio-organisational approach has been found to be a useful framework for investigating the field of computational journalism in UK newsrooms allowing an exploration of emergent themes and suggestions for further research. Boczkowski’s theory that organisational structures, work practices and in particular representations of the user shape the adoption of multimedia and interactive tools in newsroom (Boczkowski, 2004) seems well-founded. Significantly, teams at both the BBC and the Financial Times perceive their audience as wanting to personalise, share, explore and play with news/information on a variety of devices and this drives the constant search for new ways of presenting stories and the skills and technology to achieve this.

However, no evidence was found to support the idea that currently journalists in the newsroom need to learn to “code.” Similarly, it found that in all but one case, developers working in the UK newsrooms investigated strongly rejected the idea that they were “journalists” in contrast to the findings in research conducted in the States (Parasie & Dagiral, 2012; Royal, 2010; Weber & Rall, 2013). Rather than seeing this unwillingness to think of themselves as journalists as a “weakness”

(Weber & Rall, 2013), this study argues that the triangular team model identified at the BBC and Financial Times ensures the emphasis is always on the journalistic story rather than the granular data.

This contrasts with the programmer-journalist, open-source, hacker tradition observed in other studies (Karlsen & Stavelin, 2014; Parasie & Dagiral, 2012; Royal, 2010; Weber & Rall, 2013).

Clearly, caution is needed when drawing generalisations from the findings of such a small-scale study. However, this research does suggest that there is a distinction between the American and European models of computer journalism in the newsroom. Further ethnographic studies are now needed in a variety of newsroom settings across national boundaries in order to verify this and, indeed, investigate any alternative models. Similarly, the evolution of these newsroom models needs to be studied to investigate significant changes to job roles and skillsets over time perhaps influenced by developments outside the newsroom where the intersection of journalism and technology is developing rapidly (Ananny & Crawford, 2014).

The analysis of Gorkana journalism job adverts supports the evidence from the case study interviews in that expertise in coding languages was rarely required. Journalism job adverts which require coding knowledge are still the exception – just 2% of the total analysed – and there is no evidence to suggest that UK newsrooms are seeking hybrid journo-coders. But it seems employers see value in journalists having some basic understanding of HTML – the language of the Web – in that it helps them perform their core tasks such as creating digital content in a Content Management System. However, it should be noted that the journalists interviewed for this study all arrived in their specialist roles via an internal route having developed particular interests in data and multimedia rather than through an external recruitment process. In addition, recently a number of major news organisations in the UK have offered journalism trainee schemes which specifically mention coding and data analysis skills in the list of criteria suggesting that news organisations may be increasingly confident of finding graduates with this skill set and nurturing it in their newsrooms – for example, the Guardian’s 2013 Digital Trainee scheme, Reuters Journalism Programme (Thomson Reuters 2014), the Financial Times’ 2015 scheme (Financial Times, 2014), the Telegraph Media Group’s Editorial Graduate Programme 2015 (Telegraph Media Group, 2014).

Finally, this study has established the importance of defining what is meant when we discuss “coding” in the context of journalism and journalism education. The “tech-savvy” journalists interviewed in this study were not “programmers” or “coders” in the sense of building software and applications. But they were sufficiently skilled in this area to be able to collect and analyse data and to have meaningful discussions with developers about creating the User Experience demanded by the story. If we do not define “coding” clearly we risk alienating both the programming community and many highly-skilled journalists. We also risk failing to advance education programmes for the next generation of journalists if we do not have a clear understanding of how journalists operate in the newsroom setting.

Although a few universities in the UK are already offering post graduate courses in computational, data-driven and interactive journalism, it seems unlikely that forcing highly technical modules on all our journalism students would result in a generation of enthusiastic computational journalists. However, there is a strong case for all journalism students to be at least introduced to the field of computational journalism early on since many will not have even contemplated the role data and coding are now playing in the newsroom. Universities should also consider the way journalism courses are marketed to perhaps attract more students who are numerate and already interested in technology.

Moreover, this study does suggest a need to create journalism graduates who are problem-solvers, curious and able to learn new skills independently using online information and the networks of practitioners that now exist – learning behaviours that were practiced by all those interviewed for this study. One approach might be to adapt the Hacks/Hackers model to bring together the social worlds of journalism and technology students within a university setting to foster greater understanding and collaboration (Lewis & Usher, 2014). Further research should also explore the significance of Communities of Practice in sharing and developing knowledge of computational

journalism (Weiss & Domingo, 2010) since online communities and networks within the newsroom were repeatedly mentioned by interviewees as key methods of learning.

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